5.11 Weekly Goal

Thursday, May 11, 2017
5:22 PM

- [ ] 1. Back test some strategy
    - [ ] 1. Economic Indicator (Read AB-> Ask JB what does data mean)
    - [ ] 2. Python Strategy Implement 2h

- [ ] 2. Pricing Practice
    - [ ] 1. Price Practice as much as you can
        - a. Finish the vol target pricing.
    - [ ] 2. Use the Maps create Greeks Maps for all the product 1h
    - [ ] 3. Finish the pricing track and story(1h)

- [ ] 3. Macro View
    - [ ] 1. Read macro news 1h
    - [ ] 2. Got a Trade Idea based on your framework (0.5 h)

- [ ] 4. Strategy research
    - [ ] 1. Find two reasonable strategy I could propose tomorrow 1h

- [ ] 5. Study Part(You Could do when you are tired.)
    - [ ] 1. Listen to English news. Train the number sensitivity.
        - a. Do it after you finish everything
    - 2. Finish the coding test (3h)

Number Input Wrong

Friday, October 21, 2016
2:35 PM

1. I have 95.50 in reoffer. However I put 5.5% UF
2. For indicator, I have 20% PDI. In the spread variable, I set 0.2 rather than 0.02. This made a huge difference. It happens when you put number in script.
3. No matter what coupon this digit have, we go with 2% spread at least.
4. Spread for swap. When you take average of funding rates. Take care of the digits.
5. Javier_Blanco is the guy with Issuer callable. I made this mistake everytime. Never learn from it.
6. When I try to make the dates better. I change the month rather than the day. Which change the price in large scale. Be careful about that.
7. I change the value in a cell. Then formula just disappear. So next time I refresh the price. It doesn’t contain the newest price.
8. CMS_USD_10, FILIBOR
9. If JB send you the bumps, you should just copy and paste it back to caesar. Rather than input yourself
10. 15M means 15 months rather than 15 million

Calendar Mistake

Wednesday, October 26, 2016
2:13 PM

1. For issuer callable, it has autocall calendar, coupon calendar, and PDI calendar. I set PDI calendar the same as even though it is European type.
2. Wrong Strike date
   First strike date might be the strike date settlement date rather than real first autocall observation date. If dates fare different, it is easy to get different price. We use strike date as our observation date.
3. When you refresh the price. Pay attention to time. You cannot price using yesterday date.
4. Strike -> Strike adte
   Settlement Date-> Issue Date
   Valuation Date->Maturity Date
   Maturity Date->Settlement Date
5. When I deal with PoL and Calculate the PoL on underlying, it is very easy to forget the date
6. Remember to set the following convention
7. Remember to check the calendar. Make sure we don't receive coupon at the end twice.
8. **In maps, for Asian option, we have check Date manually.**
9. If I am trying to load the bump, I should make the date following. Because 2 year + 2 day, they will load 3 Year bumps. If it is 2 year, they will load 2 year bumps, it is totally different.
10. Be very careful when coupon and autocall have different calendar. Quarterly and monthly. It is easy to forget.
11. When you change the product from 20 year to 10 year. Not only need to take care about the calendar gengerator, but also take care that you need to change two dates both maturity date and settlement date
12. For the change in calendar, if we put number inside, it will overlap the default one. If you delete, the overlap will disappear. Then it will come back to default value. Remember when you change something. The calendar will not change with you.
13. For lookback, we have 6 month observation, weekly look back. We should include today and exclude the 6m time point. And we have to specific the date table.
14. Today, we see 2day maturity change will lead to 30bps difference. It is because company may distribute dividend that day.

Collaterial

Wednesday, October 26, 2016
2:13 PM

1. For OTC swap, I just use active. However, I should use CSA or BSEUR to consider collaterial.
2. We change in Discount Rate, It will change the rate in swap too
3. ITD means that no collaterial
4. In discount, when it is other currency, if OTC, then CSA, if EMTN, then active.
5. In curve, when it is other currency, we choose equivalent to libor 3m and ask about spread.
6. Desjardins have collateral which is CAD_BSUSD

   VECM model. GARCH model.

Missing Information

Tuesday, November 01, 2016
5:49 PM

1. Daily Observation-> I just ignored this. However it means American rather than European.
2. Discretely means American.
3. CtC means American.
4. If it is note, client is buying the option. If it is an OTC, we have to ask sales to know that (ITAU is receiving the premiua -7.8 %+ 0.35% =-7.45%)
5. Cap means the high strike rather than maximum profit
6. For asian option, initial averaging date is the dates we use to do the average rather than how many dates
7. When JB put MU, then we need to add bumps
8. Semester means semi annual
9. 100% -[111.75% - 115.25%] means range because this product launch in one month, we just take the mid price
10. Focus on adv after verb or noun
11. Don't forget currency. Don't forget that.
12. Issuer call. Don't forget to open LSM./
13. For leverage short put or call, remember to floor -100%
14. Check the currency , don't forget or ignore it.,
15. Autocall Increment: The last one of spread is the 1/5 of sum of coupons
16. Flowing means ver aggressive, 1,2 bos need to consider.
17. Discrete KI/KO means daily observation
18. In the description, you should read the whole part including the payoff description. Don't miss it, because non call 1 year may be included there.
19. Always be careful when you have new information. For example, you found it 1 year nc. Then you need to remember to change the spread.
20. If the product is simple, we could price it in Maps. And check it in Caesar. In this case, we need to keep the bumps to be consistent.
21. ITAU is USDCSA, BanChile is USDCSA, credit suisse is BSEUR, Jefferies dis BSEUR, BNP is BSEUR
22. Autocall Observation = on the 18th month, means it 1.5 year autocall. Only one autocall observation
23. Be very careful about the content of RFQ. For Rob_8. we can see if above 70%, redemption at 100% + coupon. That's not quite usual. So we have to be very careful
24. Be very careful about the payoff description: 5Y.100% KG, quarterly average participation on the upside? It means that there is no leverage on the downside. 95% KG is kind of tricky.
25. Read carefully. above version but coupon barrier is based on quarterly discrete barrier is not DRA but american coupon barrier.
26. Be careful about the payoff. When it is bear bull. We see that we can be autocall when it is bear, but coupon is still follow the bull version.
27. Read the RFQ carefully, receive and pay are different.

Forget to set some variables

Wednesday, November 16, 2016
6:14 PM

1. Adding bumps should be crucial in pricing
2. Remember tenor is very easy to forget.Sometime, I want another pricing. However elements are different. It is easier to do from scratch. So I create new products rather than duplicating a new one. I just have a mistake to think calendar is alright in this case.
3. For OTC product . Remember to remove the funding.
4. For Issuer callable. Don't forget to set LSM on. And based on worst and callable calenar.
5. HJM is used in autocall product, because there are correlation between interest rate and equity
6. For outperformance, strike equal to 0 is fine, there are still vol for strike equal to 0
7. Grey part doesn't affect the price.
8. Quanto just means the currency on the contract.
   Correl quanto is just added over correl FX.
9. Correl quanto -7% bid price
   correl stock 7% lambda
   correl stock 5% paralla
10. When you have different, same kind product be really careful when you duplicate.

Spread Mistake (swap)

Wednesday, November 16, 2016
6:22 PM

1. We have 1mL + spread when product is monthly autocall rather than monthly coupon
2. Spread should always end ;0
3. FI LIBOR is 3mL
4. After 10 year, LIBOR is flat
5. If the whole period is 15 month, monthly payment. We have to calculate first year average. Then use the second year 18 m funding rate. 0.20%,0.48% ; 0; if it is 3 month autocall + nc 3m. Then we could use not bullet + spread -0.25%; 0 ;. Because average = 0.20%. Bot bullet give 1 year funding rate 0.45%. So the spread is 0.20% - 0.45%. Remember that is the different between monthly and quarterly. One is 3m libor. One is 1month libor
6. For quarterly autocall. It is not simple no bullet. I still need to consider it very carefully. 3m+6m+ 9m+12m/4-1y funding rate. To put in spraed when curve is SI no bullet.
7. For quarterly autocall, don't make it wrong with monthly calculating the funding is not the same
8. First I load the bump. Then I receive the bumps by email. Then I forget to delete the local bumps.
9. **For the product with 20 underlying. The digital will be 1/20 smaller. So no need for delta to be 10. Because it is actually dividend by 20. So we need smaller spread.**
10. The reason we have to take at least 2% spread is that we are afraid the price will jump. For a digital, if the spread is too small. So we will start to hedge it when S is close to K. But if the price jump, we have no time to react. So this means that we are gonna lose money. Because when we start to hedge, it is already to late. We need 2% spread to react.
11. When you have the barrier level solve for twin win, you need to change the spread every time
12. For 1m autocall, 3y. We will use average for 1 year, 2 year funding and 3 year funding. No need for average 2y and 18 m
13. If it is an weekly autocall, if the last day is not completely week. We will extend the date to it.
14. For issuer call, if you are looking at nc 5y. Remember you have a lot of spread because difference between 1y 2y 3y 4y 5y.
15. A mistake to get wrong with Curve and Discount.
16. If it is 1.5y, you need to take care of difference between 18m and 2y.

Reoffer price Tips

Thursday, November 17, 2016
9:30 AM

1. When reoffer price is lower than 90%, treasury will only have the reoffer price notional. So funding need to be adjusted by this percentage. Happened when PDI is really near the barrier, so reoffer price is very low, client's cash is very low in this case.
2. Delta is huge. We set spread higher 2%
3. When reoffer price is low, we should consider funding*(1-UF) we know MU, option price, funding, solve for UF.
   Funding *(1-UF) - UF -MU-Option (with bumps)=0
   1-UF=reoffer is usually some number (every tens) like 10,20,30,40
4. Risk Provision:

   because the average of the 3 worst has correl skew as well, the product is long correl, but can become short correl

   for the put 50% its to stay consistent with the one with the average of the 3 worst, if there's traction we'll still be able to improve
5. Difference between Sophis and Caesar is 80bps. So we need to take more which lead to higher reoffer.
6. If somebody wants to sell something to us, we should have negative UF. Because we want to charge them if we they want us to buy. Negative UF decrease the price. Bumps should be opposite side in order to decrease the price.

Reset strike

Thursday, November 17, 2016
9:34 AM

1. Strike in RFQ is used for everyone autocall barrier 100%, put strike 50% and coupon barrier 50%m so look back is easier.
2. For fixed strike, we will need provide delta. Because the option price will change with the underlying price.
   Hello,

   What do you want to take on this ?
   Regular bumps (spx: -1 VOL / -3 DIV / -0.08 REPO ; RTY: -1.5 VOL / -0 DIV / -0.10 REPO ; 2 CORREL PARAL) costs ~ 2.55%

   The strike is already fixed so we will communicate a spot ref and a delta

Whether run all the simulation

Thursday, November 17, 2016
9:38 AM

1. When we have all pricing parameters, it is better to get all the simulation
2. When we need to solve something, we don't go through all simulation

Caesar Bug

Thursday, November 17, 2016
9:39 AM

1. Correlation Quanto and Correl stock don't change
2. Don't put too many deals in the same time. It would be very slow.
3. Remember that you load all the data. For SEB_604, with or without correl between ISX70D5 with USD rate make huge difference ~2%-3% different MU.
4. For long term like issuer call 15y, we may have big difference between Sophis and Caesar. So we need to check with trader for these stuff!

Pricing Process

Thursday, November 17, 2016
9:40 AM

1. We need to refresh data before pricing
2. After the pricing, it is the best to check the price difference between different products. We can check the price. Based on some different variables.
3. If the price is red or yellow and price is available to when the market is open. We need to update the price. If it change a lot, we need to go to stock spot cells to change the spot
   ST->come from stock tab ->ST=S0*exp(r-q)*T
   Q->come fomr quote
4. Maps order
   Underlying -> Valuation Date -> Put cursor in Duration -> Calculation -> redeption Date
5. Maps: Asian should have calendar. We use calculate above to generate the calendar.
6. CT to see the future. We always take the latest future for future ref price. Bloomberg is 15 minutes delay. Caesar is live pr ice.
   Sop we can get future refer(live) = Future refer(15 delay)+spot(live)-spot(15 delay)
7. If I want dollar amount, I should use spot times option price %
8. Maps: overwrite -> Yes => duration will change
   No => Duration keep the same
9. Calibrate price. (because we cannot bump the vol rate in Caesar. That's the reason we need to change the correlation.)

   Correl @ 39 (vs 47 book)
   Vol SPX: +50bps (JB Jacquet)
   Rate Vol: +1vol normal (Baptiste Flais)
   Rate spread (digit) = 0.25%

   Book +bump = 1.90%
   Book = 1.06%

   - ⇨ SPX vega impact ~ 0.25%
   - ⇨ Since we cannot bump the vol rate in Caesar, to get such a pricing we need to price with a Equity/rate correlation ~ 17% (instead of 39%)
10. When you send the result. Because that, don't just copy the word in Maps. Because you may have different order in Caesar.
11. FWCM: we can get the forward swap rate for the equity put rates
12. When we get the pricing, we decide the
13. Concentrate what we need to solve here. And keep you updated in the chat.
14. We are less competitive when product has longer tenor.
    one is because that our competitor have more funding when we have the same funding
    second is because that our competitor will modify the funding based on the duration.
    we already consider the duration, because we will use no bullet funding. But we are not adjust the price. This means that we will have the same funding, when product is autocall the first observation or never get autocalled. This make we are less competitive when the tenor is very long.
15. Why MU change. Because SPXLTBUP and ISX70D5 have less liquidity. So we need more bumps and MU to hedge the cost. (1% Mu more. And -2% vol bumps). And also we take more correlation because we want trader and sales both happy. If we keep the same bumps for all of them, which will increase the MU for sales. But not good for trader.
16. Why Vol bumps change for RTY. It is because we want to make trader happy as well.
17. Why we take 3.5% MU for ISX70D5/RTY? It is because that we could keep the attractive coupon and make more Mu as well. And the reason for that is because ISX70D5 have -5% dividend. So **forward of ISX70D5 is lower than SX5E.**
18. **Accurate talk is important**
19. If we refresh the price, I can just use the script in the database. Remember to refresh everything . As long as you have a g ood price, it will be fine.
20. If client is interested in our trade idea, should we keep the parameter the same or should we keep the reoffer the same. The reason we keep the reoffer the same is that client will not buy it if the UF is lower than 3%. So they will judge based on re offer first. Then look at the product.
21. Pricing another product as a reference is very helpful. We can see the improvement and also check whether the script work
22. Even thought the vol is very old, we can start with the COB first. Because this relative number will not change a lot. And we

need it to choose how much mtb or MU we are looking at.

23. It doesn't work at first. So Romain Suggest to worsen the coupon barrier and PDI barrier
24. Pricing date in Caesar is also a potential problem source. It happen in Put equity rate. It looks like we have different pric e but same script and everything. Version and reloading caesar will cause this kind of problem as well.
25. After you click pricing, you have to think what you just change, refresh your mind of this pricing. Then check all the parame ter. Then you need to think a story to remember it. Zoom out the pricing spreadsheet.
26. Don't relax your mind. You should not make any mistake. **As long as one more checking will help. You will need to do the checking.**
27. Check the option premia variance. If it is large than 10 bps. We tend to think it have some problems.
28. When we try to compare the price between Maps and Caesar. Just check without bumps, it shows lambda, but it is something different.
29. For warrant, we need 15bps for issuarance cost. For ASB
30. Check the data server. Sometimes, if you change it to Maps and you didn't change it back. It will have some problem
31. We judge the Mu also depend on COB. It should be close.
32. For fixed some level, we have to calculate delta for the product
33. Checking process. Use with bumps and without bumps to do the diagnose. It is important skill
34. Pricing Procedure: Close look and distant look=> Macro Idea and Micro Idea,
    Maps&Caesar Double Check=> this can lead to the potential Problem (where it comes from)
    Screen Shot & Copy Code => In order to have both code and full screen of parameter to consider
    RFQ Zoom In => more focus on every sentence.
    RFQ sentence by sentence.
    Caesar Box by Box
    Talk to yourself, Ask yourself question
    After you finish the pricing, check the potential places which easy to have question.
35. More information in Email. You have to follow up the information in Email. And read it very carefully. If you don't understan d something, You have to ask, otherwise, you will make mistake
36. When we have difference between sophis, we put the difference inside of Caesar, so that, next time, we price it, we can use caesar to have inline price
37. Maps and Caesar always have difference. But Autocall is the main problem. But issuer call should be inline. The reason it is different is that we have different digital smooth methodology.
38. We tend to use boosted funding when it is long maturity and big size.

Quote Tips

Thursday, November 17, 2016
10:09 AM

1. When we want to get delta, we need to put the quote

Solve Tips

Thursday, November 17, 2016
10:10 AM

1. Funding - Option price - CC -UF = Margin <>0. Then we change the option price to make margin = 0 (goal is solving parameter)p
2. When solving for something, we have to use price without bumps
3. We tend to make the barrier or parameter we solve look nice. But it means we will make more money or lose some money. It is acceptable depended on size. But in this case, we need to make sure that we are kind of consistent with what we have before. For example, Alex33, we have 80bps for American PDI in order to have 70% Barrier. So afterward, we add a boost funding and change the mu. We still keep 80bps for consistent rather than 65bps in RFQ. Just don't want to be more aggressive.

Caesar or Maps

Thursday, November 17, 2016
10:11 AM

1. Maps don't have Libor 11y
2. When JB said load from Maps, I should click Sophis Server, and switch to Maps. Then load the data again. Which will give us the vol in Maps.
3. When you add bumps because of difference between Maps and Caesar, be careful when you switch to loading from Maps. Because you may forget to delete the bumps.
4. maps is taking into account issue costs, which here would be around 10bp => $1000
5. Caesar and Maps can have some difference

Coding Mistakes

Thursday, November 17, 2016
10:12 AM

1. We can set a condition in loop
2. Remember that for evaluation, we have to set the var value to zero inside of evaluate, otherwise, var will bloom
3. When I deal with PoL, maybe multiple PDI Calendar, remember we have worst perofrmance _ indicator. And basket_perf -> basket perf indicator. If you use wo instead of basket, it will be huge mistake.
4. Remember to set the strike date when do PoL
5. When we have underlying is sum of something
   (S1T/S10+S2T/S20)>(200%-40%)
   (S1T/S10+S2T/S20)/2>80%
   100% + ((S1T/S10-1+S2T/S2001))
   =100%-2*(100-1/2*(S1T/S10+S2T/S20))
6. Sum -> be careful for the spread. Use twice and twice again: 2,2,4 when it is average.
7. Gearing is always outside of everything
   Indexation level * (Min(putstrike1-putstrike2,max(0,putstrike1-perf)))
8. Don't forget the floor, we cannot lose more than all principle. This do makes difference.
9. Interest rate is always floored by 0
10. If the payoff is performance of worst -0.3. We should put a floor on it. Make sure it doesn't lose more than 100%
11. Remember that, when you try to cap the payoff by performance. You have to use performance -1
12. For reverse convertible, remember that you have to include coupon at maturity
13. In autocall, we don't have cumulative coupon adjusted.
14. When I change PDI to Leverage put, payoff, I have strike inside, but I only change barrier to 80% instead of strike.
15. Date.fixing can be use when we have several calendar overlap
16. Don't miss the latest coupon
17. For desjardin rainbow asian option. Don't forget average(basket.weight)
18. Vol Cap is the same as vol target with 100% leverage cap
19. In the code, it is average, but I treat it as worst of. Take care of code.
20. Cms[matuiry] need max(0,) with it
21. Be really careful when payoff at maturity is different. Otherwise we will have one more coupon
22. Wedding Cake, We have indicator range. Be careful about it.

Ticker Mistake

Thursday, November 17, 2016
10:18 AM

1. For ticker, sometimes, CXX UN and CXX UQ both exist. I need to ask what we use.
2. **For underlying, AGU will have great volatility. So we will only do this when the stock have the cap inside of the product. But it turns out, the cap is 2400%, So it is too high. We will not do it.**
3. For some underlying, we need to check the liquidity. If the liquidity is not enough, we cannot trade it, or we have to change the structure.

Overwrite Message

When we change variable in correl Matrix. Do you want to keep it? => Yes

Indicator Knock Spread

Thursday, November 17, 2016
10:19 AM

1. Think very economically, don't follow rigid rule. Think the way which we make it expensive.
2. Since funding is high, we will lose our future libor easilly. And autocall barrier decrease sharply. It is easy to autocall. So we pick higher autocall spread.
3. For PDI 70%, if it is already very close to barrier, we take 6% as spread. SL-467. Or it is because autocall increment 8.80% p.q coupon
4. For the KIKO daily call spread. I should not have american spread. For Desjardin, I am too expensive. So when should we use that?
5. For CUO, we take the spread based on the difference of max return and rebate
6. Indicator DO of outperformance. We see some historical data shows 6% average,50% max. but we don't care about it

   max payoff is unlimited

   the average doesnt mean anything for pricing

   spread should be variable, but with 4% spread you cover an outperf of 20-40% which is good enough
7.

Bumps Mistake

Thursday, November 17, 2016
10:21 AM

1. For index we use parallel - > low correl 5%
   high correl 2%
   for stock we use lambda -> 7%
   Reason: when correl is very high, lambda bearly raise the bumps
2. Skew bumps 5% for stock, 1-2 % for index.
   Usually for call or put spread. Twin win
   when we are not aggressive with the product, we will take skew bumps and make vol bumps higher than what we load from maps
3. Aggressive or not depends on product.
   If the product have very rare underlying. We are not aggressive, we don't include skew bumps all the time
4. For the outperformance, for example, we are long RTY, short SPX. We will take buy the RTY vol, sell SPX vol. sell the RTY repo ,div, buy the SPX repo, div. if repo or div is positive. We will just take zero. Short the correlation.
   For the correl quanto. We need to change the number in the table. For Correl FX. Rty should be lower, SPX should be higher.
5. For Airbag. With high gearing and low KDI. It is possible to have ask vol rather than bid vol.!!!!!!
6. If you get time, write down the payoff figure. Unless it is very tradition payoff, you should test the sensitive. Which can tell you ask or bid.
7. When you are solving the Cap, you have 26.5 at first. But we figure out that we should have no cap. Because we only take 50bps mtb. Then when I try to get the COB. I forget to change the Cap first. Then I found that we are shorting the vol. But it should be long the vol. Because there is no cap.
8. When you change the ticker of basket. Don't forget to reload the bumps
9. SPY should take the bumps from spx
10. Global bumps will apply to all the basket.
11. Correlation bumps will directly affect the correlation table.
12. Stock always use lambda when the bumps is positive. When the correlation is already high, then the impact will be very small. But we don't need to put more bumps. We just take whatever trader want.
13. When there is PDI for outperformance, may short vol for long leg, long vol for short leg
14. Jb maybe will give me partial bumps. Like for fund turbo, He only gives me the vol bumps, but I have to ask myself whether we have quanto. It is kind of things you have to do yourself. Maybe he think you will take yourself.
15. Lambda doesn't work very well with negative bumps. So for stock, sometimes we use paralle.
16. Don’t forget Cap. Cap can change the sign of skew. Gearing also have a huge impact:
    3x Upside Participation
    Max Return: Please refresh [was 17.40% on Jan 10]
    European Knock-IN Put: 85%
17. You just ignore skew bumps
18. Understanding about -1 vol bumps over bumps loaded from Caesar.
    because some vols are old but as its probably very indicative i didn't want to ask trading to replug it

New Product Proposal

Thursday, November 17, 2016
10:59 AM

1. Potential underlying

- In this case, we need to find something high vol.
- I can also test the sensitivity of the vol by adding bumps.
- NVDA and NFLX have high vol around 37.79% and 40.86%
- You have to know about this. Or you need to use BBG filter to find them.
- its more a comparison between the stocks than an absolute value
- for popular stocks you will know if they are low vol, high vol, meddium vol, and you will know the most payings dividend stocks (VZ, T...)
- Don't get lazy about checking JB's pricing. You need to find the right bumps and correlation in JB's pricing. Then go to your own script to price it. Cross check is important.
- If JB didn't save the XML, you should ask him. It is your duty to double check the pricing.

2. We could see the altitude from the client RFQ. Whether it is safe product or risk product.

Trade Idea

Wednesday, January 18, 2017
9:31 AM

1. Idea might be very specific. For Flow sales, we will create some very strange looking product. But remember it is based on the trade idea. For example, bank sector perform and regional bank outperformance multicountry bank.
2. You have to read the trade idea very carefully. Even Fabrice read it very carefully. You have to do the same.
3. For this regional bank trade idea, we can have a Cap, we can also have a conditional like bank sector have positive performance. In this case, we have a little bit more expensive price. That's the reason we go with Cap.
4. We don't do stock Max 5Y. Because there is not liquidity in vol
5. For mean reverting, we can do it in the way that we long day volatility short bi week volatility. But it is expensive. We know that this value will move with spot price. So we just need to calculate the delta to track the performance.
6. Recovery note: If we have too low reoffer,
   it could be misleading the client, thinking he has a lot of chance to get back his capital while its actually very low
   So we change to issuer price 100% recovery note. We want to avoid this pb.
7. Step Down Autocall Barrier. It is for redeem fast. More secure. But it is behind PDI barrier, Coupon Barrier, and the same as observation
8. PDI will be the first one to improve and Coupon barrier will be second.
9. Normally, if we have a PDI, 7% will be a good coupon level.
10. The way to pick up stock. Well-known is the first rule. We could find the stock in index component in BBG. Or we could find it in Google.
11. If we have 7 stocks, we will load all of them in Caesar and see the pricing parameters.
12. Maturity Consideration. Client will prefer short term. 2y is better then 3y. Because they could roll the money quickly. They will make more money. We will try 2y when the coupon is high.
13. One star or this kind of tweak is just to show the client, when coupon is too good. It is not based on some view on the stock.

Difference Source

Wednesday, February 15, 2017
10:13 AM

1. We have different bumps(big difference)
2. We have different spread(can only lead to small difference)
3. Spread for the near PDI. I make it too small

Rules Collection

Monday, February 27, 2017
8:34 AM

1. If there is no WO, I need an alert. If there is a WO, I need a alert as well

11/1 Python Code

Friday, October 21, 2016
2:37 PM

Code modify:
For Sharpe Momentum Function and Momentum Function, 'quarterly' is not right.

Build Sharpe Momentum Function, we can use
Sharpe_Calculator(newStrat.loc[newStrat.index[(i-1-iObservation_period):(i-1)],strat],np.array([1]))
Use index 1:3 to get multiple record. And you can also use newStrat.index[1]:newStrat.index[3]

dfStrategy1 = dfMomentum.idxmax(axis=1,skipna=True).tolist()
Idxmax to get back the column name for the max elements.
Skipna = True => To prevent nan when we have nan data in the row.

Tuesday, November 08, 2016
2:51 PM

```
dictionary2={
        0:[newStrat1],
1:["weekly",],
2:["low"],
3:np.arange(1,2,1),
4:np.arange(120,130,10),
5:np.arange(2,6,2),
6:np.arange(120,130,10),
7:np.arange(0.025,0.1,0.025),
8:np.arange(0.94,0.99,0.01),
9:np.arange(0.01,0.03,0.01),
10:np.arange(2,10),
11:np.arange(5,10,2),
12:np.arange(1,3),
13:np.arange(0.001,0.003,0.001),
14:["weekly","quarterly","monthly",'daily'],
15:np.arange(10,110,10)
        }
```

```
par=Parameter_Optimization(Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum,(newStrat1,"weekly","low",1,120,4,120,0.1,0.95,0.02,2,5,1,0.001*0,'weekly',20),dictionary2,16)
#(Function_name,standard,dictionary,variable_number)=(Maximum_Diverisification_Strategy_Return_NoneZero,(newStrat1,"weekly","low",1,120,4,120,0.1,0.95,0.02,2,5,1,0.001*0),dictionary,14)
```

```
1.72226149833
1.72226149833
1.72226149833
1.72226149833
1.72226149833
1.5304195484
1.72226149833
1.72226149833
1.6065569901
1.61357874201
1.63578451689
1.72226149833
1.75576224288
1.72226149833
1.73912142499
1.5445098082
1.59432316234
1.49733810584
1.62945823326
```

1.73912142499
1.73912142499
1.58569450405
1.53526704833
0.304605033789
1.46412891681
1.46348216269
1.36575230467
1.16764119352
1.73912142499
1.60299107828
1.61639880346
1.73912142499
1.67153045866
1.75257827435
1.62418243519
1.75257827435
1.75809635861
1.71922025482
1.70832045181
1.02859821131
1.75809635861
1.77782573463
1.79164503426
1.7846061209
1.69760809927
1.73120730423
1.72732303309
1.69327199642
1.68558438902

11.16 Python Code

Wednesday, November 16, 2016
11:34 AM

Np.append(arr,ele)

Np.average(arr)

1.31 Python code

Tuesday, January 31, 2017
7:40 AM

```
newStrat1.loc[(newStrat1["CLS"]=="VXX2") & (newStrat1["TRADE_DT"]>2000),"TRADE_DT"]
```

```
date1=date1.apply(lambda x:datetime.date(int(x/10000),int((x%10000)/100),int(x%100)))
```

- Apply function doesn't apply to original one. We have to do a assign value. It will work.
- Apply is much quicker than loop

Deleting Row in DataFrame

```
df = df[df.line_race != 0]
```

Pasted from <http://stackoverflow.com/questions/18172851/deleting-dataframe-row-in-pandas-based-on-column-value>

How to deal with settingwithcopywarning in pandas:

2.2 Python Code

Thursday, February 02, 2017
7:41 AM

DataFrame.pct_change(*periods=1*, *fill_method='pad'*, *limit=None*, *freq=None*, ***kwargs*)[source]

Pasted from <http://pandas.pydata.org/pandas-docs/stable/generated/pandas.DataFrame.pct_change.html>

```
aList = [123, 'xyz', 'zara', 'abc', 'xyz'];
aList.sort();
```

Pasted from <https://www.tutorialspoint.com/python/list_sort.htm>

```
try:
  You do your operations here;
  ......................
except:
  If there is any exception, then execute this block.
  ......................
else:
  If there is no exception then execute this block.
```

Pasted from <https://www.tutorialspoint.com/python/python_exceptions.htm>

```
df.isin({'A': [1, 3], 'B': [4, 7, 12]})
```

Pasted from <http://stackoverflow.com/questions/21319929/how-to-determine-whether-a-pandas-column-contains-a-particular-value>

```
df_empty.empty
```

Pasted from <http://pandas.pydata.org/pandas-docs/stable/generated/pandas.Series.empty.html>

```
for letter in 'Python':     # First Example
  print 'Current Letter :', letter
```

Pasted from <https://www.tutorialspoint.com/python/python_for_loop.htm>

```
>>> int(2.9)
2
```

Pasted from <http://stackoverflow.com/questions/17651384/python-remove-division-decimal>

```
>>> int(round(2.9))
3
```

Pasted from <http://stackoverflow.com/questions/17651384/python-remove-division-decimal>

```
>>> x = np.array([[1.0, 2.3], [1.3, 2.9]])
>>> x
array([[ 1. ,  2.3],
       [ 1.3,  2.9]])
>>> x.astype(int)
array([[1, 2],
       [1, 2]])
```

Pasted from <http://stackoverflow.com/questions/10873824/how-to-convert-2d-float-numpy-array-to-2d-int-numpy-array>

```
df.apply(numpy.sum, axis=1) # equiv to df.sum(1)
```

Pasted from <http://pandas.pydata.org/pandas-docs/stable/generated/pandas.DataFrame.apply.html>

```
>>> series.apply(lambda x: x**2)
London      400
New York    441
Helsinki    144
dtype: int64
```

Pasted from <http://pandas.pydata.org/pandas-docs/stable/generated/pandas.Series.apply.html>

```
df.loc[(df["B"] > 50) & (df["C"] == 900), "A"] *= 1000
```

Pasted from <http://stackoverflow.com/questions/15315452/selecting-with-complex-criteria-from-pandas-dataframe>

```
next(x[0] for x in enumerate(L) if x[1] > 0.7)
```

Pasted from <http://stackoverflow.com/questions/2236906/first-python-list-index-greater-than-x>

```
>>> alist= [0.5, 0.3, 0.9, 0.8]
>>> [ n for n,i in enumerate(alist) if i>0.7 ][0]
2
```

Pasted from <http://stackoverflow.com/questions/2236906/first-python-list-index-greater-than-x>

```
>>> df['a'].tolist()
[1, 3, 5, 7, 4, 5, 6, 4, 7, 8, 9]
```

Pasted from <http://stackoverflow.com/questions/23748995/pandas-dataframe-to-list>

```
In [38]: left = pd.DataFrame({'key': ['K0', 'K1', 'K2', 'K3'],
   ....:                      'A': ['A0', 'A1', 'A2', 'A3'],
   ....:                      'B': ['B0', 'B1', 'B2', 'B3']})
   ....:
In [39]: right = pd.DataFrame({'key': ['K0', 'K1', 'K2', 'K3'],
   ....:                       'C': ['C0', 'C1', 'C2', 'C3'],
   ....:                       'D': ['D0', 'D1', 'D2', 'D3']})
   ....:
In [40]: result = pd.merge(left, right, on='key')
```

Pasted from <http://pandas.pydata.org/pandas-docs/stable/merging.html>

```
print(df.loc[df['B'].isin(['one','three'])])
```

Pasted from <http://stackoverflow.com/questions/17071871/select-rows-from-a-dataframe-based-on-values-in-a-column-in-pandas>

```
>>> start_date + relativedelta(months=2)
datetime.date(1984, 1, 23)
```

Pasted from <http://stackoverflow.com/questions/12736229/python-how-to-add-month-to-december-2012-and-get-january-2013>

```
>>> from dateutil.relativedelta import *
>>> from dateutil.easter import *
>>> from dateutil.rrule import *
>>> from dateutil.parser import *
>>> from datetime import *
>>> now = parse("Sat Oct 11 17:13:46 UTC 2003")
>>> today = now.date()
>>> year = rrule(YEARLY,dtstart=now,bymonth=8,bymonthday=13,byweekday=FR)[0].year
>>> rdelta = relativedelta(easter(year), today)
>>> print("Today is: %s" % today)
Today is: 2003-10-11
>>> print("Year with next Aug 13th on a Friday is: %s" % year)
Year with next Aug 13th on a Friday is: 2004
>>> print("How far is the Easter of that year: %s" % rdelta)
How far is the Easter of that year: relativedelta(months=+6)
>>> print("And the Easter of that year is: %s" % (today+rdelta))
And the Easter of that year is: 2004-04-11
```

Pasted from <https://dateutil.readthedocs.io/en/stable/>

```
df[['B', 'A']] = df[['A', 'B']]
```

Pasted from <http://pandas.pydata.org/pandas-docs/stable/indexing.html>

DataFrame.drop_duplicates(**args*, ***kwargs*)

Pasted from <http://pandas.pydata.org/pandas-docs/version/0.19.2/generated/pandas.DataFrame.drop_duplicates.html>

DataFrame.set_index(*keys*, *drop=True*, *append=False*, *inplace=False*, *verify_integrity=False*)

Pasted from <http://pandas.pydata.org/pandas-docs/stable/generated/pandas.DataFrame.set_index.html>

2.6 Python Code

Monday, February 06, 2017
11:36 AM

```
>>> import numpy as np
>>> A = np.array([[1, 2, 3], [0, 3, np.NaN]])
>>> A = np.nan_to_num(A)
>>> A
array([[ 1.,  2.,  3.],
       [ 0.,  3.,  0.]])
```

Pasted from <http://stackoverflow.com/questions/5124376/convert-nan-value-to-zero>

```
if TradeDT in OptionCF.underlyingStrike["TRADE_DT"].values
```

Tuesday, February 14, 2017
7:59 AM

```
# View the structure of loan_data
str(loan_data)

# Load the gmodels package
library(gmodels)

# Call CrossTable() on loan_status
CrossTable(loan_data$loan_status)

# Call CrossTable() on grade and loan_status
CrossTable(loan_data$grade,loan_data$loan_status,prop.r=TRUE,prop.c=FALSE,prop.t=FALSE,
prop.chisq=FALSE)


Hist(loan_data$int_rate)
Hist(loan_data$int_rate,main="aaa",xlab="bbb")

Hist_income<-hist(loan_data$annual_inc,xlab="annual income",main="histogram")
Hist_income$breaks
n_breaks<-sqrt(nrow(loan_data))
Hist_income_n<-hist(loan_data$annual_inc,breaks=n_breaks,xlab="Annual income", main="histogram")
Plot(loan_data$annual_inc)
```

Expert Judgement
Rule of thumber : Q3 + 1.5*(Q3-Q1) #IQR inter quantile range

```
Index_outlier_expert<-which(loan_data$annual_inc>300000)
Loan_data_expert<-loan_data[-index_outlier_expert,]

Outlier_cutoff<-quantile(loan_data$annual_inc,0.75) + 1.5*IQR(loan_data$annual_inc)
Index_outlier_ROT<-which(loan_data$annual_inc>outlier_cutoff)
Loan_data_ROT<-loan_data[-index_outlier_ROT,]

Plot(loan_data$emp_length,loan_data$annual_inc)

Summary(loan_data$age)
```

Missing Input: delete row/columns
Replace: Median imputation
Keep NA(some is important) but it is hard to keep them.
Solution: coarse classification , put variable in bins->

```
Index_NA<-which(is.na(loan_data$emp_length))
Loan_data_no_NA<-loan_data[-index_NA,]

Loan_data_delete_employ<-loan_data
Loan_data_delete_employ$emp_length<-NULL

Index_NA<-which(is.na(loan_data$emp_length)
```

Loan_data_replace<-loan_data
Loan_data_replace$emp_length[index_NA]<-median(loan_data$emp_length,na.rm=TRUE)

	CONTINUOUS	CATEGORICAL
DELETE	Delete rows (observations with NAs) Delete column (entire variable)	Delete rows (observations with NAs) Delete column (entire variable)
REPLACE	replace using median	replace using most frequent category
KEEP	keep as NA (not always possible) keep using coarse classification	NA category

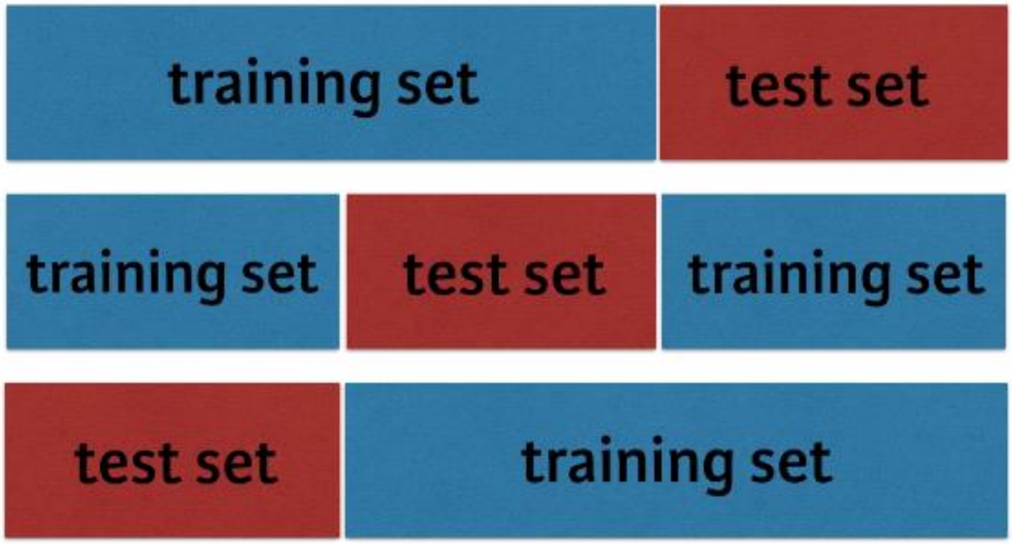
loan_data$emp_cat <- rep(NA, length(loan_data$emp_length))

loan_data$emp_cat[which(loan_data$emp_length <= 15)] <- "0-15"
loan_data$emp_cat[which(loan_data$emp_length > 15 & loan_data$emp_length <= 30)] <- "15-30"
loan_data$emp_cat[which(loan_data$emp_length > 30 & loan_data$emp_length <= 45)] <- "30-45"
loan_data$emp_cat[which(loan_data$emp_length > 45)] <- "45+"
loan_data$emp_cat[which(is.na(loan_data$emp_length))] <- "Missing"

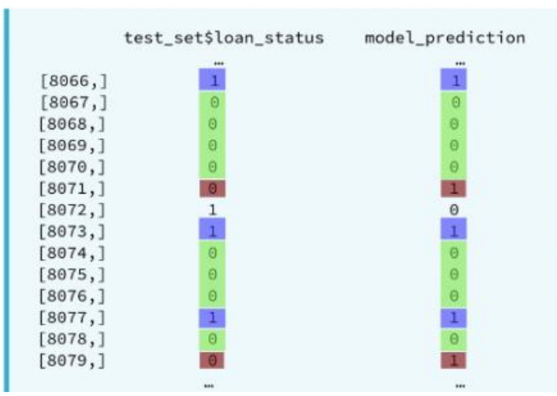
loan_data$emp_cat <- as.factor(loan_data$emp_cat)
Transfer string to factor

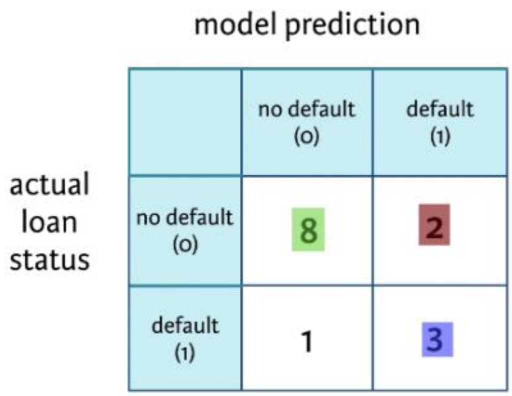
Rep(NA,length(loan_data$emp_length) create a vector with specific value

Training set 2/3+ test set 1/3
Cross-validation. Use every part to do the test



Confusion matrix
Model prediction





- Accuracy = (8 + 3) / 14 = 78.57%
- Sensitivity = 3 / (1 + 3) = 75 %
- Specificity = 8/ (8 + 2)= 80%

```
# Set seed of 567
set.seed(567)

# Store row numbers for training set: index_train
index_train=sample(1:nrow(loan_data),2/3*nrow(loan_data))
```

First argument is the range.
Second argument is how many point we random pull out.

```
# Create training set: training_set
training_set <- loan_data[index_train, ]

# Create test set: test_set
test_set<-loan_data[-index_train,]

conf_matrix=table(test_set$loan_status,model_pred)

# Compute classification accuracy
(conf_matrix[1,1]+conf_matrix[2,2])/sum(conf_matrix)

# Compute sensitivity
(conf_matrix[1,1])/(conf_matrix[1,1]+conf_matrix[1,2])


Log_model<-glm(loan_status~age,family="binomial",data=training_set)
```

Beta<0
Xj goes up by 1

So exp(Beta) <1 => odd goes down
If beta >1, xj goes up by 1
So exp(beta)>1 => odd goes up
Odd=exp(beta*x)=P(default)/P(not default)

```
# Build a glm model with variable ir_cat as a predictor
```

log_model_cat<-glm(loan_status~ir_cat,family="binomial",data=training_set)

Print the parameter estimates
log_model_cat

# Look at the different categories in ir_cat using table()
table(training_set$ir_cat)

Reference category

The interpretation of a single parameter still holds when including several variables in a model. When you do include several variables and ask for the interpretation when a certain variable changes, it is assumed that the other variables remain constant, or unchanged. There is a fancy latin phrase for this, *ceteris paribus*, literally meaning "keeping all others the same".

Pasted from <https://campus.datacamp.com/courses/introduction-to-credit-risk-modeling-in-r/chapter-2-logistic-regression?ex=4>

Build the logistic regression model
log_model_multi<-
glm(loan_status~age+ir_cat+grade+loan_amnt+annual_inc,family="binomial",data=training_set)

# Obtain significance levels using summary()
summary(log_model_multi)

Test_case<-as.data.frame(test_set[1,])
Predict(log_model_small,newdata=test_case) give us the linear result => beta*x
Predict(log_model_small,newdata=test_case,type="response")

After having obtained all the predictions for the test set elements, it is useful to get an initial idea of how good the model is at discriminating by looking at the range of predicted probabilities. A small range means that predictions for the test set cases do not lie far apart, and therefore the model might not be very good at discriminating good from bad customers. With low default percentages, you will notice that in general, very low probabilities of default are predicted. It's time to have a look at a first model.
In the previous exercise, the range for predicted probabilities of default was rather small. As discussed, small predicted default probabilities are to be expected with low default rates, but building bigger models (which basically means: including more predictors) can expand the range of your predictions. Whether this will eventually lead to *better* predictions still needs to be validated and depends on the quality of the newly included predictors. But first, have a look at how bigger models can expand the range.
Pasted from <https://campus.datacamp.com/courses/introduction-to-credit-risk-modeling-in-r/chapter-2-logistic-regression?ex=7>

# Change the code below to construct a logistic regression model using all available predictors in the data set
log_model_full <- glm(loan_status ~ ., family = "binomial", data = training_set)

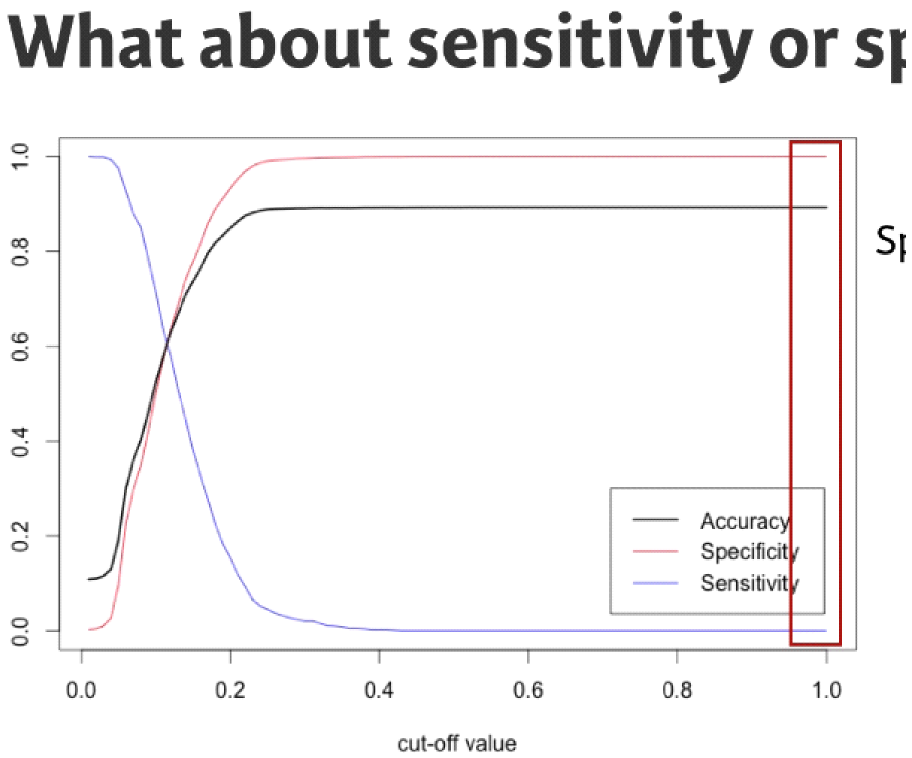
# Make PD-predictions for all test set elements using the the full logistic regression model
predictions_all_full<-predict(log_model_full,newdata=test_set,type="response")

Look at the predictions range

range(predictions_all_full)

We need to choose a cutoff which both specific, sensitive are good

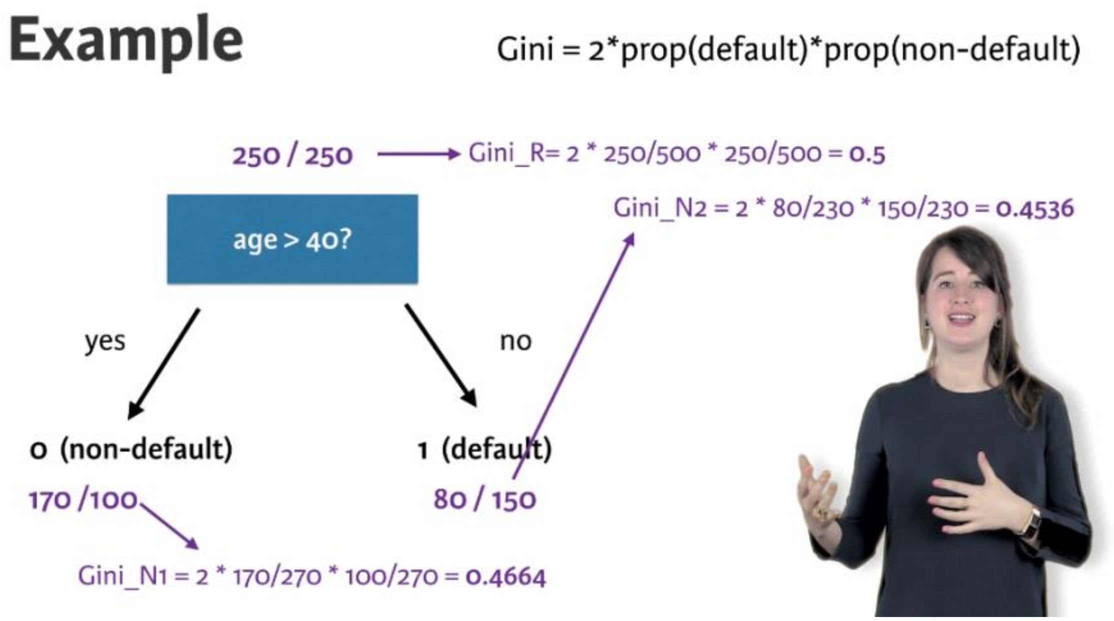
```
# The code for the logistic regression model and the predictions is given below
log_model_full <- glm(loan_status ~ ., family = "binomial", data = training_set)
predictions_all_full <- predict(log_model_full, newdata = test_set, type = "response")

# Make a binary predictions-vector using a cut-off of 15%
pred_cutoff_15=ifelse(predictions_all_full>0.15,1,0)

# Construct a confusion matrix
table(test_set$loan_status,pred_cutoff_15)
```

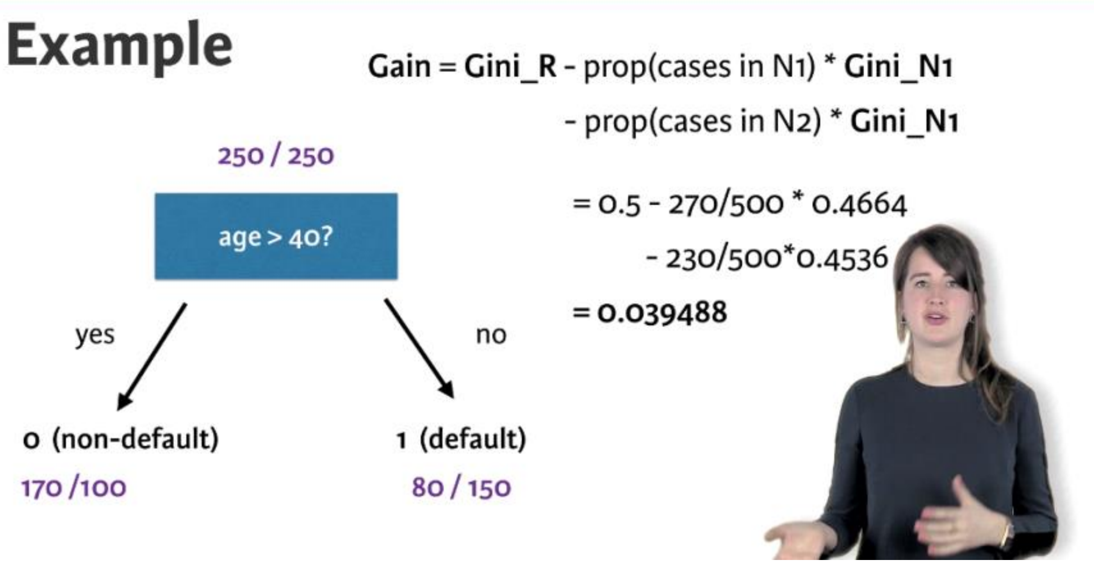


Link=logit , probit, cloglog
Variation model

```
# Fit the logit, probit and cloglog-link logistic regression models
log_model_logit <- glm(loan_status ~ age + emp_cat + ir_cat + loan_amnt,
                  family = binomial(link = probit), data = training_set)
log_model_probit <- glm(loan_status ~ age + emp_cat + ir_cat + loan_amnt,
                  family = binomial(link = logit), data = training_set)

log_model_cloglog <-  glm(loan_status ~ age + emp_cat + ir_cat + loan_amnt,
                  family = binomial(link = cloglog), data = training_set)

# Make predictions for all models using the test set
predictions_logit <- predict(log_model_logit, newdata = test_set, type = "response")
predictions_probit <- predict(log_model_probit, newdata = test_set, type = "response")
predictions_cloglog <-predict(log_model_cloglog, newdata = test_set, type = "response")
```

```
# Use a cut-off of 14% to make binary predictions-vectors
cutoff <- 0.14
class_pred_logit <- ifelse(predictions_logit > cutoff, 1, 0)
class_pred_probit <- ifelse(predictions_probit > cutoff, 1, 0)
class_pred_cloglog <- ifelse(predictions_cloglog > cutoff, 1, 0)

# Make a confusion matrix for the three models
tab_class_logit <- table(true_val,class_pred_logit)
tab_class_probit <- table(true_val,class_pred_probit)
tab_class_cloglog <- table(true_val,class_pred_cloglog)

# Compute the classification accuracy for all three models
acc_logit <- sum(diag(tab_class_logit)) / nrow(test_set)
acc_probit <- sum(diag(tab_class_probit)) / nrow(test_set)
acc_cloglog <- sum(diag(tab_class_cloglog)) / nrow(test_set)
```





```
# set a seed and run the code to obtain a tree using weights, minsplit and minbucket
set.seed(345)
tree_weights <- rpart(loan_status ~ ., method = "class",
                data = training_set,
                control = rpart.control(minsplit = 5, minbucket =2, cp = 0.001),weights=case_weights)

# Plot the cross-validated error rate for a changing cp
plotcp(tree_weights)

# Create an index for of the row with the minimum xerror
index <- which.min(tree_weights$cp[ , "xerror"])

# Create tree_min
tree_min <- tree_weights$cp[index, "CP"]

# Prune the tree using tree_min
ptree_weights=prune(tree_weights,tree_min)

# Plot the pruned tree using the rpart.plot()-package
prp(ptree_weights)


# Make predictions for each of the pruned trees using the test set.
pred_undersample <- predict(ptree_undersample, newdata = test_set,  type = "class")
pred_prior <-predict(ptree_prior, newdata = test_set,  type = "class")
pred_loss_matrix <-predict(ptree_loss_matrix, newdata = test_set,  type = "class")
pred_weights <-predict(ptree_weights, newdata = test_set,  type = "class")

# construct confusion matrices using the predictions.
confmat_undersample <- table(test_set$loan_status, pred_undersample)
confmat_prior <-table(test_set$loan_status, pred_prior)
confmat_loss_matrix <-table(test_set$loan_status, pred_loss_matrix)
confmat_weights <-table(test_set$loan_status, pred_weights)

# Compute the accuracies
acc_undersample <- sum(diag(confmat_undersample)) / nrow(test_set)
acc_prior <-sum(diag(confmat_prior)) / nrow(test_set)
acc_loss_matrix <-sum(diag(confmat_loss_matrix)) / nrow(test_set)
acc_weights <-sum(diag(confmat_weights)) / nrow(test_set)
```

Constructing a confusion matri

```
> predict(log_reg_model, newdata = test_set, type = "response")

 1          2          3          4          5          …
0.08825517 0.3502768 0.28632298 0.1657199 0.11264550   …



> predict(class_tree, new data = test_set)
          0         1
1 0.7873134 0.2126866
2 0.6250000 0.3750000
3 0.6250000 0.3750000
4 0.7873134 0.2126866
5 0.5756867 0.4243133
```

A certain strategy...

```
> log_model_full <- glm(loan_status ~ ., family = "binomial", data = training_set)
> predictions_all_full<- predict(log_reg_model, newdata = test_set, type = "response")

> cutoff <- quantile(predictions_all_full, 0.8)
  cutoff
      80%
0.1600124

> pred_full_20 <- ifelse(predictions_all_full > cutoff, 1, 0)
```

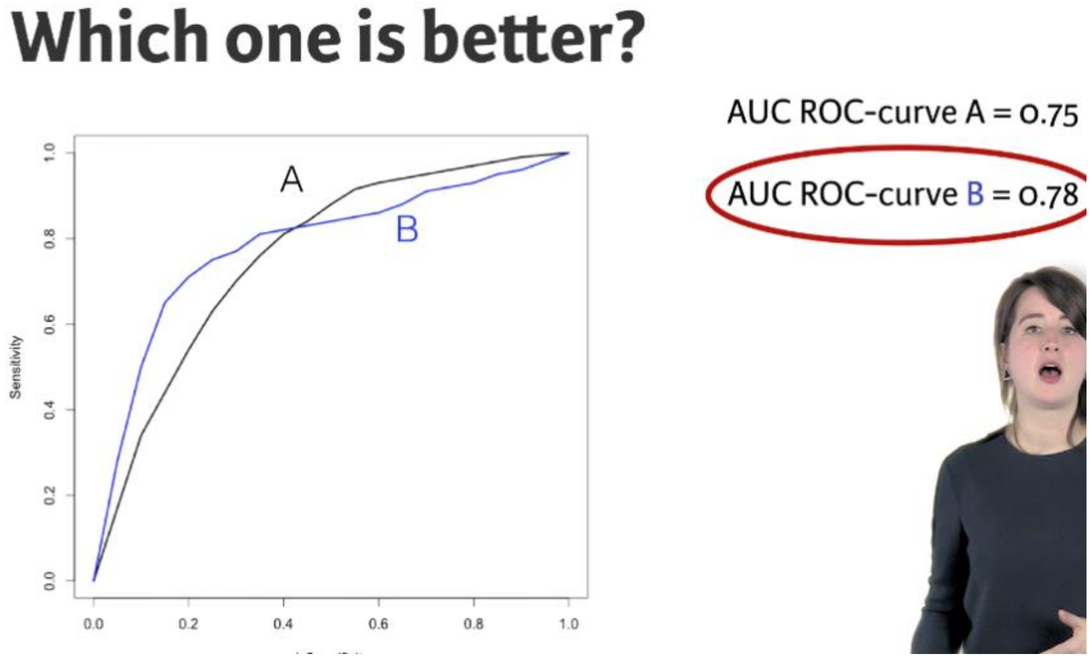
```
> true_and_predval <- cbind(test_set$loan_status, pred_full_20)
  true_and_predval

     test_set$loan_status    pred_full_20
1            0                    0
2            0                    0
3            0                    1
4            0                    0
5            0                    1
…            …                    …


> accepted_loans <- pred_and_trueval[pred_full_20 == 0,1]

> bad_rate <- sum(accepted_loans)/length(accepted_loans)
> bad_rate
[1] 0.08972541
```

The strategy table

	accept_rate	cutoff	bad_rate
[1,]	1.00	0.5142	0.1069
[2,]	0.95	0.2122	0.0997
[3,]	0.90	0.1890	0.0969
[4,]	0.85	0.1714	0.0927
[5,]	0.80	0.1600	0.0897
[6,]	0.75	0.1471	0.0861
[7,]	0.70	0.1362	0.0815
[8,]	0.65	0.1268	0.0766
…	…	…	…
[16,]	0.25	0.0644	0.0425
[17,]	0.20	0.0590	0.0366
[18,]	0.15	0.0551	0.0371
[19,]	0.10	0.0512	0.0309
[20,]	0.05	0.0453	0.0247
[21,]	0.00	0.0000	0.0000

```
# Make predictions for the probability of default using the pruned tree and the test set.
prob_default_prior <- predict(ptree_prior, newdata = test_set)[ ,2]

# Obtain the cutoff for acceptance rate 80%
cutoff_prior<-quantile(prob_default_prior,0.8)

# Obtain the binary predictions.
bin_pred_prior_80 <- ifelse(prob_default_prior > cutoff_prior, 1, 0)

# Obtain the actual default status for the accepted loans
accepted_status_prior_80 <-test_set$loan_status[bin_pred_prior_80 == 0]

# Obtain the bad rate for the accepted loans
sum(accepted_status_prior_80)/length(accepted_status_prior_80)

# Have a look at the function strategy_bank
strategy_bank

# Apply the function strategy_bank to both predictions_cloglog and predictions_loss_matrix
strategy_cloglog=strategy_bank(predictions_cloglog)
strategy_loss_matrix=strategy_bank(predictions_loss_matrix)

# Obtain the strategy tables for both prediction-vectors
strategy_cloglog$table
strategy_loss_matrix$table
# Plot the strategy functions
par(mfrow = c(1,2))
plot(strategy_cloglog$accept_rate, strategy_cloglog$bad_rate,
    type = "l", xlab = "Acceptance rate", ylab = "Bad rate",
    lwd = 2, main = "logistic regression")
```

```
plot(strategy_loss_matrix$accept_rate, strategy_loss_matrix$bad_rate,
    type = "l", xlab = "Acceptance rate",
    ylab = "Bad rate", lwd = 2, main = "tree")
```




```
# Load the pROC-package
library(pROC)

# Construct the objects containing ROC-information
ROC_logit <- roc(test_set$loan_status, predictions_logit)
ROC_probit <- roc(test_set$loan_status, predictions_probit)
ROC_cloglog <-roc(test_set$loan_status, predictions_cloglog)
ROC_all_full <- roc(test_set$loan_status, predictions_all_full)

# Draw all ROCs on one plot
plot(ROC_logit)
lines(ROC_probit, col="blue")
lines(ROC_cloglog, col="red")
lines(ROC_all_full, col="green")

# Compute the AUCs
auc(ROC_logit)
auc(ROC_probit)
auc(ROC_cloglog)
auc(ROC_all_full)
```

AUC can be use to select variable.

AUC-based pruning

1) Start with a model including all variables (in our case, 7) and compute AUC

```
> log_model_full <- glm(loan_status ~ loan_amnt + grade + home_ownership +
annual_inc + age + emp_cat + ir_cat, family = "binomial", data = training_set)

> predictions_model_full <- predict(log_model_full, newdata = test_set, type =
"response")

> AUC_model_full <- auc(test_set$loan_status, predictions_model_full)
Area under the curve: 0.6512
```

AUC-based pruning

2) Build 7 new models, where each time one of the variables is rem
PD-predictions using the test set

```
log_1_remove_amnt <- glm(loan_status ~ grade + home_ownership + annual_inc + age
+ emp_cat + ir_cat, family = "binomial", data = training_set)

log_1_remove_grade <- glm(loan_status ~ loan_amnt + home_ownership + annual_inc +
age + emp_cat + ir_cat, family = "binomial", data = training_set)

log_1_remove_home <- glm(loan_status ~ loan_amnt + grade + annual_inc + age +
emp_cat + ir_cat, family = "binomial", data = training_set)

…

pred_1_remove_amnt <- predict(log_1_remove_amnt, newdata = test_set, type =
"response")
pred_1_remove_grade <- predict(log_1_remove_grade, newdata = test_set, type =
"response")
pred_1_remove_home <- predict(log_1_remove_home, newdata = test_set, type =
"response")
…
```

3) Keep the model that led to the best AUC (AUC full model: 0.6512)

```
> auc(test_set$loan_status, pred_1_remove_amnt)
Area under the curve: 0.6514

> auc(test_set$loan_status, pred_1_remove_grade)
Area under the curve: 0.6438

> auc(test_set$loan_status, pred_1_remove_home)
Area under the curve: 0.6537

…
```

```
# Build four models each time deleting one variable in log_3_remove_ir
log_4_remove_amnt <- glm(loan_status ~ grade + annual_inc + emp_cat,
                family = binomial, data = training_set)
log_4_remove_grade <-glm(loan_status ~ loan_amnt +  annual_inc + emp_cat,
                family = binomial, data = training_set)
log_4_remove_inc <- glm(loan_status ~ loan_amnt + grade + emp_cat,
                family = binomial, data = training_set)
log_4_remove_emp <-glm(loan_status ~loan_amnt + grade + annual_inc,
                family = binomial, data = training_set)

# Make PD-predictions for each of the models
pred_4_remove_amnt <- predict(log_4_remove_amnt, newdata = test_set, type = "response")
pred_4_remove_grade <-  predict(log_4_remove_grade, newdata = test_set, type = "response")
pred_4_remove_inc <- predict(log_4_remove_inc, newdata = test_set, type = "response")
pred_4_remove_emp <-  predict(log_4_remove_emp, newdata = test_set, type = "response")

# Compute the AUCs
auc(test_set$loan_status,pred_4_remove_amnt)
auc(test_set$loan_status,pred_4_remove_grade)
auc(test_set$loan_status,pred_4_remove_inc)
auc(test_set$loan_status,pred_4_remove_emp)
```

But... very classification-focused

- Timing aspect is neglected
- New popular method: survival analysis
    - PD's that change over time
    - time-varying covariates can be included

Thursday, March 02, 2017
9:57 AM

```
        lastDate=np.array(underlyingStrike_everyday["TRADE_DT"])[-1]
        if LongShort=="Long":
#Create MTM, IV and Premia Table
            Option_Table_ASK_tradeData=pd.DataFrame(index=underlyingStrike_everyday["TRADE_DT"])
            OptionPremia=pd.DataFrame(index=underlyingStrike_everyday["TRADE_DT"])
            OptionIntrisicValue=pd.DataFrame(index=underlyingStrike_everyday["TRADE_DT"])
            for i in range(underlyingStrike.shape[0]):
#Gather information (Spot Back Level, Early Trade Date, exprDate)
                spot_level=underlyingStrike.loc[i,"spotBack"]
                tradeDate_today=underlyingStrike.loc[i,"TRADE_DT"]
                colName=underlyingStrike.loc[i,"TRADE_DT"].strftime("%m/%d/%Y")
                exprDate_today=underlyingStrike.loc[i,"EXPR_DT"]
#Adjust option price using spot level.
                timeseries=pd.DataFrame({colName:Option_Table_ASK["Series"+str(underlyingStrike.loc[i,"tradedOptionID"])]})/spot_level
#change the option price data up to tradeDate
                timeseries=timeseries[(timeseries.index>=tradeDate_today)]
#Start to check earlyUnwind
                earlyUnwind=False
                trigger1=timeseries[np.array((timeseries-timeseries.loc[timeseries.index[0]])>stopEarn) | np.array((timeseries-timeseries.loc[timeseries.index[0]])<stopLoss)]
                trigger2=triggerOffCalendar[(triggerOffCalendar>tradeDate_today) & (triggerOffCalendar<exprDate_today)].to_frame()
                triggerDate1=next(iter(trigger1.index.tolist() or []), 0)
                triggerDate2=next(iter(trigger2.index.tolist() or []), 0)
                #calendar have to be sorted
                triggerDateTogether=min_date(triggerDate1,triggerDate2)
                earlyUnwind=(triggerDateTogether!=0)
#Early unwind will be true and triggerDateTogether will be some date.
#We have three condition
#1. No Unwind we have all the data till maturity
#2. No Unwind we don't have all the data till maturity
#3. We do have unwind But indicator told me to do it the last date or maturity date -> So we cannot unwind
#4. We do have unwind and we can unwind it.
                if (((earlyUnwind==False or triggerDateTogether==exprDate_today or triggerDateTogether==lastDate) and (exprDate_today<= lastDate)) or ((earlyUnwind==True) and (triggerDateTogether == lastDate))):
#The method we hold the option to maturity
                    exprDate_today=underlyingStrike.loc[i,"EXPR_DT"]
                    strike_today=underlyingStrike.loc[i,"strikeLevel"]
                    expr_spotdate=max(underlyingStrike_everyday.loc[underlyingStrike_everyday["TRADE_DT"]<=exprDate_today,"TRADE_DT"]) # usually is the Friday before that Saturday
                    exprSpot=underlyingStrike_everyday.loc[underlyingStrike_everyday["TRADE_DT"]==expr_spotdate,"UNDL_PRC"] # adjusted Underlying Price at maturity  date
                    spot_level_adjusted=underlyingStrike.loc[i,"UNDL_PRC"] # Adjusted Spot Price at the trade date
                    premia=-timeseries[timeseries.index==tradeDate_today]  # Calculate Premia
                    timeseries=timeseries[(timeseries.index<expr_spotdate) & (timeseries.index>=tradeDate_today)] # Generate premia series with trade date without expiry date
                    Option_Table_ASK_tradeData=pd.concat([Option_Table_ASK_tradeData,timeseries],axis=1)
                    OptionPremia=pd.concat([OptionPremia,premia],axis=1) # set up the premia in premia table
                    if PC=="C":
                        exprSpot=exprSpot.apply(lambda x: max(exprSpot.values-strike_today,0.0))
                    elif PC=="P":
                        exprSpot=exprSpot.apply(lambda x: max(strike_today-exprSpot.values,0.0))
#       exprSpot.index=[expr_spotdate]
                    IV=pd.DataFrame({underlyingStrike.loc[i,"TRADE_DT"].strftime("%m/%d/%Y"):exprSpot.values[0].tolist()},index=[expr_spotdate])/spot_level_adjusted # IV we need use adjusted spot level to do the divide
                    OptionIntrisicValue=pd.concat([OptionIntrisicValue,IV],axis=1)
                elif ((earlyUnwind==False or triggerDateTogether==exprDate_today or triggerDateTogether==lastDate) and (exprDate_today> lastDate)):
#The method we hold the option to the last date
                    exprDate_today=underlyingStrike.loc[i,"EXPR_DT"]
                    expr_spotdate=max(underlyingStrike_everyday.loc[underlyingStrike_everyday["TRADE_DT"]<=exprDate_today,"TRADE_DT"]) # this one should give me last date
                    spot_level_adjusted=underlyingStrike.loc[i,"UNDL_PRC"]
                    premia=-timeseries[timeseries.index==tradeDate_today]
                    timeseries=timeseries[(timeseries.index<=expr_spotdate)] # include the expr_spotdate => actually last date
                    Option_Table_ASK_tradeData=pd.concat([Option_Table_ASK_tradeData,timeseries],axis=1)
                    OptionPremia=pd.concat([OptionPremia,premia],axis=1)
                    IV=pd.DataFrame({underlyingStrike.loc[i,"TRADE_DT"].strftime("%m/%d/%Y"):[0.0]},index=[expr_spotdate])
                    OptionIntrisicValue=pd.concat([OptionIntrisicValue,IV],axis=1)
                else:
#This method we early execise.
                    exprDate_today=triggerDateTogether
#                   underlyingStrike.loc[i,"EXPR_DT"]=exprDate_today
                    strike_today=underlyingStrike.loc[i,"strikeLevel"]
                    expr_spotdate=min(underlyingStrike_everyday.loc[underlyingStrike_everyday["TRADE_DT"]>exprDate_today,"TRADE_DT"]) # find the day we unwind the position => the date after the trigger
                    spot_level_adjusted=underlyingStrike.loc[i,"UNDL_PRC"]
                    premia=-timeseries[timeseries.index==tradeDate_today]
                    timeseries=timeseries[(timeseries.index<expr_spotdate)]
                    Option_Table_ASK_tradeData=pd.concat([Option_Table_ASK_tradeData,timeseries],axis=1)
                    OptionPremia=pd.concat([OptionPremia,premia],axis=1)
                    shortPrice=Option_Table_BID.loc[expr_spotdate,"Series"+str(underlyingStrike.loc[i,"tradedOptionID"])]
                    IV=pd.DataFrame({underlyingStrike.loc[i,"TRADE_DT"].strftime("%m/%d/%Y"):[shortPrice]},index=[expr_spotdate])/spot_level
                    OptionIntrisicValue=pd.concat([OptionIntrisicValue,IV],axis=1)
            OptionMTM=Option_Table_ASK_tradeData.copy()
```

Wednesday, April 12, 2017
11:37 AM

```
insert into EntryCap
select temptable2.a,MarketCap.value from (select TempTable.id_stock as a,
Max(MarketCap.date) as b from (select Min(date) as date, id_stock from Index_member
where id_index=251
group by id_stock) as TempTable
left join MarketCap
on TempTable.date>MarketCap.date and TempTable.id_stock=MarketCap.id_stock group by
TempTable.id_stock) as temptable2
left join MarketCap
on temptable2.b=MarketCap.date and temptable2.a=MarketCap.id_stock

select date from MarketCap where id_stock=3
```

```
def  StairCase(n):
    for i in range(1,n+1):
        for j in range(n-i):
            print(" ",end="")
        for k in range(i):
            print("#",end="")
        print("")
```

4.13 Python code

Thursday, April 13, 2017
8:35 AM

*operator means unpack . **means unpack twice

```
def array_left_rotation(a, n, k):
    for i in range(k):
        temp=a.copy()
        for j in range(n):
            temp[j-1]=a[j]
        a=temp
    return a

n, k = map(int, input().strip().split(' '))
a = list(map(int, input().strip().split(' ')))
answer = array_left_rotation(a, n, k);
print(*answer, sep=' ')


def number_needed(a, b):

a_dict={'a':0,'b':0,'c':0,'d':0,'e':0,'f':0,'g':0,'h':0,'i':0,'j':0,'k':0,'l':0,
'm':0,'n':0,'o':0,'p':0,'q':0,'r':0,'s':0,'t':0,'u':0,'v':0,'w':0,'x':0,'y':0,'z
':0}

b_dict={'a':0,'b':0,'c':0,'d':0,'e':0,'f':0,'g':0,'h':0,'i':0,'j':0,'k':0,'l':0,
'm':0,'n':0,'o':0,'p':0,'q':0,'r':0,'s':0,'t':0,'u':0,'v':0,'w':0,'x':0,'y':0,'z
':0}
    for i in range(len(a)):
        if not (a[i] in a_dict.keys()):
            a_dict[a[i]]=1
        else:
            a_dict[a[i]]+=1
    for i in range(len(b)):
        if not (b[i] in b_dict.keys()):
            b_dict[b[i]]=1
        else:
            b_dict[b[i]]+=1
    sum_dict=dict()
    for i in range(26):
        key=sorted(a_dict.keys())[i]
        sum_dict[key]=min(a_dict[key],b_dict[key])
    count=0
    for i in range(len(a)):
        if (sum_dict[a[i]]<a_dict[a[i]]):
            a_dict[a[i]]-=1
            count+=1
    for i in range(len(b)):
```

```
        if (sum_dict[b[i]]<b_dict[b[i]]):
            b_dict[b[i]]-=1
            count+=1
    return count

a = input().strip()
b = input().strip()

print(number_needed(a, b))


def check_binary_search_tree_(root):
    temp1=temp2=temp3=temp4=True
    if not (root.left == None):
        temp1=check_binary_search_tree_(root.left)
        temp3=root.data>root.left.data
    if not (root.right==None):
        temp2=check_binary_search_tree_(root.right)
        temp4=root.data<root.right.data
    return temp1&temp2&temp3&temp4
```

4.17 Python Code

Monday, April 17, 2017
5:07 PM

a=[1,2,3]
A=function_test(a[:])

It is kind of shallow copy. In this case, it is called by value.

Id(a) will return specific id for each object.

```
def ref_demo(x):
    print (x,"id=",id(x))
    x=[1,2,3]
```

This will create an local variable.

```
def ref_demo(x):
    print (x,"id=",id(x))
    x+=[1,2,3]
```

This will change x it self

```
def ref_demo(x):
    print (x,"id=",id(x))
    x[0]=1
```

This will change x itself as well.

Function Summery

Friday, December 09, 2016
1:02 PM

```
BendingTemporal((0, Spread, BendingLength, 0, PDICalendar.Count);
```

```
PDICalendar
= CalendarGenerator.CreateFrequencyCalendar((FixingCalendar, strikeDate, maturityDate, "100y");
```

```
PDICalendar.Count
```

```
 double payoffType = PayoffType.Value == "Call" ? 1 : -1;
```

```
Chooser PayoffType("Call;Put", "Product", "PayoffType");
```

```
SpaceVector asianFinals = basket.Evaluate(AsianOut).AverageTemporal();
```

Airbag

Tuesday, November 01, 2016
11:01 AM

- BendingLength is how many days you want client to pay for the put down in
- TimeVector basketVector =
  basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weights)
  we can see that we are average the basket for each day in the PDICalendar. So we can get a TimeVector.
- AverageSpatial(basket.weights) remember this average function when we have a weight average portfolio and multiple observation
- TimeVector bentSpread = BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count)
  TimeVector BendingTermporal(double startingLevel, double ending level, int bending length, int nbDatesBeforeEnd, int count);
  Return a timevector storing value, linearly interpolated from one value to another on a specified interval.
  Startlevel: value to start bending at
  endinglevel: value to end bending at
  bending length: number of dates during which bending is performance.
  nbDateBeforeEnd: Number of dates remaining after bending has ended; 0 if bending is performed euntil the end.
  count: number of dates in the timevector
  return;
  we need to decide how many dates, how many dates have the decrease, how many ending value at the end.
- indicator = IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
  For the american knock in, and indicator is down. We have to use bestof.
- BarrierType.Value
  Return the chooser value
- Chooser BarrierType("European;American", "Product", "Barrier type");
  The way to construct a chooser.
- PDICalendar
  = CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y")
  IpriceSchedule createFrequencyCalendar(pricingschedule fixingCalendar, FixingDate Begindate, fixingdate endingdate, string frequency)
  create a calendar with frequency dates.
  Broken date is at the beginning
  Fixing Calendar : master calendar
  startdate will not be incluede into calendar.
- BendingLength = **Min**(PDICalendar.Count, **Max**(0, BendingLength));
  in case the option tenor is less then 90 days. Then we should shorten the bending length.
  It is inside of initialize{}.

```
double Gearing("1.0", "Product", "Gearing");
double BarrierDI("0.7", "Product", "DI barrier");
double Spread("0.03", "Product", "Barrier spread");
int BendingLength("90", "Product", "Bending days");
Chooser BarrierType("European;American", "Product", "Barrier type");
IPricingSchedule PDICalendar;
```

```
Evaluate(IVectorCoupon aCoupon)
{
      TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weights);
      TimeVector bentSpread = BendingTemporal((0, Spread, BendingLength, 0, PDICalendar.Count);
      double indicator = IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
      double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);
      aCoupon[maturityDate] +=
Gearing * Max(0.0, basketPerf - strike) - indicator * Max(strike - basketPerf, 0.0);
}


Initialize()
{
   if(BarrierType.Value == "European")
   {
      PDICalendar
= CalendarGenerator.CreateFrequencyCalendar((FixingCalendar, strikeDate, maturityDate, "100y");
   }
   else
   {
      PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
   }

   BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Asian

Tuesday, November 01, 2016
12:23 PM

- double basketPerf = basket.Performance(strikeDate, CalendarAsia).AverageTemporal().Average(basket.Weights);
  Show the average across time with equal weights. Then we average with weights.
- double payoffType = PayoffType.Value == "Call" ? 1 : -1;
  use the new kind of equation

```
double Gearing("1.0", "Product", "Gearing");
Chooser PayoffType("Call;Put", "Product", "PayoffType");
Calendar CalendarAsia("CalendarAsia");
```

```
Evaluate(IVectorCoupon aCoupon)
{
   double basketPerf =
basket.Performance(strikeDate, CalendarAsia).AverageTemporal().Average(basket.Weights);
   double payoffType = PayoffType.Value == "Call" ? 1 : -1;
   aCoupon[maturityDate] = Gearing * Max(payoffType * (basketPerf - strike), 0);
}
```

Turbo

Monday, November 07, 2016
1:48 PM

- Long a call, short a put. The reason we need two is that we may have different gearing.

```
double GearingCall("1.5", "Call Zone", "Call Gearing");
double CallStrike("1.0", "Call Zone", "Call Strike");
double GearingPut("1.0", "Put Zone", "Put Gearing");
double PutStrike("1.0", "Put Zone", "Put Strike");


Evaluate(IVectorCoupon aCoupon)
{
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);
   aCoupon[maturityDate] =
GearingCall * Max(basketPerf - CallStrike, 0) + GearingPut * Min(basketPerf - PutStrike, 0);
}
```

Vanilla

Monday, November 07, 2016
1:49 PM

- **In Java, it is also a==1?True:False.**

```
double Gearing("1.0", "Product", "Gearing");
Chooser PayoffType("Call;Put", "Product", "PayoffType");

Evaluate(IVectorCoupon aCoupon)
{
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);
   double payoffType = PayoffType.Value == "Call" ? 1 : -1;
   aCoupon[maturityDate] = Gearing * Max(payoffType * (basketPerf - strike), 0);
}
```

Vanilla Strip

Monday, November 07, 2016
1:51 PM

- It is multiple vanilla option. For each date in coupon calendar, there is a option payoff.
- Foreach() is used when there is a array or calendar
- Date type is fixingdate
- Performance(startdate,enddate) will return a ST/S0. If we have multiple underlying. It is a space vector. If we have multiple calendar, it is a timevector.

```
Chooser PayoffType("Call;Put", "Product", "PayoffType");
Calendar CouponCalendar("");

Evaluate(IVectorCoupon aCoupon)
{
   foreach(FixingDate date in CouponCalendar)
   {
      double basketPerf = basket.Performance(strikeDate, date).Average(basket.Weights);
      double payoffType = PayoffType.Value == "Call" ? 1 : -1;
      aCoupon[date] = Max(payoffType * (basketPerf - strike), 0);
   }
}
```

Asian in - out

Monday, November 07, 2016
1:56 PM

- Evaluate will return the value at that index.
- Averagetemporal will average across different times
- Strike and spot are both asian version rather than 1 point value.
- Calculate average across time first. Then average across the stock.

```
Chooser PayoffType("Call;Put", "Product", "PayoffType");
Calendar AsianIn("");
Calendar AsianOut("");

Evaluate(IVectorCoupon aCoupon)
{
   SpaceVector asianStrikes = basket.Evaluate(AsianIn).AverageTemporal();
   SpaceVector asianFinals = basket.Evaluate(AsianOut).AverageTemporal();
   double basketPerf = (asianFinals / asianStrikes).Average(basket.Weights);
   double payoffType = PayoffType.Value == "Call" ? 1 : -1;
   aCoupon[maturityDate] += Max(payoffType * (basketPerf - strike), 0);
}
```

Bonus

Monday, November 07, 2016
2:00 PM

- The way when it is PDI and multiple observation. Remember you have to have performance for each observation. Then you will pick up the best of the indicatordown
- At maturity, we have a PDI. If it is not Knock in, we will have max(bonus, basketperf-strike). If it is knocked in, we will have max(0,basketperf-strike).
- Which means that, if knocked in, perf > 0 ,we have positive payoff
- If knocked in , perf < 0 ,we will have negative payoff
- If not knocked in, perf is very high, we will have perf,
- If not knocked in, perf is low, we will have bonus.

```
double Bonus("0.1", "Product", "Bonus");
double BarrierDI("0.7", "Product", "DI barrier");
double Spread("0.03", "Product", "Barrier spread");
int BendingLength("90", "Product", "Bending days");
Chooser BarrierType("European;American", "Product", "Barrier type");
IPricingSchedule PDICalendar;

Evaluate(IVectorCoupon aCoupon)
{
   TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weights);
   TimeVector bentSpread = BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);
   double indicator = IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights) - strike;
   aCoupon[maturityDate] += Max(Bonus * (1 - indicator), basketPerf) + indicator * Min(basketPerf, 0.0);
}


Initialize()
{
   if(BarrierType.Value == "European")
   {
      PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
   }
   else
   {
      PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
   }
   BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Bonus Long Basket Downside WO

Wednesday, November 09, 2016
2:19 PM

- When it is worst of + American PDI, we need to get MinSpatial first. Then use bending to get more spread than European PDI.
- Remember it is different from Wo across space and time.

```
double Bonus("0.1", "Product", "Bonus");
double BarrierDI("0.7", "Product", "DI barrier");
double Spread("0.03", "Product", "Barrier spread");
int BendingLength("90", "Product", "Bending days");
Chooser BarrierType("European;American", "Product", "Barrier type");
IPricingSchedule PDICalendar;

Evaluate(IVectorCoupon aCoupon)
{
    TimeVector basketVector = basket.Performance(strikeDate, PDICalendar).MinSpatial();
    TimeVector bentSpread = BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);
    double indicator = IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    double worstPerf = basket.Performance(strikeDate, maturityDate).WorstOf();
    double basketPerf = basket.Performance(strikeDate, maturityDate).Average();
    aCoupon[maturityDate] += indicator * (worstPerf - strike) + (1-
indicator) * Max(Bonus, basketPerf - strike);
}


Initialize()
{
  if(BarrierType.Value == "European")
  {
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
  }
  else
  {
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
  }
  BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

American Coupon Barrier

Wednesday, November 09, 2016
8:25 AM

```
CalendarDecorator Coupon("0.05", "Product", "Coupon");

CalendarDecorator Barrier("0.7", "Product", "Coupon Barrier");
// Barrier Spread
CalendarDecorator Spread("0.03", "Product", "Barrier Spread");
// Coupon calendar
Calendar CouponCalendar("");

double PDIBarrier("1.0", "PDI", "PDIBarrier");
double BarrierSpread("1.0", "PDI", "BarrierSpread");

double BarrierLockin("1.0", "Lockin", "BarrierLockin");
double LockinSpread("1.0", "Lockin", "LockinSpread");
double CouponLockin("1.0", "Lockin", "CouponLockin");

// Use this method to implement your pricing
Evaluate(IVectorCoupon aCoupon)
{
  double lockin = 0;

  // For each coupon payment date
  foreach(FixingDate date in CouponCalendar)
  {
      // Retrieve the basket performance
      double wo = basket.Performance(strikeDate, date).WorstOf();

    // Compute the KI indicator on this performance
    double indicCoupon = IndicatriceUp(wo, Barrier[date], Spread[date]);
    lockin = Max(lockin, IndicatriceUp(wo, BarrierLockin, LockinSpread));

    // Pay the given coupon
    aCoupon[date] += Coupon[date] * indicCoupon * (1-lockin) + lockin * CouponLockin;


    // Client is short a PDI at maturity
    if (date == CouponCalendar.End)
    {
      double indicKI = IndicatriceDown(wo, PDIBarrier, BarrierSpread);

      // Pay the PDI
      aCoupon[date] += indicKI * Min(0, wo - strike) * (1-lockin);
    }

  }
}
```

Lockin+ Memory

Wednesday, November 09, 2016
10:11 AM

```
/// <summary>
/// Digital strip ; each calendar date, the option pays a coupon if the average basket performance is
greater than a certain level given in the date.Cap.
/// </summary>
// Coupon
double Coupon("0.05", "Product", "Coupon");

CalendarDecorator Barrier("0.7", "Product", "Coupon Barrier");
// Barrier Spread
CalendarDecorator Spread("0.03", "Product", "Coupon Barrier Spread");
// Coupon calendar
Calendar CouponCalendar("");

double PDIBarrier("1.0", "PDI", "PDIBarrier");
double BarrierSpread("1.0", "PDI", "BarrierSpread");

double BarrierLockin("1.0", "Lockin", "BarrierLockin");
double LockinSpread("1.0", "Lockin", "LockinSpread");
double CouponLockin("1.0", "Lockin", "CouponLockin");
double MemoryBarrier("1.0", "Product", "MemoryBarrier");
double MemorySpread("1.0", "Product", "MemorySpread");

// Use this method to implement your pricing
Evaluate(IVectorCoupon aCoupon)
{
  double lockin = 0;
  double currentCoupon=0.0;
  // For each coupon payment date
  foreach(FixingDate date in CouponCalendar)
  {
      // Retrieve the basket performance
      double wo = basket.Performance(strikeDate, date).WorstOf();

    // Compute the KI indicator on this performance
    double indicCoupon = IndicatriceUp(wo, Barrier[date], Spread[date]);
    lockin = Max(lockin, IndicatriceUp(wo, BarrierLockin, LockinSpread));
    double indicMemory=IndicatriceUp(wo,MemoryBarrier,MemorySpread);
    // Pay the given coupon
    aCoupon[date] += Coupon * indicCoupon * (1-
lockin) + lockin * CouponLockin +indicMemory *currentCoupon;
    currentCoupon*=(1-indicMemory);
    currentCoupon+=Coupon * (1-indicCoupon)*(1-lockin);

    // Client is short a PDI at maturity
    if (date == CouponCalendar.End)
    {
      double indicKI = IndicatriceDown(wo, PDIBarrier, BarrierSpread);
```

```
            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike) * (1-lockin);
        }

    }
}
```

Call or put Spread

Monday, December 05, 2016
12:12 PM

- Notation. ? :
- Call Spread and Put spread is the call or put with cap

```
double Cap("1.0", "Product", "Cap");

Chooser PayoffType("Call spread;Put spread", "Product", "PayoffType");
Evaluate(IVectorCoupon aCoupon)
{

   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

   double payoffType = PayoffType.Value == "Call spread" ? 1 : -1;

   aCoupon[maturityDate] = Min(Cap, Max(payoffType * (basketPerf - strike), 0));
}
```

Call or Put Spread Strip

Monday, December 05, 2016
12:14 PM

- Strip means that we have a serial of call spread or put spread.

```
// Cap of the payoff
CalendarDecorator Cap("1.0", "Product", "Cap");
// Choose between call and put
Chooser PayoffType("Call spread;Put spread", "Product", "PayoffType");
// Strip calendar
Calendar CouponCalendar("");

/// The payoff of a call spread or put spread strip
Evaluate(IVectorCoupon aCoupon)
{
  // For each date in the coupon calendar
  foreach(FixingDate date in CouponCalendar)
  {
    // Retrieve the performance of the weighted basket at maturity
    double basketPerf = basket.Performance(strikeDate, date).Average(basket.Weights);

    // Determine whether we're pricing a call or a put
    double payoffType = PayoffType.Value == "Call spread" ? 1 : -1;

    // Pay a final coupon depending on the payoff type
    aCoupon[date] = Min(Cap[date], Max(payoffType * (basketPerf - strike), 0));
  }
}
```

Equinoxe

Wednesday, December 07, 2016
2:29 PM

- When payoff is max(KG-1.0, perf-1.0), which means that the upside is the same. The difference is just where is the down side is protected.
- When KG is 100%, it is just a call. When KG is 90%, it is a call strike at 90% and lose 10% already. When KG is 100%, it is a call strike at 110% and win 10% already.
- It is kind of autocall, because coupon is only collected when it is autocaled.
- But coupon is not incremented. It is like a bonus of autocall. There is no coupon at maturity.
- At the maturity, it is a KG protected call option.And the performance is asian calendar.
- Strikedate , autocall calendar . End -> calendar asia final.
- But why do we need that, because usually, it is just all the date in calendar asian.
- Strike date is start date, end autocall calendar is end date.
- `double asian = basket.Performance(strikeDate, CalendarAsiaFinal.Sub(strikeDate, date)).Average();`
- What if the startdate or end date is not in calendar asian final?
- Start date is excluded. End date is included. It will give the date in the calendar on this period.

```
double KG("1.0", "Product", "KG");
// Level for the coupon payment
double Coupon("0.1", " Coupon", "Coupon");
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");

// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");
Calendar CalendarAsiaFinal("CalendarAsiaFinal");

/// Pay a given coupon if the basket performance is above a given level, recall if it's above
another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
  // For each date in the callable calendar
  foreach (FixingDate date in AutoCallCalendar)
  {
    double perf = basket.Performance(strikeDate, date).Average();

    // Client is short a PDI at maturity
    if (date == AutoCallCalendar.End)
    {
      double asian =
basket.Performance(strikeDate, CalendarAsiaFinal.Sub(strikeDate, date)).Average();

      aCoupon[date] += Max(KG - 1.0, asian - 1.0);
    }
    else
```

```
        {
            // Retrieve the basket performance
            aCoupon[date] += IndicatriceUp(perf, AutocallBarrier[date], AutocallSpread[date]) * (Cou
pon + swap[date]);

            if (perf > AutocallBarrier[date])
            {
                break;
            }
        }

    }
}
```

Fixed Best

Wednesday, December 07, 2016
3:09 PM

- Payoff as discussed below.
- Intvector, the construct like this can give the vector which have nbFixed of element. Start from 0 to nbFixed-1
  IntVector intV = **new IntVector**(NbFixed, 0, 1);
  we can use the intvector as the index of the basketspace
- **SpaceVector** basketPerf =
  basket.**Performance**(strikeDate, maturityDate).**SortDescending**() - strike;
  the first one is the best one. Based on this code, we can see that we can use (vector - number)
- basketPerf[intV] = **new SpaceVector**(NbFixed, FixedLevel);
  newSpaceVector(int, double) give the size(int) vector containing value double
- basketPerf[intV] will give back partial of the vector
- In this case , we can just set the value of the best performance stock to fixed level.

```
/// <summary>
/// Fixed Best
/// At maturity, the option pays the weighted sum of the performances of 'N' underlyings, where the best 'n' underlyings
/// are fixed at a predetermined level and the remaining (N-n) underlyings are awarded their actual performances.
/// The payout is floored at zero.
/// </summary>

int NbFixed("0", "Product", "Nb Fixed");
// Level to Fix
double FixedLevel("0.0",  "Product", "Fixed Level");


// Use this method to implement your pricing
Evaluate(IVectorCoupon aCoupon)
{
  // Define an IntVector of size NbFixed, containing 0, 1, ..., NbFixed - 1
  IntVector intV = new IntVector(NbFixed, 0, 1);

    // Retrieve the performance of the underlyings since origin
   SpaceVector basketPerf = basket.Performance(strikeDate, maturityDate).SortDescending() - strike;

  // Set the values of each underlying which index is contained in intV at FixedLevel
   basketPerf[intV] = new SpaceVector(NbFixed, FixedLevel);

    // Call at maturity
    aCoupon[maturityDate] += Max(basketPerf.Average(), 0.0);
}
```

Individual Cap

Wednesday, December 07, 2016
3:36 PM

- Payoff as follows
- For each calendar day, we need to check the individual cap and floor. Get the average performance. Meet the global cap.
- Substract global floor means that we need to substract from the average performance.
- basketPerf = **Min**(LocalCap , **Max**(LocalFloor, basketPerf - strike));
  remember you need to minus strike here.
- SpaceVector is able to do calculation together. Vector=Min(Vector,0.0) something like that.

```
/// <summary>
/// Individual Cap pays a strip of coupons equal to a globally floored sum of locally floored/locally
capped perfs
/// Coupon(t) = $$ max( \sum\ weight_i perf_i(t) , GlobalFloor)$$
/// $$ perf_i(t) = max(LocalFloor, min(LocalCap,frac{S^i_t}{S^i _0}- strike ))
/// </summary>

// Local cap
double LocalCap("0.1", "Product", "Local Cap");
// Local floor
double LocalFloor("-1", "Product", "Local Floor");
// Global floor
double GlobalFloor("0.0", "Product", "Global Floor");
// Choose whether we substract the global floor when paying the coupon
Chooser SubstractGlobalFloor("No;Yes", "Product", "Substract global floor");
// Coupon calendar
Calendar CouponCalendar("", "Product", "Coupon Calendar");


/// The payoff of an indicap
Evaluate(IVectorCoupon aCoupon)
{
  // Loop through the calendar to calculate coupons
  foreach(FixingDate date in CouponCalendar)
  {
    // Retrieve the performance of the underlyings since origin
    SpaceVector basketPerf = basket.Performance(strikeDate, date);

    // Locally floor and cap each perf
    basketPerf = Min(LocalCap , Max(LocalFloor, basketPerf - strike));

    // Pay the equiweighted average of the modified perfs, subject to a global floor
    aCoupon[date] += Max(GlobalFloor, basketPerf.Average());

    // Substract the global floor if requested
    if(SubstractGlobalFloor.Value == "Yes")
    {
      aCoupon[date] -= GlobalFloor;
```

```
        }
    }
}
```

KODA

Wednesday, December 07, 2016
5:44 PM

- AccumulationCalendar.Count
  can be used to count the calendar
- KODA is bunch of Forward. Client buy at accumstrike. If spot go up, client make money.
- Remember KODA is obligation for both. There is no max or min
- If perf> strike, client buy notional, perf< strike, client buy leverage.
- KO (perf > barrier), contract early terminated. Accumulated notional*payoff
- If KO in guaranteed, We have extra accumulated. Because client guess right, they need some payment. But if it is knockout too early, they has no notional. They don't like it. That's the reason we have guaranteed period.
- dailyNotional = 1.0 / AccumulationCalendar.Count; make sure that Notional is equally spread in calendar

```
/// <summary>
///  Knock Out Daily Accumulator: Accumulator with an Up&Out Barrier
///  If activated all the accumulated stock are delivered 2 days after barrier is touched
///
///  Don't forget to adjust the payment date
/// </summary>

// Accumulation strike
double AccuStrike("0.85", "Product", "Accumulation Strike");
// Leverage
double Leverage("1.0", "Product", "Leverage");
// Barrier level
double BarrierLevel("1.20", "Product", "Barrier Level");
// Parallel shift used for the barrier
double BarrierShift("0.03", "Product", "Barrier Shift");
// Accumulation Calendar : Daily calendar but manually generated to take into account holidays
Calendar AccumulationCalendar("");
// Guaranteed Period Calendar
Calendar GuaranteedPeriodCalendar("");
// End Of Period Calendar
Calendar EndOfPeriodCalendar("");


/// The payoff of a KODA
Evaluate(IVectorCoupon aCoupon)
{
  // Percentage of stocks which can be sold each day
  double dailyNotional = 1.0 / AccumulationCalendar.Count;

  // Percentage of stocks which can be accumulated each day
  double dailyLeverage = Leverage / AccumulationCalendar.Count;

  // Percentage of accumulated stocks which can be accumulated on one period
  double accumulatedStock = 0.0;

  // Loop through the Accumulation calendar
```

```
  foreach (FixingDate date in AccumulationCalendar)
  {
    double perf = basket.Performance(strikeDate,date).Average();

    // Check Knock Out
    if (perf >= BarrierLevel + BarrierShift)
    {
      // Knock Out during guaranteed period : we accumulate until the end of the guaranteed period
without leverage
      double daysToGuaranteedEnd = GuaranteedPeriodCalendar.End.Index - date.Index;
      if(daysToGuaranteedEnd > 0)
      {
        accumulatedStock += daysToGuaranteedEnd * dailyNotional;
      }
      aCoupon[date] += accumulatedStock * (perf - AccuStrike);
      break;
    }

    // Accumulation
    accumulatedStock += perf >= AccuStrike ? dailyNotional : dailyLeverage;

    // Shares delivery at the end of Period
    if (date.In(EndOfPeriodCalendar))
    {
      aCoupon[date] += accumulatedStock * (perf - AccuStrike);
      // Reinit
      accumulatedStock = 0.0;
    }
  }
}
```

Opale

Friday, December 09, 2016
1:12 PM

```
/// <summary>
///  Opale :
///  Contract where the buyer receive a prefixed amount of stock at a given price when the stock price
closes within a given trading range
///  Payoff = $$\sum_{i\in\ Obs}\frac{1}{nb\ Obs}\ \times\ \mathbb{1}(\frac{S^i}{S^0}\ \>Barrier\)\times
\ (Sale\ Price\ -\ \frac{S^i}{S^0})$$
/// </summary>

// Price at which to sell the stock
double SellPrice("1.0", "Product", "Sell Price");
// DO Barrier
double Barrier("0.85", "Product", "Barrier");
// Spread used for the digit
double Spread("0.03", "Product", "Spread");
// Coupon Calendar : daily observation
IPricingSchedule CouponCalendar;


/// The payoff of an opale
Evaluate(IVectorCoupon aCoupon)
{
  // Daily notional : percentage of stocks which can be sold each day
  double dailyNotional = 1.0 / CouponCalendar.Count;

  // Loop through the calendar
  foreach (FixingDate date in CouponCalendar)
  {
    // Retrieve the performance of the basket
    double basketPerf = basket.Performance(strikeDate, date).Average();

    // Compute the selling indicator based on whether or not we're above the barrier
    double sellIndicator = IndicatriceUp(basketPerf, Barrier, Spread);

    // Pay the conditional spread between the given sell and the perf
    aCoupon[date] += dailyNotional * sellIndicator * (SellPrice - basketPerf);
  }
}

// Initialization of the daily calendar
Initialize()
{
  // Daily monitoring
  CouponCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
}
```

Vol target

Wednesday, December 07, 2016
5:44 PM

```
/// <summary>
/// Generic volatility cap product script
/// Overlays a volatility cap mechanism, which enables to manipulate the volcap strategy
performance directly like other payoffs
/// </summary>


// Volatility target
double VolTarget("0.1","Product","Vol Target");
// Payoff floor
double GlobalFloor("0.0","Product","Global Floor");
// Amount of synthetic dividends
double SyntheticDividends("0.0","Product","Synthetic Divs");
// Amount of fees rebated by the fund managers
double FeesRebate("0.0","Product","Rebate Fees");

// Select if we'll use a non risky pocket or no
Chooser LiborPocket("Add;None", "Volcap", "Libor Pocket");
// Volatility computation horizon #1
int VolHorizon1("20","Volcap","VolHorizon1");
// First volatility computation horizon #2
int VolHorizon2("60","Volcap","VolHorizon2");
// Risky asset maximum allocation
double RiskyAllocationMin("0.0","Volcap","RiskyAllocMin");
// Risky asset minimum allocation
double RiskyAllocationMax("1.0","Volcap","RiskyAllocMax");
// Frequency at which rebalancing on the risky asset will be done
//Chooser RebalancingFrequency("Daily;Weekly;Monthly", "Volcap", "Rebalancing Frequency");
// TFactor used in the volatility computation formula
int TFactor("254","Volcap","Tfactor");
// Threshold above which will we'll reallocate the risky asset
double ReallocThreshold("0.0","Volcap","ReallocThreshold");
// Starting allocation in the risky asset, used while there isn't enough history to compute volatilities
double StartingAllocation("1.0","Volcap","StartingAlloc");
// Calendar used as a container for the strategy observation dates
Calendar ObservationCalendar("",  "ObservationCalendar", "ObservationCalendar");

/// Generic script for volcap type products
Evaluate(IVectorCoupon aCoupon)
{
  // Compute and retrieve as a TimeVector the volcap strategy on a subcalendar
  TimeVector observedPerfs
= RetrievePerfsOnCalendar(VolCapStrategyComputation(), ObservationCalendar);

  // Pay the call on the maximum performance reached by the volcap strategy on a LockInCalendar
date
```

```
    aCoupon[maturityDate] += Max(GlobalFloor, observedPerfs.Average() - strike);
}

// Derivated volcap index
double[] VolCapStrategyComputation()
{
    // Prior computations to create the volcap strategy
    TimeVector dailyPerfs =
basket.PerformanceCliqueted(FixingCalendar).AverageSpatial(basket.Weights);
    double[] realizedVols = HistoricalVolatilityEstimator(dailyPerfs);
    double[] allocationWeights = AllocationWeightComputation(realizedVols);

    // TimeVector spaceholder to store volcap data
    double[] volcappedPerfs = new double[FixingCalendar.Count];
    volcappedPerfs[0] = 1.0;
    FixingDate oldDate = strikeDate;

    // Compute the volcap
    for(int i = 1; i < FixingCalendar.Count; i++)
    {
        FixingDate date = FixingCalendar[i];
        // Compute the dt used for fees and the libor pocket
        double dt = date.Fixing.Subtract(oldDate.Fixing).TotalDays / 365.0;
        // Update the strategy
        volcappedPerfs[i] =
volcappedPerfs[i - 1] * (1.0 + allocationWeights[i - 1] * (dailyPerfs[i - 1] - 1.0 - FeesRebate * dt) +
                        liborFactor * (1.0 - allocationWeights[i - 1]) * libors[date] * dt - SyntheticDividends *
dt);
        oldDate = date;
    }

    return volcappedPerfs;
}

// Risky asset allocation computation
double[] AllocationWeightComputation(double[] dailyVols)
{
    double[] allocationWeights = new double[dailyVols.Length];
    // No vol for the first date => use the starting allocation
    allocationWeights[0] = StartingAllocation;
    for(int i = 0; i < allocationWeights.Length-1; i++)
    {
        // If vol is infinitely negative (= still computing vols, not enough data), use the default starting
vol
        if(double.IsNegativeInfinity(dailyVols[i]))
        {
            allocationWeights[i+1] = StartingAllocation;
        }
        else
        {
            // Otherwise use the computed allocation
            double theoreticalAlloc
= Max(RiskyAllocationMin, Min(RiskyAllocationMax, VolTarget / dailyVols[i]));
```

```
        allocationWeights[i+
1] = Math.Abs(theoreticalAlloc - allocationWeights[i]) > ReallocThreshold ?
          theoreticalAlloc : allocationWeights[i];
      }
    }
    return allocationWeights;
}

// Historical volatility computation
double[] HistoricalVolatilityEstimator(TimeVector dailyPerfs)
{
    // First compute log^2 daily perfs
    double[] squareLogPerfs = new double[dailyPerfs.Count];
    for(int i = 0; i < squareLogPerfs.Length; i++)
    {
      double logPerfs = Math.Log(dailyPerfs[i]);
      squareLogPerfs[i] = logPerfs * logPerfs;
    }

    // Then init computed volatilities using the performance vector ...
    double[] volatilities = new double[dailyPerfs.Count];
    // ... initialize ...
    double weightHorizon1 = 1.0 / VolHorizon1;
    double weightHorizon2 = 1.0 / VolHorizon2;
    double sumLogsHorizon1 = 0;
    double sumLogsHorizon2 = 0;
    // ... and here we go !
    for(int i = 0; i < squareLogPerfs.Length; i++)
    {
      double maxDailyVol = double.NegativeInfinity;
      sumLogsHorizon1 += squareLogPerfs[i];
      sumLogsHorizon2 += squareLogPerfs[i];
      if(i >= VolHorizon1 - 1)
      {
        maxDailyVol = Max(maxDailyVol, Math.Sqrt(sumLogsHorizon1 * weightHorizon1));
        sumLogsHorizon1 -= squareLogPerfs[i - VolHorizon1 + 1];
      }
      if(i >= VolHorizon2 - 1)
      {
        maxDailyVol = Max(maxDailyVol, Math.Sqrt(sumLogsHorizon2 * weightHorizon2));
        sumLogsHorizon2 -= squareLogPerfs[i - VolHorizon2 + 1];
      }
      volatilities[i] = maxDailyVol * sqrtFactor;
    }

    // Return the computed volatility vector
    return volatilities;
}

// Helper function to retrieve a subset of the dailyPerfs vector given a specific calendar
TimeVector RetrievePerfsOnCalendar(double[] dailyPerfs, Calendar calendar)
{
    // Create a dummy placeholder timevector
```

```
    TimeVector subcalendarPerfs = basket.Performance(strikeDate, calendar).AverageSpatial();

    // Override the perfs using the correct volcap perf levels
    double[] volcappedData = new double[calendar.Count];
    for(int i = 0; i < calendar.Count; i++)
    {
        volcappedData[i] = dailyPerfs[calendar[i].Index];
    }

    // Set correct values and return the vector
    subcalendarPerfs.SetValues(volcappedData);
    return subcalendarPerfs;
}


/// <summary>
/// Initialize functions
/// </summary>

// Square root of the number of days used to compute the volatility
double sqrtFactor;
// Factor used to compute the libor contribution to the strategy
double liborFactor;
// Daily observation calendar
IPricingSchedule DailyCalendar;
// Rebalancing calendar, frequency chosen by the user
//IPricingSchedule RebalancingCalendar;
// Vectorial holder for Libor observations
ObservableVector libors;
DiscountCurve CurveLibor("Active", "Libor", "Libor Rate Curve");
string LiborMaturity("3M", "Libor", "Maturity");

// Initialize the product : we directly generate the daily calendar and the rebalancing calendar from
strike date to maturity date
Initialize()
{
    // Generation of the daily calendar
    DailyCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
    // Generation of the rebalancing calendar
    //string rebalFreq = RebalancingFrequency.Value == "Daily" ? "1d" : RebalancingFrequency.Value
== "Weekly" ? "1w" : "1m";
    //RebalancingCalendar = CalendarGenerator.CreateFrequencyCalendar(FixingCalendar,
strikeDate, maturityDate, rebalFreq);

    // Square root computation
    sqrtFactor = Math.Sqrt(TFactor);

    // Compute the libor factor
    liborFactor = LiborPocket.Value == "Add" ? 1 : 0;
}

InitializeObservable(IObservableFactory aMarket)
```

```
{
    libors = CreateLibors(aMarket, LiborMaturity, CurveLibor);
}
```

Rainbow

Monday, February 27, 2017
9:24 AM

- Remember SortAscending() is small to large. So the worst is the first one.
- Rainbow need spacevector first. It is performance of every stock
- Rainbow has a option inside. Max(rainbowPerf-strike,0)

```
/// <summary>
///  Rainbow
///  At maturity, the option pays a weighted average of the averaged underlying
///  values observed across a given observation period.
///  The first weight of the basket will be assigned to the worst of asians.
///     The last weight of the basket will be assigned to the best of asians.
///  The weights are generally determined such that the largest weight is attributed to the best
performing
///  underlying, and the smallest weight is attributed to the worst performing
///  underlying. The payout is floored at 0.
///
///  Payoff = $$ Max(0,\ \sum_{j\in Nb sj}\omega(j)\ \times\ SortAscending(Perf(j)))$$
///  $$ \omega(0)$$ is the weight of the first underlying in the basket. It will
///  be the weight of the worst of perfs.
/// </summary>


// The payoff of a rainbow
Evaluate(IVectorCoupon aCoupon)
{
   // Retrieve the asian performances of each underlying in the basket
   SpaceVector perfVector = basket.Performance(strikeDate, maturityDate);

   // Rainbow : The first weight of the basket will be assigned to the worst of asians.
   //            The last weight of the basket will be assigned to the best of asians.
   double rainbowPerf = perfVector.SortAscending().Average(basket.Weights);

   // Call on the rainbow
   aCoupon[maturityDate] += Max(rainbowPerf - strike, 0);
}
```

Rainbow on Asian

Monday, February 27, 2017
9:28 AM

- AverageTemporal() means average across the calendar. Then rank between different stock

Description :
At maturity, the option pays a weighted average of the averaged underlying values observed across a given observation period. The first weight of the basket will be assigned to the worst of asians, the last weight to the best of asians.

```
/// <summary>
///  Rainbow on asian :
///  At maturity, the option pays a weighted average of the averaged underlying
///  values observed across a given observation period.
///  The first weight of the basket will be assigned to the worst of asians.
///     The last weight of the basket will be assigned to the best of asians.
///  The weights are generally determined such that the largest weight is attributed to the best performing
///  underlying, and the smallest weight is attributed to the worst performing
///  underlying. The payout is floored at 0.
///
///  Payoff = $$ Max(0,\ \sum_{j\in Nb sj}\omega(j)\ \times\ SortAscending(Asian(j)))$$
///  $$ Asian(j) = \frac{1}{nb Obs}\sum_{i \in Obs}\frac{S_j^0}{S_j^i}$$
///  $$ \omega(0)$$ is the weight of the first underlying in the basket. It will
///  be the weight of the worst of asians.
/// </summary>
// The Asian Calendar
Calendar AsianCalendar("");
// The payoff of rainbow with asian tail
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the asian performances of each underlying in the basket
    SpaceVector perfVector = basket.Performance(strikeDate, AsianCalendar).AverageTemporal();

    // Rainbow : The first weight of the basket will be assigned to the worst of asians.
    //              The last weight of the basket will be assigned to the best of asians.
    double rainbowPerf = perfVector.SortAscending().Average(basket.Weights);

    // Call on the rainbow
    aCoupon[maturityDate] += Max(rainbowPerf - strike, 0);
}
```

Whale Put

Monday, February 27, 2017
9:30 AM

- Perf is around 1
- Bullish structure. But it looks like put on the inverse performance.

Description :
At maturity, the option is a Put on the inverse performance of the underlying basket (bullish structure).

```
/// <summary>
/// Whale Put on basket of stocks (Bullish Structure)
/// At maturity, the option is a Put on the inverse performance of the underlying basket.
/// The payout is floored at zero.
/// Payoff = $$ max(100% - \frac{Strike}{Basket} , 0)$$
///
/// Basket = $$ \frac{1}{n}\sum\ weight_i frac{S^i_T}{S^i_0}$$
/// </summary>
// Whale put
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at maturity
    double perf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

    // Pay the inverse performance
    aCoupon[maturityDate] = Max(1 - strike/perf, 0);
}
```

Bonus WO

Monday, February 27, 2017
9:35 AM

- Remember we use WO on both DI and performance.
- `Max(Bonus * (1 - indicator), basketPerf) can only be positive. Because Bonus *(1-indicator)>0 no matter what.`
- `So include basketperf here is not a problem.`

Description :
Long a call with a KO floor, short a PDI on the basket.

```
/// <summary>
/// Bonus ; long call with a KO floor, short a Put Down and In on the basket.
/// </summary>
// Level for the Bonus floor
double Bonus("0.1", "Product", "Bonus");
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Put DI on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the PDI Calendar
    TimeVector basketVector = basket.Performance(strikeDate, PDICalendar).MinSpatial();

    // Create the bent spread which will be used for computing the indicator
    TimeVector bentSpread = BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 = yes, between = a bit)
    double indicator = IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    // Compute the basket performance at maturity
    double basketPerf = basket.Performance(strikeDate, maturityDate).WorstOf() - strike;

    // Call with a conditional floor - PDI on the basket at maturity
    aCoupon[maturityDate] += Max(Bonus * (1 - indicator), basketPerf) + indicator * Min(basketPerf, 0.0);
}
// Initialize the product : we directly generate the calendar from strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar = CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar = CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Call Wo

Monday, February 27, 2017
9:46 AM

- Believe even Worst will give good performance.

```
/// <summary>
///  Call WO :
///  At maturity the option pays a call on the performance of the worst underlying.
/// </summary>

// Gearing
double Gearing("1.0", "Product", "Gearing");

/// The payoff of a call WO
Evaluate(IVectorCoupon aCoupon)
{
   // Retrieve the worst performance in the basket
   double wo = basket.Performance(strikeDate, maturityDate).WorstOf();

   // Pay the
   aCoupon[maturityDate] = Gearing * Max(0, wo - strike);
}
```

Call PDE

Monday, February 27, 2017
9:48 AM

- FixingCalendar.Backward Can reverse the calendar
- basket__underlying[0]

Description :
Client short a PDI at maturity versus guaranteed incremental coupons ; callability feature for either the issuer or the client.

```
/// <summary>
/// Switchable : pays a call at maturity ; switchability feature for the issuer to convert the product into a
plain bond paying yearly coupons
/// Coded in EDP
/// </summary>

// Coupon
double Coupon("0.1", "Product", "Coupon");
// PDI Barrier
double PDIBarrier("0.7", "Product", "PDI Barrier");
// PDI Spread
double PDISpread("0.03", "Product", "PDI Spread");
// Calendar used for coupon payment and switchability
Calendar CouponCalendar("", "Product", "VariableName");
Chooser CallType("Callable;Puttable", "Callability", "Call type");

// Barrier observation calendar
IPricingSchedule PDICalendar;

EvaluatePDE()
{
  // Fix the maximum number of coupons to be paid
  double incrementalCoupons = Coupon * CouponCalendar.Count;

  // Loop backward on all dates
  foreach(FixingDate date in FixingCalendar.Backward)
  {
    // Rollback all observables
    product.Rollback(date);

    // Retrieve the underlying performance
    Observable perf = basket.Performance(basket__underlying[0], strikeDate, date);

    // Pay the call at maturity
    if (date == FixingCalendar.End)
    {
      product
= IndicatriceExpensive(perf, PDIBarrier, PDISpread, perf - strike + incrementalCoupons, incrementalCou
pons);
    }
```

```
        // For each date in the coupon calendar except the maturity, decide to exercise the switch
        if (date.In(CouponCalendar))
        {
            if (date != maturityDate)
            {
                // Issuer callable
                if (CallType.Value == "Callable")
                {
                    product = Min(product, incrementalCoupons + swap[date]);
                }
                // Client callable
                else if (CallType.Value == "Puttable")
                {
                    product = Max(product, incrementalCoupons + swap[date]);
                }
            }

            // Decrement the coupons
            incrementalCoupons -= Coupon;
        }
    }

    // Return the product slice
    return product;
}
```

Cappuccino

Monday, February 27, 2017
11:23 AM

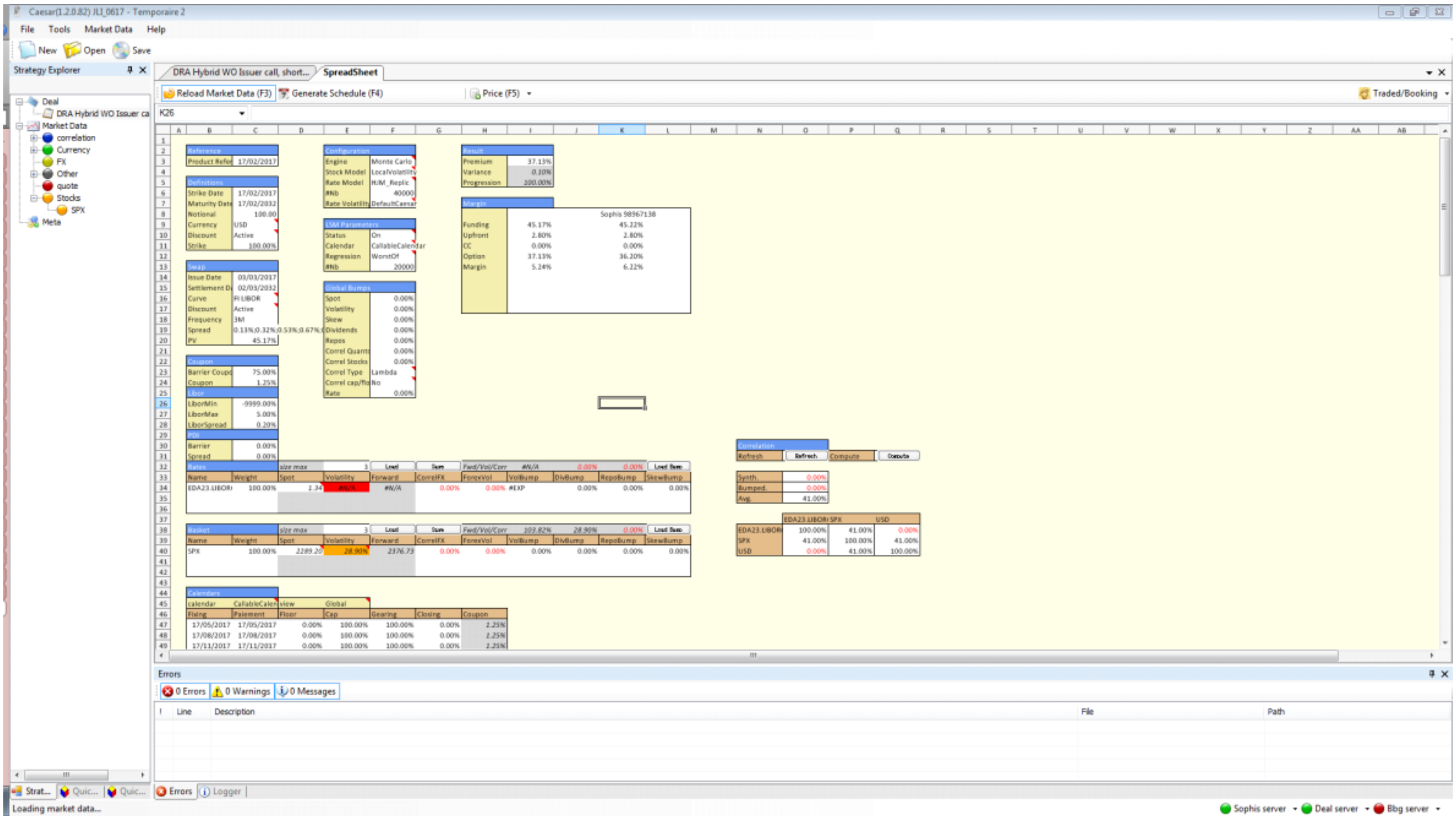
- Kind of same as Individual Cap. Different is individual Payoff is different. It is a bonus + Short Put.

```
/// <summary>
/// Cappuccino pays a strip of coupons equal to a globally floored sum of perfs,
/// where each negative performance is locally floored, and each positive performance is set to a given
level
/// </summary>

// Level to which positive performances are set
double CappuLevel("0.1", "Product", "Cappu Level");
// Spread used for the digit
double Spread("0.05", "Product", "Spread");
// Local floor
double LocalFloor("-1", "Product", "Local Floor");
// Global floor
double GlobalFloor("0.0", "Product", "Global Floor");
// Choose whether we substract the global floor when paying the coupon
Chooser SubstractGlobalFloor("No;Yes", "Product", "Substract global floor");
// Coupon calendar
Calendar CouponCalendar("", "Product", "Coupon Calendar");


/// The payoff
Evaluate(IVectorCoupon aCoupon)
{
  // Loop through the calendar to calculate coupons
  foreach(FixingDate date in CouponCalendar)
  {
    // Retrieve the performance of the underlyings since origin
    SpaceVector basketPerf = basket.Performance(strikeDate, date) - strike;

    // Compute the indicator vector determining whether each perf is positive or not
    SpaceVector indicUp = IndicatriceUp(basketPerf, 0, Spread);

    // Locally floor and cap each perf
    basketPerf = indicUp * CappuLevel + (1 - indicUp) * Max(LocalFloor, basketPerf);

    // Pay the equiweighted average of the modified perfs, subject to a global floor
    aCoupon[date] += Max(GlobalFloor, basketPerf.Average());

    // Substract the global floor if requested
    if(SubstractGlobalFloor.Value == "Yes")
    {
      aCoupon[date] -= GlobalFloor;
    }
  }
}
```

Libor Hybrid

Monday, February 27, 2017
4:06 PM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of the code to change if needed
/// </summary>

// Callable calendar
double PDIBarrier("0.7", "PDI", "Barrier");
double BarrierSpread("0.03", "PDI", "Spread");
IPricingSchedule ObservationCalendar;
Calendar CouponCalendar("");
Calendar PDICalendar("PDICalendar");
Calendar CallableCalendar("");
double CouponBarrier("1.0", "Coupon", "Barrier Coupon");
CalendarDecorator Coupon("0.07", "Coupon", "Coupon");


RateBasket RatesBasket("", "Rates");
double LiborMin("1.0", "Libor", "LiborMin");
double LiborMax("1.0", "Libor", "LiborMax");
double LiborSpread("1.0", "Libor", "LiborSpread");


/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
   FixingDate oldDate = strikeDate;


   // Loop through the callable calendar
   foreach(FixingDate date in CouponCalendar)
   {

      double sumCoupon = 0;
      double count = 0;
      foreach(FixingDate subDate in ObservationCalendar.Sub(oldDate, date))
      {
         double subWO = basket.Performance(strikeDate, subDate).WorstOf();
         double indicWO = IndicatriceUp(subWO, CouponBarrier, 0.005);
         double indicLibor
= IndicatriceRange(RatesBasket.Evaluate(subDate),LiborMin, LiborMax, LiborSpread);
         sumCoupon += indicWO * indicLibor;
         count++;
      }

      aCoupon[date] += sumCoupon * Coupon[date] / count;

      if (date.In(CallableCalendar))
         aCoupon[date] += productPV[date].Callable(swap[date]);


      if (date == CouponCalendar.End)
      {
         double worstEver = basket.Performance(strikeDate, PDICalendar).WorstOf();
         double indicKI = IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

         double wo = basket.Performance(strikeDate,maturityDate).WorstOf();

         aCoupon[date] += indicKI * Min(0, wo - strike);
      }

      oldDate = date;
   }


}

Initialize()
{
   // Accrual observation calendar
   ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
}
```


File
Tools
Market Data
Help
New
Open
Save
Strategy Explorer
SpreadSheet
Reload Market Data (F3)
Generate Schedule (F4)
Price (F5)
Traded/Booking
Deal
Market Data
correlation
Currency
FX
Other
quote
Stocks
SPX
Meta
Errors
0 Errors
0 Warnings
0 Messages
Line
Description
File
Path
Logger
Loading market data...
Sophis server
Deal server
Bbg server

Libor Hybrid 2

Monday, February 27, 2017
4:08 PM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of the code to change if needed
/// </summary>

// Callable calendar
double PDIBarrier("0.7", "PDI", "Barrier");
double BarrierSpread("0.03", "PDI", "Spread");
IPricingSchedule ObservationCalendar;
Calendar CouponCalendar("");
Calendar PDICalendar("PDICalendar");
Calendar CallableCalendar("");
double CouponBarrier("1.0", "Coupon", "Barrier Coupon");
CalendarDecorator Coupon("0.07", "Coupon", "Coupon");


DiscountCurve CurveLibor("Active", "Libor", "Libor Rate Curve");
string LiborMaturity("3M", "Libor", "Maturity");

ObservableVector libors;
InitializeObservable(IObservableFactory aMarket)
{
   libors = CreateLibors(aMarket, LiborMaturity, CurveLibor);
}
double LiborMin("1.0", "Libor", "LiborMin");
double LiborMax("1.0", "Libor", "LiborMax");
double LiborSpread("1.0", "Libor", "LiborSpread");


/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
   FixingDate oldDate = strikeDate;


   // Loop through the callable calendar
   foreach(FixingDate date in CouponCalendar)
   {

      double sumCoupon = 0;
      double count = 0;
      foreach(FixingDate subDate in ObservationCalendar.Sub(oldDate, date))
      {
         double subWO = basket.Performance(strikeDate, subDate).WorstOf();
         double indicWO = IndicatriceUp(subWO, CouponBarrier, 0.005);
         double indicLibor = IndicatriceRange(libors[subDate],LiborMin, LiborMax, LiborSpread);
         sumCoupon += indicWO * indicLibor;
         count++;
```

```
        }

        aCoupon[date] += sumCoupon * Coupon[date] / count;

        if (date.In(CallableCalendar))
          aCoupon[date] += productPV[date].Callable(swap[date]);


        if (date == CouponCalendar.End)
        {
          double worstEver = basket.Performance(strikeDate, PDICalendar).WorstOf();
          double indicKI = IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

          double wo = basket.Performance(strikeDate,maturityDate).WorstOf();

          aCoupon[date] += indicKI * Min(0, wo - strike);
        }

        oldDate = date;
      }


}

Initialize()
{
  // Accrual observation calendar
  ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
}
```

CMS Hybrid

Monday, February 27, 2017
4:09 PM

```
/// <summary>
/// Vanilla call or put on the basket
/// Payoff = $$ max(+/-1 * ( \frac{1}{n} \sum \frac{S_T}{S_0} - 100%), 0 )$$
/// </summary>


DiscountCurve CurveCMS("Active", "CMS", "CMS Rate Curve");
string CMSMaturity("10Y", "CMS", "Maturity");

ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
    cms = CreateCMS(aMarket, CMSMaturity, CurveCMS);
}

Basket Rates(";;;;", "Rates");
double Spread("1.0", "Product", "Spread");
/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the performance of the weighted basket at maturity
    double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

    double indic = IndicatriceUp(cms[maturityDate],cms[strikeDate],Spread);

    // Pay a final coupon depending on the payoff type
    aCoupon[maturityDate] =  Max(strike-basketPerf, 0)*indic;
}
```

CMS_USD_30Y
CMS_USD_10Y

Reference	
Product Refer	15/02/2017

Definitions	
Strike Date	15/02/2017
Maturity Date	15/02/2018
Notional	100.00
Currency	USD
Discount	Active
Strike	95.00%

Swap	
Issue Date	01/03/2017
Settlement Da	01/03/2018
Curve	Active
Discount	Active
Frequency	3M
Spread	0.00%
PV	0.97%

CMS	
CMS Rate Cur	FI LIBOR
Maturity	10Y
Product	
Spread	0.25%

Configuration	
Engine	Monte Carlo
Stock Model	LocalVolatility
Rate Model	HJM_Replic
#Nb	80000
Rate Volatility	DefaultCaesar

LSM Parameters	
Status	Off

Global Bumps	
Spot	0.00%
Volatility	0.00%
Skew	0.00%
Dividends	0.00%
Repos	0.00%
Correl Quanto	0.00%
Correl Stocks	0.00%
Correl Type	Lambda
Correl cap/flo	No
Rate	0.00%

Result	
Premium	2.22%
Variance	0.02%
Progression	100.00%

Margin	
Funding	0.00%
Upfront	0.00%
CC	0.00%
Option	2.22%
Margin	-2.22%

Rates		size max	3	Load	Save	Fwd/Vol/Corr	#N/A	0.00%	0.00%	Load Bump
Name	Weight	Spot	Volatility	Forward	CorrelFX	ForexVol	VolBump	DivBump	RepoBump	SkewBump
CMS_USD_10	100.00%	2.45	#N/A	#N/A	0.00%	0.00%	#EXP	0.00%	0.00%	0.00%

Basket		size max	3	Load	Save	Fwd/Vol/Corr	99.33%	14.25%	0.00%	Load Bump
Name	Weight	Spot	Volatility	Forward	CorrelFX	ForexVol	VolBump	DivBump	RepoBump	SkewBump
SPX	100.00%	2338.86	15.89%	2323.26	0.00%	0.00%	0.50%	0.00%	0.00%	0.00%

Quote	
Refresh	Refresh

Correlation			
Refresh	Refresh	Compute	Compute

Synth.	0.00%
Bumped.	0.00%
Avg.	18.00%

	CMS_USD_10	SPX	USD
CMS_USD_10	100.00%	18.00%	0.00%
SPX	18.00%	100.00%	41.00%
USD	0.00%	41.00%	100.00%

Hybrid Collection

Monday, February 27, 2017
6:16 PM

```
DiscountCurve CurveCMS("Active","CMS","CMS Rate Curve");
string CMSMaturity("10Y","CMS","Maturity");

double Multipler("1.0", "Product", "Multipler");
ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
   cms=CreateCMS(aMarket,CMSMaturity,CurveCMS);
}

Basket Rates(";;;;","Rates");


/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
   double gearing=0.0;
   // Retrieve the performance of the weighted basket at maturity
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights)-1.0;
   if(basketPerf>0)
   {
      gearing=1.0;
   }
   else if(basketPerf<-0.2)
   {
      gearing=2.0;
   }
   else{
      gearing=-basketPerf*5+1.0;
   }
   // Pay a final coupon depending on the payoff type
   aCoupon[maturityDate] =  Max(0,(Max(0,cms[maturityDate])-cms[strikeDate]))*gearing;
}
####################################################################
DiscountCurve CurveCMS("Active","CMS","CMS Rate Curve");
string CMSMaturity("10Y","CMS","Maturity");

double Multipler("1.0", "Product", "Multipler");
ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
   cms=CreateCMS(aMarket,CMSMaturity,CurveCMS);
}

Basket Rates(";;;;","Rates");


/// The payoff of a vanilla call or put
```

```
Evaluate(IVectorCoupon aCoupon)
{
   // Retrieve the performance of the weighted basket at maturity
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

   // Pay a final coupon depending on the payoff type
   aCoupon[maturityDate] =  Max(strike-basketPerf+cms[maturityDate]*Multipler, 0);
}
################################################################################
DiscountCurve CurveCMS("Active","CMS","CMS Rate Curve");
string CMSMaturity("10Y","CMS","Maturity");

double Multipler("1.0", "Product", "Multipler");
ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
   cms=CreateCMS(aMarket,CMSMaturity,CurveCMS);
}

Basket Rates(";;;;","Rates");


/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
   double gearing=0.0;
   // Retrieve the performance of the weighted basket at maturity
   double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

   // Pay a final coupon depending on the payoff type
   aCoupon[maturityDate] =  Max(0.8-basketPerf,0.0)*
100 * Min(0.01,Max(Max(0.0,cms[maturityDate])-cms[strikeDate],0.0));
}
####################################################################################
double Gearing("1.0", "Product", "Gearing");
// Choose between call and put
DiscountCurve CurveCMS("Active","CMS","CMS Rate Curve");
string CMSMaturity("10Y","CMS","Maturity");
double Barrier("1.0", "Product", "Barrier");

ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
   cms=CreateCMS(aMarket,CMSMaturity,CurveCMS);
}

Basket Rates(";;;;","Rates");
double Spread("1.0","Product","Spread");

/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
   // Retrieve the performance of the weighted basket at maturity
```

```
    double basketPerf = basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

    double indic=IndicatriceUp(cms[maturityDate],Barrier,Spread);
    // Pay a final coupon depending on the payoff type
    aCoupon[maturityDate] =  Max(strike-basketPerf, 0)*indic;
}
```

Bear Bull

Tuesday, March 28, 2017
10:59 AM

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>

// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");

// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
double AutocallBear("1.0", "Product", "AutocallBear");

/// Initialize the product : we directly generate the calendar from strike date to maturity date,
depending on the chosen type
Initialize()
{
  // Calendar generation : daily if US barrier, at maturity only if european
  if(BarrierType.Value == "European")
  {
    // Monitoring at maturity
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
  }
  else
  {
    // Daily monitoring
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
  }
}

/// Pay a given coupon if the basket performance is above a given level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the incremental coupon and the survival indicator
```

```
   double incrementalCoupon = Coupon;

   // For each date in the callable calendar
   foreach (FixingDate date in AutoCallCalendar)
   {

      // Retrieve the basket performance
      double basketPerf = basket.Performance(strikeDate, date).WorstOf();
      double bo = basket.Performance(strikeDate, date).BestOf();
      // Compute the coupon indicator
      double indicRecall = (1-
date.Closing)*IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[date]) + date.Closing*Indi
catriceDown(bo,AutocallBear+AutocallSpread[date],AutocallSpread[date]);
      // Pay the coupon
      aCoupon[date] += indicRecall * (incrementalCoupon + swap[date]);

      // Recall the product if we're above the barrier
      if(basketPerf > AutocallBarrier[date] && date.Closing==0)
      {
         break;
      }

      if(bo < AutocallBear && date.Closing==1)
      {
         break;
      }


      // Update the incremental coupon
      incrementalCoupon += Coupon;

      // Client is short a PDI at maturity
      if (date == AutoCallCalendar.End)
      {
         // Cômpute the indicator from the worst basket performance to determine whether or not KI
occurred
         double worstPerf = basket.Performance(strikeDate, PDICalendar).MinSpatial().WorstOf();
         double indicKI = IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

         // Pay the PDI
         aCoupon[date] += indicKI * Min(0, basketPerf - strike);
      }
   }
}
```

DRA issuer call

Tuesday, April 11, 2017
9:55 AM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of the code to change if needed
/// </summary>

// Callable calendar
double PDIBarrier("0.7", "PDI", "Barrier");
double BarrierSpread("0.03", "PDI", "Spread");
IPricingSchedule ObservationCalendar;
Calendar CouponCalendar("");
Calendar PDICalendar("PDICalendar");
Calendar CallableCalendar("");
double CouponBarrier("1.0", "Coupon", "Barrier Coupon");
CalendarDecorator Coupon("0.07", "Coupon", "Coupon");



/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
  FixingDate oldDate = strikeDate;


  // Loop through the callable calendar
  foreach(FixingDate date in CouponCalendar)
  {
    // Retrieve the basket performance for any date in the current accrual period
    TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, date)).MinSpatial();

    // Compute the DRA indicator and pay the accrual coupon
    double indicDRA = IndicatriceUp(timePerfs, CouponBarrier, 0.005).Average();

    aCoupon[date] += indicDRA*Coupon[date];

    if (date.In(CallableCalendar))
      aCoupon[date] += productPV[date].Callable(swap[date]);


    if (date == CouponCalendar.End)
    {
      double worstEver = basket.Performance(strikeDate, PDICalendar).WorstOf();
      double indicKI = IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

      double wo = basket.Performance(strikeDate,maturityDate).WorstOf();

      aCoupon[date] += indicKI * Min(0, wo - strike);
    }
```

```
        oldDate = date;
    }


}

Initialize()
{
    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
}
```

Cliquet, global and local cap and floor IScript

Monday, May 15, 2017
8:19 AM

Description :
At each observation date, a coupon equal to the cliqueted performance of the underlying locally floored and locally capped is calculated. At maturity, the coupons are paid in fine and a global floor is applied. Performance: 6m or longer

```
/// <summary>
/// Cliquet, global and local cap and floor
/// At each observation date, a coupon equal to the cliqueted
performance of the underlying
/// locally floored and locally capped is calculated. At maturity, the
coupons are paid in fine
/// and a global floor is applied. Performance: 6m or longer
/// </summary>
// Global cap
double GlobalCap("9999", "Product", "Global Cap");
// Global floor
double GlobalFloor("0", "Product", "Global Floor");
// Local cap
double LocalCap("0.05", "Product", "Local Cap");
// Local floor
double LocalFloor("-0.05", "Product", "Local Floor");
// Cliquet calendar
Calendar CliquetCalendar("", "Product", "VariableName");
/// The payoff of a cliquet
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the cliqueted performance of the basket
    // strikeDate must be included in CliquetCalendar to take S0 into
account
    TimeVector cliquetPerfs =
basket.PerformanceCliqueted(CliquetCalendar).AverageSpatial() - strike
;

    // Locally floor/cap the perf vector
    cliquetPerfs = Max(LocalFloor, Min(LocalCap, cliquetPerfs));

    // Final Cpn with the global floor
    aCoupon[maturityDate] = Max(GlobalFloor, Min(GlobalCap, cliquetPer
fs.Sum()));
}
```

CMS digitals strip IScript

Monday, May 15, 2017
8:19 AM

Description :
At each observation, a CMS coupon is paid if the equity underlying is deemed to meet the payment condition - typically if it closes above a coupon payment barrier.

```
/// <summary>
/// CMS digits on an equity basket
/// It pays a strip of coupon. At each observation, a CMS coupon is
paid if the equity underlying
/// is deemed to meet the payment condition: typically if it closes
above a coupon payment barrier.
/// Coupon(t) = $$ \left( CMS(t) + X \right)
\mathbf{1}_{Basket(t) > Barrier}   $$
/// </summary>
// Spread over CMS
double CmsSpread("0.0", "Product", "Cms spread");
// Coupon barrier
double BarrierCoupon("0.80", "Product", "Coupon barrier");
// Coupon spread
double SpreadCoupon("0.03", "Product", "Coupon spread");
// Coupon calendar
Calendar CouponCalendar("Coupon calendar");
// Type of cms payment to be made : in arrears or in advance
Chooser CmsChooser("In advance;In arrears", "Product", "Cms
payment");
DiscountCurve CurveCMS("Active", "CMS", "CMS Rate Curve");
string CMSMaturity("10Y", "CMS", "Maturity");

/// Payoff of a CMS digit strip
Evaluate(IVectorCoupon aCoupon)
{
    // Depending on whether we're pricing in arrears or in advance,
set the cms date differently
    FixingDate cmsDate = strikeDate;

    // Loop through the calendar to compute digits
    foreach (FixingDate date in CouponCalendar)
    {
        // Pay the cms observed today if in arrears
        if(CmsChooser.Value == "In arrears")
        {
            cmsDate = date;
        }

        // perf Equity
        double perf =
basket.Performance(strikeDate, date).Average();
        // Conditional Coupon
        double indic
= IndicatriceUp(perf, BarrierCoupon, SpreadCoupon);
        aCoupon[date] = (cms[cmsDate] + CmsSpread) * indic;

        // Update the cms date to be the previous observation date
```

```
if in advance
        if(CmsChooser.Value == "In advance")
        {
            cmsDate = date;
        }
    }
}
ObservableVector cms;
InitializeObservable(IObservableFactory aMarket)
{
    cms = CreateCMS(aMarket, CMSMaturity, CurveCMS);
}
```

CUI Basket IScript

Monday, May 15, 2017
8:20 AM

Description :
Call up-and-in on the basket performance ; european or american barrier. Smoothing performed as if the bank was long the product.

```
/// <summary>
/// Call Up and In on the basket ; american or european barrier.
Smoothing by spread bending ; we're long the product.
/// </summary>
// Level for the Up and In barrier
double BarrierUI("1.3", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("American;European", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule CUICalendar;
// Call UI on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the CUI
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, CUICalendar).AverageSpatial(basket.W
eights);

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, CUICalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceUp(basketVector - bentSpread, BarrierUI, bentSpread).B
estOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);

    // CUI on the basket at maturity
    aCoupon[maturityDate] +=
indicator * Max(basketPerf - strike, 0.0);
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
```

```
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        CUICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        CUICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(CUICalendar.Count, Max(0, BendingLength));
}
```

CUO Basket IScript

Monday, May 15, 2017
8:20 AM

Description :
Call up-and-out on the basket performance ; european or american barrier. Smoothing performed as if the bank was short the product.

```
/// <summary>
/// Call Up and Out on the basket ; american or european barrier.
Smoothing by spread bending, we're short the product.
/// </summary>
// Level for the Up and Out barrier
double BarrierUO("1.3", "Product", "UO barrier");
// Rebate
double Rebate("0.1", "Product", "Rebate");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("American;European", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule CUOCalendar;
// Call UO on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the CUO
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, CUOCalendar).AverageSpatial(basket.W
eights);

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, CUOCalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceUp(basketVector - bentSpread, BarrierUO, bentSpread).B
estOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);

    // CUO with rebate on the basket at maturity
    aCoupon[maturityDate] += (1 - indicator) * Max(basketPerf - str
ike, 0.0) + indicator * Rebate;
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
```

```
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        CUOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        CUOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(CUOCalendar.Count, Max(0, BendingLength));
}
```

CUO Basket on Individual Stock IScript

Monday, May 15, 2017
8:20 AM

Description :
Call up-and-out on the basket performance ; european or american barrier. Smoothing performed as if the bank was long the product.

```
/// The level for the barriers up & down
double BarrierUp("1.20", "Product", "Barrier UpOut");
/// The barrier spread
double Spread("0.03", "Product", "Barrier spread");
int NbDays("100", "Product", "NbDays");
double X("0.0", "Product", "X");
/// the observation period
IPricingSchedule ObservationCalendar;
/// Initialize the product
/// We directly add the daily calendar from strike date to maturity
date
Initialize()
{
    // Daily discretization
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}

/// Put WorstOf DI
Evaluate(IVectorCoupon aCoupon)
{
    // indicate if we touched the barrier or not (0 = yes, 1 = no,
between = perhaps !)
    SpaceVector Indicatrice = new SpaceVector(basket.Count, 0.0);
    // on se ballade dans le calendrier global mais sans le lookback
    foreach(FixingDate date in ObservationCalendar)
    {
        // Basket valorisation :  WO at this date
        SpaceVector Perf = basket.Performance(strikeDate, date);

        double temporalSpread = 0.00001;
        double lDeltaT = ObservationCalendar.End - date;
        if (lDeltaT < NbDays)
            temporalSpread += (Spread - 0.00001) * (NbDays - lDeltaT)
/ NbDays;
        // the digital DI
        SpaceVector indicUp
= IndicatriceUp(Perf, BarrierUp + temporalSpread, temporalSpread);

        Indicatrice = Max(Indicatrice, indicUp);
        if (date == ObservationCalendar.End)
        {
            SpaceVector lCoupon
= (Perf - 1.0) + Indicatrice  * (X -  (Perf - 1.0));
            // Coupon
            aCoupon[date] += Max(0.0, lCoupon.Average());
```

```
            }
        }
    }
```

Everest IScript

Monday, May 15, 2017
8:20 AM

Description :
At maturity the option pays the sum of a fixed coupon and the geared performance of the worst performing underlying. Each coupon is floored at zero

```
/// <summary>
///  Everest :
///  At maturity the option pays the sum of a fixed coupon and the
geared
///  performance of the worst performing underlying. Each coupon is
globally floored.
///  Payoff = $$ \sum_{i\in Obs}(FixedCoupon\ +\ Gearing\ \times\
WorstOf(i)\ -\ 100%,\  Floor)$$
/// </summary>
// Gearing
double Gearing("0.25", "Product", "Gearing WO");
// Fixed Coupon
double FixedCoupon("0.05", "Product", "Fixed Coupon");
// Coupon floor
double CouponFloor("0.0", "Product", "Coupon Floor");
// Coupon calendar
Calendar CouponCalendar("", "Product", "Coupon Calendar");
/// The payoff of an everest
Evaluate(IVectorCoupon aCoupon)
{
    // Loop through the calendar to calculate coupons
    foreach(FixingDate date in CouponCalendar)
    {
        // Retrieve the worst performance in the basket
        double wo =
basket.Performance(strikeDate, date).WorstOf() - strike;

        // Coupon is calculated as a fixed part plus the geared
performance of the wo, floored and paid
        aCoupon[date] = Max(CouponFloor, FixedCoupon + Gearing * wo
);
    }
}
```

PDI Basket IScript

Monday, May 15, 2017
8:20 AM

Description :
Put down-and-in on the basket performance ; european or american barrier.

```
/// <summary>
/// Put Down and In on the basket ; american or european
barrier. Smoothing by spread bending.
/// </summary>
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Put DI on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the PDI
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(baske
t.Weights);

    // Create the bent spread which will be used for computing
the indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count
);

    // Indicates whether we touched the barrier or not (0 = no,
1 = yes, between = a bit)
    double indicator
= IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weig
hts);

    // PDI on the basket at maturity
    aCoupon[maturityDate] +=
indicator * Max(strike - basketPerf, 0.0);
}
// Initialize the product : we directly generate the calendar
from strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity
only if european
```

```
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, stri
keDate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, stri
keDate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength
= Min(PDICalendar.Count, Max(0, BendingLength));
}
```

PDO Basket IScript

Monday, May 15, 2017
8:21 AM

Description :
Put down-and-out on the basket performance ; european or american barrier. Smoothing performed as if the bank was short the product.

```
/// <summary>
/// Put Down and Out on the basket ; american or european barrier.
Smoothing by spread bending, we're short the product.
/// </summary>
// Level for the Up and Out barrier
double BarrierDO("0.7", "Product", "UO barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("American;European", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDOCalendar;
// Put DO on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the PDO
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDOCalendar).AverageSpatial(basket.W
eights);

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDOCalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceUp(basketVector, BarrierDO, bentSpread).WorstOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);

    // PDO on the basket at maturity
    aCoupon[maturityDate] +=
indicator * Max(strike - basketPerf, 0.0);
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
```

```
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(PDOCalendar.Count, Max(0, BendingLength));
}
```

Phoenix, KG IScript

Monday, May 15, 2017
8:21 AM

Description :
Phoenix, capital guaranteed

```
/// <summary>
/// Phoenix on the basket, capital guaranteed.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Product", "Coupon");
// Level for the coupon barrier
double CouponBarrier("0.7", "Product", "Coupon barrier");
// Level for the autocall
double AutocallBarrier("1.0", "Product", "Autocall barrier");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");


/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
Evaluate(IVectorCoupon aCoupon)
{
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).Average(basket.Weights);

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
= IndicatriceUp(basketPerf, CouponBarrier, Max(0.01, Coupon / 6));
        aCoupon[date] += indicCoupon * Coupon;

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier,  Max(0.01, swap[date] / 6
));
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier)
        {
            break;
        }
    }
}
```

Super asian IScript

Monday, May 15, 2017
8:21 AM

Description :
At each observation date, compute the basket value. If it is a new absolute maximum/minimum, then it contributes towards the final payoff for the payoff. The average of these performances is taken and the payout is floored / capped at zero.

```
/// <summary>
/// Super Asian
/// At each observation date, the basket value is calculated.
/// If the basket value is a new absolute maximum (minimum for the
put) then it contributes towards the final payoff for the call.
/// The average of these performances is taken and the payout is
floored (capped for the put) at zero.
/// </summary>
// Gearing
double Gearing("1.0", "Product", "Gearing");
// Asian Calendar
Calendar AsianCalendar("");
// Choose between call and put
Chooser PayoffType("Call;Put", "Product", "PayoffType");
// Super asian call payoff
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize a null time vector
       TimeVector perfAsian = new TimeVector();

    // Loop through the asian calendar
    foreach (FixingDate date in AsianCalendar)
    {
        // Compute the current performance
        double perf =
basket.Performance(strikeDate, date).Average(basket.Weights) - stri
ke;

        // Use the current basket performance if it's a new maximum
(minimum for the put)
        if((PayoffType.Value
== "Call" && perf > Max(0, perfAsian.BestOf())) ||
          (PayoffType.Value
== "Put" && perf < Min(0, perfAsian.WorstOf())))
        {
            perfAsian = perfAsian.Append(perf);
        }
    }

    // Pay the call (or the put) on the super asian vector
    double superAsianPerf = perfAsian.Average() * (PayoffType.Value
== "Call" ? 1 : -1);
    aCoupon[maturityDate] += Gearing * Max(superAsianPerf, 0);
}
```

Sweet Reverse IScript

Monday, May 15, 2017
8:21 AM

Description :
Coupon - Put down-and-in on the basket performance ; european or american barrier.

```
/// <summary>
/// Coupon - Put Down and In on the basket ; american or european
barrier. Smoothing by spread bending.
/// </summary>
// Coupon paid at maturity
double Coupon("0.1", "Product", "Coupon");
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Coupon calendar
Calendar CouponCalendar("");
// Coupon - Put DI on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Pay the coupon at each coupon calendar date
    foreach(FixingDate date in CouponCalendar)
    {
        aCoupon[date] += Coupon;
    }

    // Retrieve the basket performance at each date in the PDI
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.W
eights);

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);

    // PDI on the basket at maturity
```

```
    aCoupon[maturityDate] -=
indicator * Max(strike - basketPerf, 0.0);
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Switchable, PDE IScript

Monday, May 15, 2017
8:22 AM

Description :
Pays a call at maturity ; switchability feature for the issuer to convert the product into a plain bond paying yearly coupons.

```
/// <summary>
/// Switchable : pays a call at maturity ; switchability feature
for the issuer to convert the product into a plain bond paying
yearly coupons
/// Coded in EDP
/// </summary>
// Coupon
double Coupon("0.1", "Product", "Coupon");
// Calendar used for coupon payment and switchability
Calendar CouponCalendar("", "Product", "VariableName");
Chooser SwitchType("Callable;Puttable", "Product", "Switch type");
EvaluatePDE()
{
    // Initialize the running coupons
    Observable runningCoupons = product * 0.0;

    // Fix to the calendar count the initial number of coupons to
be paid
    double nbCoupons = CouponCalendar.Count;

    // Loop backward on all dates
    foreach(FixingDate date in FixingCalendar.Backward)
    {
        // Rollback all observables
        product.Rollback(date);
        runningCoupons.Rollback(date);

        // Retrieve the underlying performance
        Observable perf =
basket.Performance(basket__underlying[0], strikeDate, date);

        // Pay the call at maturity
        if (date == FixingCalendar.End)
        {
            product = Max(perf - strike, 0.0);
        }

        // For each date in the coupon calendar except the
maturity, decide to exercise the switch
        if (date.In(CouponCalendar))
        {
            if (date != maturityDate)
            {
                // Issuer callable
                if (SwitchType.Value == "Callable")
                {
```

```
                    product
= Min(product, runningCoupons + nbCoupons * Coupon);
                }
                // Client callable
                else if (SwitchType.Value == "Puttable")
                {
                    product
= Max(product, runningCoupons + nbCoupons * Coupon);
                }
            }

            // Decrement the number of coupons
            nbCoupons--;

             // Increment the running coupon object
            runningCoupons += Coupon;
        }
    }

    // Return the product slice
    return product;
}
```

Voltarget IScript

Monday, May 15, 2017
8:22 AM

```
/// <summary>
/// Generic volatility cap product script
/// Overlays a volatility cap mechanism, which enables to manipulate
the volcap strategy performance directly like other payoffs
/// </summary>
// Volatility target
double VolTarget("0.1","Product","Vol Target");
// Payoff floor
double GlobalFloor("0.0","Product","Global Floor");
// Amount of synthetic dividends
double SyntheticDividends("0.0","Product","Synthetic Divs");
// Amount of fees rebated by the fund managers
double FeesRebate("0.0","Product","Rebate Fees");
// Select if we'll use a non risky pocket or no
Chooser LiborPocket("Add;None", "Volcap", "Libor Pocket");
// Volatility computation horizon #1
int VolHorizon1("20","Volcap","VolHorizon1");
// First volatility computation horizon #2
int VolHorizon2("60","Volcap","VolHorizon2");
// Risky asset maximum allocation
double RiskyAllocationMin("0.0","Volcap","RiskyAllocMin");
// Risky asset minimum allocation
double RiskyAllocationMax("1.0","Volcap","RiskyAllocMax");
// Frequency at which rebalancing on the risky asset will be done
//Chooser RebalancingFrequency("Daily;Weekly;Monthly", "Volcap",
"Rebalancing Frequency");
// TFactor used in the volatility computation formula
int TFactor("254","Volcap","Tfactor");
// Threshold above which will we'll reallocate the risky asset
double ReallocThreshold("0.0","Volcap","ReallocThreshold");
// Starting allocation in the risky asset, used while there isn't
enough history to compute volatilities
double StartingAllocation("1.0","Volcap","StartingAlloc");
// Calendar used as a container for the strategy observation dates
Calendar ObservationCalendar("",  "ObservationCalendar", "ObservationC
alendar");
/// Generic script for volcap type products
Evaluate(IVectorCoupon aCoupon)
{
    // Compute and retrieve as a TimeVector the volcap strategy on a
subcalendar
    TimeVector observedPerfs
= RetrievePerfsOnCalendar(VolCapStrategyComputation(), ObservationCale
ndar);

    // Pay the call on the maximum performance reached by the volcap
strategy on a LockInCalendar date
    aCoupon[maturityDate] += Max(GlobalFloor, observedPerfs.Average()
- strike);
}
// Derivated volcap index
double[] VolCapStrategyComputation()
{
```

```
    // Prior computations to create the volcap strategy
    TimeVector dailyPerfs =
basket.PerformanceCliqueted(FixingCalendar).AverageSpatial(basket.Weig
hts);
    double[] realizedVols = HistoricalVolatilityEstimator(dailyPerfs);
    double[] allocationWeights
= AllocationWeightComputation(realizedVols);

    // TimeVector spaceholder to store volcap data
    double[] volcappedPerfs = new double[FixingCalendar.Count];
    volcappedPerfs[0] = 1.0;
    FixingDate oldDate = strikeDate;

    // Compute the volcap
    for(int i = 1; i < FixingCalendar.Count; i++)
    {
        FixingDate date = FixingCalendar[i];
        // Compute the dt used for fees and the libor pocket
        double dt =
date.Fixing.Subtract(oldDate.Fixing).TotalDays / 365.0;
        // Update the strategy
        volcappedPerfs[i] =
volcappedPerfs[i - 1] * (1.0 + allocationWeights[i - 1] * (dailyPerfs[
i - 1] - 1.0 - FeesRebate * dt) +
                            liborFactor * (1.0 - allocationWeights[i -
 1]) * libors[date] * dt - SyntheticDividends * dt);
        oldDate = date;
    }

    return volcappedPerfs;
}
// Risky asset allocation computation
double[] AllocationWeightComputation(double[] dailyVols)
{
    double[] allocationWeights = new double[dailyVols.Length];
    // No vol for the first date => use the starting allocation
    allocationWeights[0] = StartingAllocation;
    for(int i = 0; i < allocationWeights.Length-1; i++)
    {
        // If vol is infinitely negative (= still computing vols, not
enough data), use the default starting vol
        if(double.IsNegativeInfinity(dailyVols[i]))
        {
            allocationWeights[i+1] = StartingAllocation;
        }
        else
        {
            // Otherwise use the computed allocation
            double theoreticalAlloc
= Max(RiskyAllocationMin, Min(RiskyAllocationMax, VolTarget / dailyVol
s[i]));
            allocationWeights[i+
1] = Math.Abs(theoreticalAlloc - allocationWeights[i]) > ReallocThresh
old ?
                theoreticalAlloc : allocationWeights[i];
        }
    }
```

```
    return allocationWeights;
}
// Historical volatility computation
double[] HistoricalVolatilityEstimator(TimeVector dailyPerfs)
{
    // First compute log^2 daily perfs
    double[] squareLogPerfs = new double[dailyPerfs.Count];
    for(int i = 0; i < squareLogPerfs.Length; i++)
    {
        double logPerfs = Math.Log(dailyPerfs[i]);
        squareLogPerfs[i] = logPerfs * logPerfs;
    }

    // Then init computed volatilities using the performance
vector ...
    double[] volatilities = new double[dailyPerfs.Count];
    // ... initialize ...
    double weightHorizon1 = 1.0 / VolHorizon1;
    double weightHorizon2 = 1.0 / VolHorizon2;
    double sumLogsHorizon1 = 0;
    double sumLogsHorizon2 = 0;
    // ... and here we go !
    for(int i = 0; i < squareLogPerfs.Length; i++)
    {
        double maxDailyVol = double.NegativeInfinity;
        sumLogsHorizon1 += squareLogPerfs[i];
        sumLogsHorizon2 += squareLogPerfs[i];
        if(i >= VolHorizon1 - 1)
        {
            maxDailyVol
= Max(maxDailyVol, Math.Sqrt(sumLogsHorizon1 * weightHorizon1));
            sumLogsHorizon1 -= squareLogPerfs[i - VolHorizon1 + 1];
        }
        if(i >= VolHorizon2 - 1)
        {
            maxDailyVol
= Max(maxDailyVol, Math.Sqrt(sumLogsHorizon2 * weightHorizon2));
            sumLogsHorizon2 -= squareLogPerfs[i - VolHorizon2 + 1];
        }
        volatilities[i] = maxDailyVol * sqrtFactor;
    }

    // Return the computed volatility vector
    return volatilities;
}
// Helper function to retrieve a subset of the dailyPerfs vector given
a specific calendar
TimeVector RetrievePerfsOnCalendar(double[] dailyPerfs, Calendar calen
dar)
{
    // Create a dummy placeholder timevector
    TimeVector subcalendarPerfs =
basket.Performance(strikeDate, calendar).AverageSpatial();

    // Override the perfs using the correct volcap perf levels
    double[] volcappedData = new double[calendar.Count];
    for(int i = 0; i < calendar.Count; i++)
```

```
    {
        volcappedData[i] = dailyPerfs[calendar[i].Index];
    }

    // Set correct values and return the vector
    subcalendarPerfs.SetValues(volcappedData);
    return subcalendarPerfs;
}
/// <summary>
/// Initialize functions
/// </summary>

// Square root of the number of days used to compute the volatility
double sqrtFactor;
// Factor used to compute the libor contribution to the strategy
double liborFactor;
// Daily observation calendar
IPricingSchedule DailyCalendar;
// Rebalancing calendar, frequency chosen by the user
//IPricingSchedule RebalancingCalendar;
// Vectorial holder for Libor observations
ObservableVector libors;
DiscountCurve CurveLibor("Active", "Libor", "Libor Rate Curve");
string LiborMaturity("3M", "Libor", "Maturity");
// Initialize the product : we directly generate the daily calendar
and the rebalancing calendar from strike date to maturity date
Initialize()
{
    // Generation of the daily calendar
    DailyCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    // Generation of the rebalancing calendar
    //string rebalFreq = RebalancingFrequency.Value == "Daily" ?
"1d" : RebalancingFrequency.Value == "Weekly" ? "1w" : "1m";
    //RebalancingCalendar =
CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate,
maturityDate, rebalFreq);

    // Square root computation
    sqrtFactor = Math.Sqrt(TFactor);

    // Compute the libor factor
    liborFactor = LiborPocket.Value == "Add" ? 1 : 0;
}
InitializeObservable(IObservableFactory aMarket)
{
    libors = CreateLibors(aMarket, LiborMaturity, CurveLibor);
}
```

Altiplano IScript

Monday, May 15, 2017
8:22 AM

Description :
The option pays a strip of coupons, conditional to no worst(i) underlying having touched a given barrier on an observation date prior or equal to the current coupon date and ulterior to the previous one.

```
/// <summary>
/// Altiplano, bermudean observations
/// The option pays a strip of coupons, conditional to worst(i)
underlying not having touched a given barrier
/// on an observation date prior or equal to the current coupon
date and ulterior to the previous one
/// </summary>
// Coupon barrier
double Barrier("0.7", "Product", "Barrier");
// Spread for each digit
double Spread("0.03", "Product", "Spread");
// Calendar on which coupons are paid
Calendar CouponCalendar("", "Product", "CouponCalendar");
// Calendar on which barrier KI is monitored
Calendar ObservationCalendar("", "Product", "ObservationCalendar");
/// Pay a strip of coupons, input as the basket weights
Evaluate(IVectorCoupon aCoupon)
{
    // Store the first previous date as the strike date
    FixingDate oldDate = strikeDate;

    foreach (FixingDate date in CouponCalendar)
    {
        double indic = double.MaxValue;
        // Retrieve the worst performance for any underlying on the
observation dates between the two coupons
        foreach(FixingDate insideDate in ObservationCalendar.Sub(ol
dDate, date))
        {
            SpaceVector perf =
basket.Performance(strikeDate, insideDate);
            perf = perf.SortDescending();
            // Use the indicator averaged on the weights to compute
and pay the coupons
            double indicCoupons
= IndicatriceUp(perf, Barrier, Spread).Average(basket.Weights);
            // keep the information
            indic = Min(indic, indicCoupons);
        }
        // the coupon for the coupon date
        aCoupon[date] += indic;

        // Update the previous date to be the current one for the
next worst computation
        oldDate = date;
    }
}
```

Autocall Incremental Basket, short PDI IScript

Monday, May 15, 2017
8:22 AM

Description :
Autocall incremental on basket short a Down-and-In Put at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", " Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI Zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI Zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI Zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
}
/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
```

```
Evaluate(IVectorCoupon aCoupon)
{
        // Initialize the incremental coupon and the survival
indicator
    double incrementalCoupon = Coupon;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).Average(basket.Weights );

        // Compute the coupon indicator
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[date
]);
        // Pay the coupon
        aCoupon[date] +=
indicRecall * (incrementalCoupon + swap[date]);

        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier[date])
        {
            break;
        }

        // Update the incremental coupon
        incrementalCoupon += Coupon;

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst basket performance
to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weig
hts).WorstOf();
            double indicKI
= IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, basketPerf - strike);
        }
    }
}
```

Autocall Incremental WO Demi Airbag short PDI IScript

Monday, May 15, 2017
8:23 AM

Description :
Autocall incremental on WO Semi Aribag Effect Short a Down-and-In Put at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
}
/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the incremental coupon and the survival indicator
    double incrementalCoupon = Coupon;
```

```
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[d
ate]);
        // Pay the coupon
        aCoupon[date] +=
indicRecall * (incrementalCoupon + swap[date]);

        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst basket
performance to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).MinSpatial().WorstOf();
            double indicKI
= IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += (1.0 - indicKI) * incrementalCoupon *
0.5;

            aCoupon[date] += indicKI * Min(0, basketPerf - strike);
        }

        // Update the incremental coupon
        incrementalCoupon += Coupon;
    }
}
```

Autocall Incremental WO short PDI IScript

Monday, May 15, 2017
8:23 AM

Description :
Autocall incremental on WO short a Down-and-In Put at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
}
/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
```

```
{
        // Initialize the incremental coupon and the survival
indicator
    double incrementalCoupon = Coupon;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[d
ate]);
        // Pay the coupon
        aCoupon[date] +=
indicRecall * (incrementalCoupon + swap[date]);

        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier[date])
        {
            break;
        }

        // Update the incremental coupon
        incrementalCoupon += Coupon;

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst basket
performance to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).MinSpatial().WorstOf();
            double indicKI
= IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, basketPerf - strike);
        }
    }
}
```

Autocall Incremental WO short PDI - Fees NAV IScript

Monday, May 15, 2017
8:23 AM

Description :
Autocall incremental on WO short a Down-and-In Put at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
/// Barrier spread
double Fees("0.03", " Product", "Fees");
double CC("0.005", " Product", "CC");
// Barrier observation calendar
IPricingSchedule PDICalendar;
Func<double, FuncData, double, double, double> funcFees;

/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }

    funcFees = (pv, funcData, fees, Swap) =>
    {
```

```
        return fees * (1 - Swap + pv + CC);
    };
}
/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
        // Initialize the incremental coupon and the survival
indicator
    double incrementalCoupon = Coupon;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[date
]);
        // Pay the coupon


        aCoupon[date] +=
productPV[date].Eval(funcFees, Fees, swap[date]);

        aCoupon[date] +=
indicRecall * (incrementalCoupon + swap[date]);


        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier[date])
        {
            break;
        }

        // Update the incremental coupon
        incrementalCoupon += Coupon;

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst basket performance
to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).MinSpatial().WorstOf();
            double indicKI
= IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, basketPerf - strike);
        }
    }
}
```

Call vs Call IScript

Monday, May 15, 2017
8:24 AM

Description :
Sum of calls minus Call of Basket

```
/// <summary>
/// Call basket minus the basket of calls
/// -------------------------------------
/// uses weihgted formula
/// </summary>

// the average of calls weight
double AverageCallsWeigth("1.0", "Product", "Average Weigth");
// the vanilla call weitgh
double CallWeigth("1.0", "Product", "Call Weigth");
/// Pay a given coupon if the basket performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // vectorial perf
    SpaceVector perfT = basket.Performance(strikeDate, maturityDate);
    // the call
    double call = Max(perfT.Average(basket.Weights) - strike, 0.0);
    // the basket of calls
    double averageCalls
= Max(perfT - strike, 0.0).Average(basket.Weights);
    // the coupons
    aCoupon[maturityDate] =
AverageCallsWeigth * averageCalls - CallWeigth * call;
}
```

Correlation swap IScript

Monday, May 15, 2017
8:24 AM

Description :
Returns the fair-value strike of the correlation swap

```
/// <summary>
///  Correlation swap
///  Returns the fair value strike for the correlation swap
/// </summary>
// Daily calendar used for correlation computing
IPricingSchedule ObsCalendar;
// Initialize the product : we directly generate the calendar from 
strike date to maturity date (daily)
Initialize()
{
    // Daily monitoring with final payment
    ObsCalendar 
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d", true);
}
/// Compute the fair-value strike for the correlation swap
Evaluate(IVectorCoupon aCoupon)
{
    double realizedCorrel = 0.0;

    // Compute the logvector of the mean values
    SpaceVector meansLog 
= Log(basket.Performance(strikeDate, maturityDate)) / ObsCalendar.C
ount;
    // Compute the day-to-day cliqueted performance for each 
underlying
    Matrix cliquetPerf = basket.PerformanceCliqueted(ObsCalendar);

    // Double loop for each pair in the basket
    for(int i = 0; i < basket.Count; i++)
    {
        for(int j = 0; j < i; j++)
        {
            // Retrieve the log-means
            double mean1 = meansLog[i];
            double mean2 = meansLog[j];
            // Compute the logvector of the cliqueted perf for each 
underlying
            TimeVector perfi 
= Log(cliquetPerf.GetTimeVector(i)) - mean1;
            TimeVector perfj 
= Log(cliquetPerf.GetTimeVector(j)) - mean2;
            double sigma1 = (perfi * perfi).Sum();
            double sigma2 = (perfj * perfj).Sum();
            double cov = (perfi * perfj).Sum();
            // Add to the realized correl storage variable
            realizedCorrel += 
```

```
cov /(Math.Sqrt(sigma1) * Math.Sqrt(sigma2));
        }
    }

    // Divide by n*(n-1) and return as of the strikeDate to bypass
discounting : we're looking for the strike and not the price
    realizedCorrel *= (2.0/(basket.Count * (basket.Count - 1)));

    // price version
    aCoupon[maturityDate] = realizedCorrel - this.strike;

       // strike version
    //aCoupon[strikeDate] = realizedCorrel;
}
```

Digital IScript

Monday, May 15, 2017
8:24 AM

Description :
At maturity, the option pays a coupon if the average basket performance at maturity is greater than a given level.

```
/// <summary>
/// Digital ; at maturity, the option pays a coupon if the average
basket performance at maturity is greater than a given level.
/// </summary>
// Coupon
double Coupon("0.05", "Product", "Coupon");
// Barrier
double Barrier("1.00", "Product", "Barrier");
// Barrier Spread
double Spread("0.03", "Product", "Barrier Spread");
// Barrier type
Chooser BarrierType("American;European", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule ObservationCalendar;
// Use this method to implement your pricing
Evaluate(IVectorCoupon aCoupon)
{
       // Retrieve the best basket performance during the
observation period
       double bestPerf =
basket.Performance(strikeDate, ObservationCalendar).AverageSpatial(
basket.Weights).BestOf();

    // Compute the KI indicator on this performance
    double indicCoupon = IndicatriceUp(bestPerf, Barrier, Spread);

    // Coupon at maturity
    aCoupon[maturityDate] = Coupon * indicCoupon;
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
```

```
ate, maturityDate, "1d");
    }
}
```

Digitals strip IScript

Monday, May 15, 2017
8:24 AM

Description :
The option pays a strip of coupons depending on the average basket performance at each coupon payment date.

```
/// <summary>
/// Digital strip ; each calendar date, the option pays a coupon if
the average basket performance is greater than a certain level
given in the date.Cap.
/// </summary>
// Coupon
CalendarDecorator Coupon("0.05", "Product", "Coupon");
CalendarDecorator Barrier("0.7", "Product", "Column Name");
// Barrier Spread
CalendarDecorator Spread("0.03", "Product", "Barrier Spread");
// Coupon calendar
Calendar CouponCalendar("");
// Use this method to implement your pricing
Evaluate(IVectorCoupon aCoupon)
{
    // For each coupon payment date
    foreach(FixingDate date in CouponCalendar)
    {
           // Retrieve the basket performance
           double basketPerf =
basket.Performance(strikeDate, date).Average(basket.Weights);

        // Compute the KI indicator on this performance
        double indicCoupon
= IndicatriceUp(basketPerf, Barrier[date], Spread[date]);

        // Pay the given coupon
        aCoupon[date] += Coupon[date] * indicCoupon;
    }
}
```

DRA autocall, short PDI IScript

Monday, May 15, 2017
8:25 AM

Description :
Autocallable with an DRA coupon, short a Down-and-In Put at maturity

```
/// <summary>
/// Autocall DRA on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Product", "Coupon");
// Level for the coupon barrier
double CouponBarrier("0.7", "Product", "Coupon barrier");
// Level for the autocall
double AutocallBarrier("1.0", "Product", "Autocall barrier");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Accrual observation calendar
IPricingSchedule ObservationCalendar;


/// Pay a DRA coupon and recall if the basket performance is above a
given level
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the previous date to be used when determining the
DRA observation period
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance for any date in the current
accrual period
        TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, date))
.AverageSpatial(basket.Weights);

        // Compute the DRA indicator and pay the accrual coupon
        double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier, Max(0.01, Coupon / 6)).Avera
ge();
        aCoupon[date] += indicDRA * Coupon;

        // Retrieve the basket performance
        double basketPerf =
```

```
basket.Performance(strikeDate, date).Average(basket.Weights);

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier,  Max(0.01, swap[date] / 6
));
        aCoupon[date] += indicRecall * swap[date];

        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier)
        {
            break;
        }

        // Update the previous date for the next computation
        oldDate = date;

         // Client is short a PDI at maturity
         if (date == AutoCallCalendar.End)
         {
            // Compute the indicator from the worst basket performance
to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weig
hts).WorstOf();
            double indicKI
= IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, basketPerf - strike);
         }
    }
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }

    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
```

```
, maturityDate, "1d");
}
```

DRA issuer call short PDI IScript

Monday, May 15, 2017
8:25 AM

Description :
callable with an DRA coupon, short a Down-and-In Put at maturity

```
/// <summary>
/// Autocall DRA on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
CalendarDecorator Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// Level for the coupon spread
CalendarDecorator CouponSpread("0.03", "Coupon", "Coupon spread");
// Calendar for autocall and coupons dates
Calendar CouponCalendar("", "Product", "Coupon Calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Accrual observation calendar
IPricingSchedule ObservationCalendar;
Calendar CallableCalendar("");
// LSM section
// First declare the vector used to store conditional expectancy
observables ...
ObservableConditionalExpectancyVector condExp;
// ... which is then initialized here
InitializeObservable(IObservableFactory aMarket)
{
      // We create observables at each date in CallableCalendar
      // The product is issuer callable ; change to
ExerciseType.ClientCallable else
      // Standard parameters : regression on the basket, monomes,
degree 3
      condExp
= CreateConditionalExpectancies(aMarket, CallableCalendar, PricingBase
.ConditionalExpectancy.ExerciseType.IssuerCallable, RegressionFactorWo
rstOf, BasisType.Monomes, 3, 2, false);
}
/// Pay a DRA coupon and recall if the basket performance is above a
given level
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
      // Initialize the previous date to be used when determining the
DRA observation period
      FixingDate oldDate = strikeDate;
```

```
      // For each date in the callable calendar
    foreach (FixingDate date in CouponCalendar)
    {
      // Retrieve the basket performance for any date in the current
accrual period
      TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, date))
.MinSpatial();

      // Compute the DRA indicator and pay the accrual coupon
      double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier[date], 0.005).Average();
      double currentCoupon = indicDRA * Coupon[date];
      oldDate = date;

      // Retrieve the basket performance
      double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

      // Client is short a PDI at maturity
        if (date == CouponCalendar.End)
        {
            // Compute the indicator from the worst basket performance
to determine whether or not KI occurred
            double indicKI
= IndicatriceDown(basketPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] +=
indicKI * Min(0, basketPerf - strike) + currentCoupon;
        }
        else
        {
            if (date.In(CallableCalendar))
            {
                  aCoupon[date] +=
condExp[date].Exercise(currentCoupon, swap[date]);
            }
            else
            {
                  aCoupon[date] += currentCoupon;
            }
        }
      // Update the previous date for the next computation
      oldDate = date;
    }
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
      // Monitoring at maturity
      PDICalendar
```

```
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
      // Daily monitoring
      PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }

    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}
```

DRA WO autocall, short PDI IScript

Monday, May 15, 2017
8:25 AM

Description :
Autocallable with an DRA coupon, short a PDI

```
/// <summary>
/// Autocall DRA on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Product", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Product", "Coupon barrier");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Product", "Autocall
barrier");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

 // Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


// Accrual observation calendar
IPricingSchedule ObservationCalendar;


/// Pay a DRA coupon and recall if the basket performance is above a
given level
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the previous date to be used when determining the
DRA observation period
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance for any date in the current
accrual period
        TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, date))
.MinSpatial();

        // Compute the DRA indicator and pay the accrual coupon
        double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier[date], 0.005).Average();
        aCoupon[date] += indicDRA * Coupon;
```

```
        // Retrieve the basket performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], 0.015);
        aCoupon[date] += indicRecall * swap[date];

        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Update the previous date for the next computation
        oldDate = date;

         // Client is short a PDI at maturity
         if (date == AutoCallCalendar.End)
         {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
         }
    }
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
     // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
```

```
}
```

DRA WO autocall, short Put IScript

Monday, May 15, 2017
8:26 AM

```
/// <summary>
/// Autocall DRA on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Product", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Product", "Coupon barrier");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Product", "Autocall
barrier");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");
// Level for the Down and In barrier
double PutStrike("0.7", "Product", "Put Strike");

// Accrual observation calendar
IPricingSchedule ObservationCalendar;


/// Pay a DRA coupon and recall if the basket performance is above a
given level
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the previous date to be used when determining the
DRA observation period
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance for any date in the current
accrual period
        TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, date))
.MinSpatial();

        // Compute the DRA indicator and pay the accrual coupon
        double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier[date], 0.005).Average();
        aCoupon[date] += indicDRA * Coupon;

        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(basketPerf, AutocallBarrier[date], 0.015);
        aCoupon[date] += indicRecall * swap[date];

        // Recall the product if we're above the barrier
        if(basketPerf > AutocallBarrier[date])
```

```
        {
            break;
        }

        // Update the previous date for the next computation
        oldDate = date;

         // Client is short a PDI at maturity
         if (date == AutoCallCalendar.End)
         {
            // Pay the PDI
            aCoupon[date] += Min(0, basketPerf - PutStrike) / PutStrik
e;
         }
    }
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}
```

Mediolanum IScript

Monday, May 15, 2017
8:26 AM

Description :
At each observation date, a digital option on the worst performing underlying is evaluated and paid. At maturity, the structure pays the excess of the asian basket performance over the sum of the digitals.

```
/// <summary>
/// Mediolanum
/// At each observation date, a digital option on the worst performing
underlying
/// is evaluated and paid. At maturity, the structure pays the excess
of the final basket performance
/// over the sum of the digitals. The payout is floored at zero.
/// </summary>
// Coupon stored if WO is above the barrier
double Coupon("0.05", "Product", "Coupon");
// Coupon barrier
double CouponBarrier("1.0", "Product", "CouponBarrier");
// Spread used for the coupon
double CouponSpread("0.03", "Product", "CouponSpread");
// Gearing of the final performance
double Gearing("1.0", "Product", "Gearing");
// Coupon calendar
Calendar CouponCalendar("");
// Asian calendar for the call
Calendar AsianCalendar("");
/// The payoff of a Mediolanum
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the sum of coupons to be used at maturity
    double sumCoupons = 0;

    // Digit coupons on the WO
    foreach (FixingDate date in CouponCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // Compute the associated coupon
        double paidCoupon
= IndicatriceUp(wo, CouponBarrier, CouponSpread) * Coupon;

        // Pay and add to the sum of coupons
        aCoupon[date] += paidCoupon;
        sumCoupons += paidCoupon;
       }

    // Compute the asian perf on the Basket
    double asianPerf =
basket.Performance(strikeDate, AsianCalendar).AverageTemporal().Averag
e(basket.Weights);

    // Pay the outperf of the asian perf over the coupon sum
    aCoupon[maturityDate] +=
```

```
Gearing * Max(asianPerf - strike - sumCoupons, 0.0);
}
```

Melting Everest IScript

Monday, May 15, 2017
8:26 AM

Description :
At maturity the option pays the sum of a fixed coupon and the geared performance of the worst performing underlying. The worst performing underlying at each observation date is removed from the basket, and the structure continues.

```
/// <summary>
///  Melting Everest:
///  At maturity the option pays the sum of a fixed coupon and the
geared
///  performance of the worst performing underlying. The worst
performing
///  underlying at each observation date is removed from the basket,
and
///  the structure continues. Each coupon is floored at zero.
///
///  Payoff = $$ \sum_{i\in Obs}(FixedCoupon\ +\ Gearing\ \times\
WorstOf(i)\ -\ 100%,\  Floor)$$
///  $$WorstOf(i)$$ : the worst performance on the basket composed by
underlyings which are stil active at the date i
/// </summary>
// Gearing
double Gearing("0.25", "Product", "Gearing");
// Fixed Coupon
double FixedCoupon("0.05", "Product", "Fixed Coupon");
// Floor
double Floor("0.0", "Product", "Floor");
// Coupon calendar
Calendar CouponCalendar("", "Product", "Coupon Calendar");
/// Payoff of the melting Everest
Evaluate(IVectorCoupon aCoupon)
{
    // Create the meltable basket
    DynamicBasket dynBasket = basket.CreateDynamicBasket();

    // Loop through the coupon calendar
    foreach(FixingDate date in CouponCalendar)
    {
        // Retrieve the worst perf in the remaining underlyings at
that date
        Observation worstObs =
dynBasket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon using the usual Everest formula
        double coupon = FixedCoupon + Gearing * (worstObs - strike);

        // Pay the floored coupon
        aCoupon[date] = Max(Floor, coupon);

        // Remove the worst performer of the dynamic basket
        dynBasket.Mask(worstObs);
    }
}
```

PDI WO IScript

Monday, May 15, 2017
8:26 AM

Description :
Put down-and-in on the worst performance in the basket ; european or american barrier.

```
/// <summary>
/// Put Down and In on the WO ; american or european barrier.
Smoothing by spread bending.
/// </summary>
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Put DI on the WO
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the worst performance of the basket at each
date in the PDI Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).MinSpatial();

    // Create the bent spread which will be used for computing
the indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Cou
nt);

    // Indicates whether we touched the barrier or not (0 =
no, 1 = yes, between = a bit)
    double indicator
= IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf(
);
    // Compute the worst performance of the basket at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).WorstOf();

    // PDI on the WO at maturity
    aCoupon[maturityDate] += -
indicator * Max(strike - basketPerf, 0.0);
}
// Initialize the product : we directly generate the calendar
from strike date to maturity date, depending on the chosen
type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity
only if european
```

```
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, st
rikeDate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, st
rikeDate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength
= Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Phoenix Basket, short PDI IScript

Monday, May 15, 2017
8:27 AM

Description :
Phoenix Basket short a Down-and-In Put on the basket at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Auto Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Pay a given coupon if the WO performance is above a given level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the basket performance
        double perfT = basket.Performance(strikeDate, date).Average(basket.Weights);

        // Compute the coupon indicator and pay the coupon
        double indicCoupon = IndicatriceUp(perfT, CouponBarrier[date], CouponSpread[date]);
        aCoupon[date] += indicCoupon * Coupon;

        // Compute the recall indicator and pay the swap
        double indicRecall = IndicatriceUp(perfT, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(perfT > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Compute the indicator from the basket to determine whether or not KI occurred
            double worstPerf =
basket.Performance(strikeDate, PDICalendar).AverageSpatial(basket.Weights).WorstOf();
            double indicKI = IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, perfT - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from strike date to maturity date, depending on
the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if european
```

```
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar = CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
    }
}
```

Phoenix Yeti WO star effect, short PDI IScript

Monday, May 15, 2017
8:27 AM

Description :
Phoenix WO with a yeti effect on the coupon, short a Down-and-In Put WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto
Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
double StarEffectBarrier("1.0", "Product", "StarEffectBarrier");


/// Pay a given coupon if the WO performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the yeti coupon
    double currentCoupon = 0;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Coupon incrementation
        currentCoupon += Coupon;

        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
```

```
= IndicatriceUp(wo, CouponBarrier[date], CouponSpread[date]);
        aCoupon[date] += indicCoupon * currentCoupon;

        // Decrement the coupon based on whether we paid it or not
        currentCoupon *= (1 - indicCoupon);

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            double bo =
basket.Performance(strikeDate, maturityDate).BestOf();
            double indicKO
= IndicatriceUp(bo, StarEffectBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] +=
indicKI * Min(0, wo - strike) * (1 - indicKO);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
```

```
}
```

Phoenix Yeti WO, short PDI IScript

Monday, May 15, 2017
8:27 AM

Description :
Phoenix WO with a yeti effect on the coupon, short a Down-and-In Put WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");
// Incremental spread
Chooser IncrementalSpread("No;Yes", "Coupon", "Incremental Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the yeti coupon
    double currentCoupon = 0;


    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Coupon incrementation
        currentCoupon += Coupon;

        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator and pay the coupon
        double incrFactor = IncrementalSpread.Value == "No" ? 1.0 :
```

```
currentCoupon / Coupon;
        double indicCoupon
= IndicatriceUp(wo, CouponBarrier[date], incrFactor * CouponSpread[dat
e]);
        aCoupon[date] += indicCoupon * currentCoupon;

        // Decrement the coupon based on whether we paid it or not
        currentCoupon *= (1 - indicCoupon);

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
}
```

Podium IScript

Monday, May 15, 2017
8:28 AM

Description :
Strip of coupons, decreased by a fixed amount each time a stock has finished below a barrier level and floored at 0.

```
/// <summary>
///  Podium :
///  Strip of coupons decreased by a fixed amount each time a stock
has finished below a barrier level.
///  Floored at 0.
///  Payoff = $$ \sum_{i\in Obs}(Max\ Coupon\ -\ n\ \times\ Share\
Loss)$$
///  $$n$$: number of stocks to have finished below a barrier level
at the observation $$i$$
/// </summary>
// Maximum Coupon
double MaxCoupon("0.30", "Product", "Max Coupon");
// Coupon loss per share below the barrier
double CouponLoss("0.03", "Product", "Coupon Loss");
// Barrier
double Barrier("1.0", "Product", "Barrier");
// Spread
double Spread("0.03", "Product", "Barrier Spread");
// Coupon calendar
Calendar CouponCalendar("");

/// The payoff of a podium
Evaluate(IVectorCoupon aCoupon)
{
    // Loop through the calendar to calculate coupons
    foreach (FixingDate date in CouponCalendar)
    {
        // Retrieve the basket performance
        SpaceVector basketPerf =
basket.Performance(strikeDate, date);

        // Count the number of stocks below the barrier
        double stocksBelowBarrier
= IndicatriceDown(basketPerf, Barrier, Spread).Sum();

        // Pay the maximum coupon decremented by the number of
stocks to perform below the barrier, floored at 0
        aCoupon[date] += Max(MaxCoupon - stocksBelowBarrier * Coupo
nLoss, 0);
    }
}
```

Step Up IScript

Monday, May 15, 2017
8:28 AM

Description :
Pays a yearly coupon if the basket is above a given level. Potential Yeti feature.

```
/// <summary>
/// Step Up : pays a yearly coupon if the basket is above a given
level.
/// Parameters : Cap = barrier, Closing = coupon, Floor = spread
/// Yeti effect possible.
/// </summary>
// Coupons Calendar
Calendar CouponCalendar("");
// Yeti feature
Chooser HasYeti("No;Yes", "Product", "Yeti feature");
/// Step Up
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the coupon sum
    double couponSum = 0;

    // Loop through the coupon calendar
    foreach (FixingDate date in CouponCalendar)
    {
        // Increase the sum of coupons to be paid by the coupon
this year
        couponSum += date.Closing;

        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).Average(basket.Weights);

        // Compute the coupon indicator
        double couponIndicator
= IndicatriceUp(basketPerf, date.Cap, Max(0.02, date.Floor));

        // Pay the eventual coupon
        aCoupon[date] += couponIndicator * couponSum;

        // Update the sum of coupons : set to 0 (if no yeti) or
decrease by the coupon paid this year (yeti)
        couponSum *= (HasYeti.Value
== "No" ? 0 : (1 - couponIndicator));
    }
}
```

Switchable LSM IScript

Monday, May 15, 2017
8:28 AM

Description :
Geared Call at maturity Every year the issuer can call the product at t * X%

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");

// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");
Evaluate(IVectorCoupon aCoupon)
{
    double incrementalCoupon = Coupon;

    foreach (FixingDate date in AutoCallCalendar)
    {
        double basketPerf =
basket.Performance(strikeDate, date).Average();

        // This coupon is located “below” the Autocall function. It
is therefore conditional of the early redemption event (if any) at
that date.
        if (date == AutoCallCalendar.End)
        {
            aCoupon[date] += 1.25 * Max(0, basketPerf - strike);
        }
        else
        {
              // Note: No “break” is needed here, the recall event
being handled by the function itself. (+ “symmetric” type
smoothing)
               aCoupon[date] +=
productPV[date].Callable(incrementalCoupon + swap[date]);
            incrementalCoupon += Coupon;
        }
    }
}
```

Callable product (LSM version) IScript

Monday, May 15, 2017
8:28 AM

Description :
Template for a callable product using LSM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of
the code to change if needed
/// </summary>
// Callable calendar
Calendar CallableCalendar("");
/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
    // Loop through the callable calendar
    foreach(FixingDate date in CallableCalendar)
    {
        // At each callability date, using the Exercise function,
        // Set the coupon received whether the product is called or
not, as well as the additional coupon on exercise
        // The LSM engine will then regress the desired state
variables (by default the basket) on them to determine the optimal
callability date
        double coupon = date.Closing;

        // Here, unconditional coupon is nought, and on exercise we
pay date.Closing + the remaining swap value
        aCoupon[date] +=
condExp[date].Exercise(0, coupon + swap[date]);
    }

    // At maturity, the client receives a final payoff (here, a
call) - provided the product hasn't been called before
    double perf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);
    aCoupon[maturityDate] += Max(0, perf - strike);
}
// LSM section
// First declare the vector used to store conditional expectancy
observables ...
ObservableConditionalExpectancyVector condExp;
// ... which is then initialized here
InitializeObservable(IObservableFactory aMarket)
{
    // We create observables at each date in CallableCalendar
    // The product is issuer callable ; change to
ExerciseType.ClientCallable else
    // Standard parameters : regression on the basket, monomes,
degree 3
    condExp
= CreateConditionalExpectancies(aMarket, CallableCalendar, PricingB
ase.ConditionalExpectancy.ExerciseType.IssuerCallable);
}
```

Coupon strip product IScript

Monday, May 15, 2017
8:28 AM

Description :
Template for a coupon paying product

```
/// <summary>
/// Template - coupon paying product
/// </summary>
// Coupon calendar
Calendar CouponCalendar("");
/// The payoff of a coupon paying product
Evaluate(IVectorCoupon aCoupon)
{
    // Loop through the coupon calendar
    foreach(FixingDate date in CouponCalendar)
    {
        // Retrieve the basket performance at the given date
        SpaceVector basketPerf =
basket.Performance(strikeDate, date) - strike;

        // Calculate the coupon and pay it at that date
        double coupon = 0;
        aCoupon[date] = coupon;
    }
}
```

Empty Index IScript

Monday, May 15, 2017
8:29 AM

Description :
Index base script

```
GetCalendar(DateTime startDate, DateTime endDate)
{   /// <summary>
    var cal = (PricingCalendar)GetCalendarByTicker("SX5E");
    return new PricingCalendar(cal.RecurrentBankHolidays, new List<
DateTime>(cal.BankHolidays).Union(new DateTime[]
{ new DateTime(2015, 4, 3) }).ToArray(), cal.WeekendDays);
}
Evaluate()
{
    double quote = 1.0;

    // date de la cotation
    DateTime today = ReferenceDate;
    DateTime lastDate = LastQuote.Date;
    return new IndexQuote(ReferenceDate, quote, new Dictionary<stri
ng, string>());
}
```

European payoff IScript

Monday, May 15, 2017
8:29 AM

Description :
Template for a european payoff

```
/// <summary>
/// Template - generic european payoff
/// </summary>
/// The payoff of a european payoff
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at maturity
    SpaceVector basketPerf =
basket.Performance(strikeDate, maturityDate) - strike;

    // Calculate the performance and pay it
    double perf = 0;
    aCoupon[maturityDate] = perf;
}
```

Synthetic Quanto IScript

Monday, May 15, 2017
8:29 AM

Description :
Compute Quanto*(Call - Put) - (Call - Put)

```
/// <summary>
/// Vanilla call or put on the basket
/// Payoff = $$ max(+/-1 * ( \frac{1}{n} \sum \frac{S_T}{S_0} -
100%), 0 )$$
/// </summary>
// Choose between call and put
Basket FXBasket(";;;;", "FXBasket");
/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{

    // Retrieve the performance of the weighted basket at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights
);

    // Pay a final coupon depending on the payoff type

    aCoupon[maturityDate] += (1/FXBasket.Performance(strikeDate,mat
urityDate).Average())*(Max(basketPerf - strike, 0) - Max(strike-
basketPerf,0));

    aCoupon[maturityDate] -= (Max(basketPerf - strike, 0) - Max(str
ike-basketPerf,0));

}
```

Asian Call Spread Altiplano IScript

Monday, May 15, 2017
8:30 AM

Description :
Asian Call Spread on the Altiplano

```
/// <summary>
/// Call spread or put spread on the basket
/// </summary>
Calendar CalendarAsia("");
// Cap of the payoff
double Cap("1.0", "Product", "Cap");

/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the performance of the weighted basket at maturity
    double basketPerf =
basket.Performance(strikeDate, CalendarAsia).AverageTemporal().SortAsc
ending().Average(basket.Weights);


    // Pay a final coupon depending on the payoff type
    aCoupon[maturityDate] = Min(Cap - strike, Max(basketPerf - strike,
 0));
}
```

Alizea IScript

Monday, May 15, 2017
8:30 AM

Description :
Pays a strik of coupon linked to the IRR with a lock-in mechanism

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
double Coupon("1.0", "Product", "Coupon");
double Cap("1.0", "Product", "Cap");

/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    double bestof = -1.0;
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();
        double dt
= (date.Fixing - strikeDate.Fixing).TotalDays / 365.25;
        // Compute the coupon indicator and pay the coupon
        double arr = (Math.Pow(wo, 1.0 / dt) - 1.0);

        bestof = date.Cap * Max(bestof, arr);
        double coupon =
date.Cap * Max(0.0, Min(Cap, bestof)) + (1.0 - date.Cap) * Coupon;
        aCoupon[date] += coupon;
    }
}
```

Double Barrier PDI WO IScript

Monday, May 15, 2017
8:30 AM

Description :

```
/// <summary>
/// Put Down and In on the WO ; american or european barrier.
Smoothing by spread bending.
/// </summary>
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
double BarrierDigit("0.8", "Digit", "BarrierDigit");
double Digit("0.2", "Digit", "Digit");
double SpreadDigit("0.05", "Digit", "SpreadDigit");
// Put DI on the WO
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the worst performance of the basket at each date in
the PDI Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).MinSpatial();

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    // Compute the worst performance of the basket at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).WorstOf();

    double indic
= IndicatriceDown(basketPerf, BarrierDigit, SpreadDigit);

    // PDI on the WO at maturity
    aCoupon[maturityDate] += Max(-1.0,-
indicator * Max(strike - basketPerf, 0.0) - indic*Digit);
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
```

```
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

Double Up Call IScript

Monday, May 15, 2017
8:30 AM

Description :

```
/// <summary>
/// Call Up and Out on the basket ; american or european barrier.
Smoothing by spread bending, we're short the product.
/// </summary>
// Level for the Up and Out barrier
double BarrierUO("1.3", "Product", "UO barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("American;European", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule CUOCalendar;
double GearingKI("0.35", "Params", "GearingKI");
double GearingNoKI("0.7", "Params", "GearingNoKI");
// Call UO on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the basket performance at each date in the CUO
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, CUOCalendar).AverageSpatial(basket.Weig
hts);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceUp(basketVector, BarrierUO + Spread, Spread).BestOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average(basket.Weights);

    // CUO with rebate on the basket at maturity
    aCoupon[maturityDate] += (indicator * GearingKI + (1-
indicator)*GearingNoKI)* Max(basketPerf - strike, 0.0) ;
}
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        CUOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
```

```
        // Daily monitoring
        CUOCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
}
```

Reverse Convertible WO IScript

Monday, May 15, 2017
8:30 AM

Description :
Coupon - Put down-and-in on the worst performance european or american barrier.

```
/// <summary>
/// Coupon - Put Down and In on the basket ; american or european
barrier. Smoothing by spread bending.
/// </summary>
// Coupon paid at maturity
double Coupon("0.1", "Product", "Coupon");
// Level for the Down and In barrier
double BarrierDI("0.7", "Product", "DI barrier");
// Barrier spread
double Spread("0.03", "Product", "Barrier spread");
// Barrier bending period
int BendingLength("90", "Product", "Bending days");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Coupon calendar
Calendar CouponCalendar("");
// Coupon - Put DI on the basket
Evaluate(IVectorCoupon aCoupon)
{
    // Pay the coupon at each coupon calendar date
    foreach(FixingDate date in CouponCalendar)
    {
        aCoupon[date] += Coupon;
    }

    // Retrieve the basket performance at each date in the PDI
Calendar
    TimeVector basketVector =
basket.Performance(strikeDate, PDICalendar).MinSpatial();

    // Create the bent spread which will be used for computing the
indicator
    TimeVector bentSpread
= BendingTemporal(0, Spread, BendingLength, 0, PDICalendar.Count);

    // Indicates whether we touched the barrier or not (0 = no, 1 =
yes, between = a bit)
    double indicator
= IndicatriceDown(basketVector, BarrierDI, bentSpread).BestOf();
    // Compute the basket performance at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).WorstOf();

    // PDI on the basket at maturity
    aCoupon[maturityDate] -=
indicator * Max(strike - basketPerf, 0.0);
}
```

```
// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }

    // Floor the bending length
    BendingLength = Min(PDICalendar.Count, Max(0, BendingLength));
}
```

DRA WO Issuer call, short PDI IScript

Monday, May 15, 2017
8:31 AM

Description :
Template for a callable Hybrid product using LSM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of
the code to change if needed
/// </summary>
// Callable calendar
double PDIBarrier("0.7", "PDI", "Barrier");
double BarrierSpread("0.03", "PDI", "Spread");
IPricingSchedule ObservationCalendar;
Calendar CouponCalendar("");
Calendar PDICalendar("PDICalendar");
Calendar CallableCalendar("");
double CouponBarrier("1.0", "Coupon", "Barrier Coupon");
CalendarDecorator Coupon("0.07", "Coupon", "Coupon");
/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
    FixingDate oldDate = strikeDate;


    // Loop through the callable calendar
    foreach(FixingDate date in CouponCalendar)
    {
        // Retrieve the basket performance for any date in the
current accrual period
        TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate, dat
e)).MinSpatial();

        // Compute the DRA indicator and pay the accrual coupon
        double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier, 0.005).Average();

        aCoupon[date] += indicDRA*Coupon[date];

        if (date.In(CallableCalendar))
            aCoupon[date] += productPV[date].Callable(swap[date]);


        if (date == CouponCalendar.End)
        {
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            double wo =
basket.Performance(strikeDate,maturityDate).WorstOf();
```

```
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }

        oldDate = date;
    }


}
Initialize()
{
    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
}
```

DRA WO Issuer call, short PDI_daily IScript

Monday, May 15, 2017
8:31 AM

Description :
callable with an DRA coupon, short a Down-and-In Put at maturity

```
/// <summary>
/// Autocall DRA on the basket ; client is short a PDI at
maturity.
/// </summary>
// Level for the coupon payment
CalendarDecorator Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon
barrier");
// Level for the coupon spread
CalendarDecorator CouponSpread("0.03", "Coupon", "Coupon
spread");
// Calendar for autocall and coupons dates
Calendar CouponCalendar("", "Product", "Coupon Calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
// Accrual observation calendar
IPricingSchedule ObservationCalendar;
Calendar CallableCalendar("");
// LSM section
// First declare the vector used to store conditional expectancy
observables ...
ObservableConditionalExpectancyVector condExp;
// ... which is then initialized here
InitializeObservable(IObservableFactory aMarket)
{
    // We create observables at each date in CallableCalendar
    // The product is issuer callable ; change to
ExerciseType.ClientCallable else
    // Standard parameters : regression on the basket, monomes,
degree 3
    condExp
= CreateConditionalExpectancies(aMarket, CallableCalendar, Prici
ngBase.ConditionalExpectancy.ExerciseType.IssuerCallable, Regres
sionFactorWorstOf, BasisType.Monomes, 3, 2, false);
}

/// Pay a DRA coupon and recall if the basket performance is
above a given level
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
```

```
    // Initialize the previous date to be used when determining
the DRA observation period
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in CouponCalendar)
    {
        // Retrieve the basket performance for any date in the
current accrual period
        TimeVector timePerfs =
basket.Performance(strikeDate, ObservationCalendar.Sub(oldDate,
date)).MinSpatial();

        // Compute the DRA indicator and pay the accrual coupon
        double indicDRA
= IndicatriceUp(timePerfs, CouponBarrier[date], 0.005).Average()
;
        double currentCoupon = indicDRA * Coupon[date];
        oldDate = date;

        // Retrieve the basket performance
        double basketPerf =
basket.Performance(strikeDate, date).WorstOf();

        // Client is short a PDI at maturity
        if (date == CouponCalendar.End)
        {
            // Compute the indicator from the worst basket
performance to determine whether or not KI occurred
            double indicKI
= IndicatriceDown(basketPerf, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] +=
indicKI * Min(0, basketPerf - strike) + currentCoupon;
        }
        else
        {
            if (date.In(CallableCalendar))
            {
                aCoupon[date] +=
condExp[date].Exercise(currentCoupon, swap[date]);
            }
            else
            {
                aCoupon[date] += currentCoupon;
            }
        }
        // Update the previous date for the next computation
        oldDate = date;
    }
}
// Initialize the product : we directly generate the calendar
from strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity
```

```
only if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, stri
keDate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, stri
keDate, maturityDate, "1d");
    }

    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, stri
keDate, maturityDate, "1d");
}
```

Phoenix Defensive WO, short PDI IScript

Monday, May 15, 2017
8:31 AM

Description :
Phoenix WO, short a Down-and-In Put on WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        SpaceVector basketPerf = basket.Performance(strikeDate,date);

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
= IndicatriceUp(basketPerf, CouponBarrier[date], CouponSpread[date]).A
verage();
        aCoupon[date] += indicCoupon * Coupon;

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
```

```
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
}
```

Phoenix WO American Coupon IssuerCall, short PDI IScript

Monday, May 15, 2017
8:32 AM

Description :
Phoenix WO, short a Down-and-In Put on WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Calendar for autocall and coupons dates
Calendar CouponCalendar("Autocall calendar");
Calendar CallableCalendar("CallableCalendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
IPricingSchedule ObsCalendar;

/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in CouponCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        TimeVector woPerf =
basket.Performance(strikeDate,ObsCalendar.Sub(oldDate,date)).MinSpatia
l();

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
= IndicatriceDown(woPerf, CouponBarrier[date], CouponSpread[date]).Bes
tOf();
        aCoupon[date] += (1-indicCoupon) * Coupon;

        if (date.In(CallableCalendar))
        {
            aCoupon[date] += productPV[date].Callable(swap[date]);
```

```
        }

        // Client is short a PDI at maturity
        if (date == CouponCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
        oldDate = date;
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
    ObsCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}
```

Phoenix WO American Coupon, short PDI IScript

Monday, May 15, 2017
8:32 AM

Description :
Phoenix WO, short a Down-and-In Put on WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
IPricingSchedule ObsCalendar;

/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    FixingDate oldDate = strikeDate;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        TimeVector woPerf =
basket.Performance(strikeDate,ObsCalendar.Sub(oldDate,date)).MinSpatia
l();

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
= IndicatriceDown(woPerf, CouponBarrier[date], CouponSpread[date]).Bes
tOf();
        aCoupon[date] += (1-indicCoupon) * Coupon;
```

```
        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
        oldDate = date;
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
    ObsCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}
```

Phoenix WO Performance Plus, short PDI IScript

Monday, May 15, 2017
8:32 AM

Description :
Phoenix WO, short a Down-and-In Put on WO at maturity

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
double Gearing("1.0", "Coupon", "Gearing");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto
Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Pay a given coupon if the WO performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        aCoupon[date] += Max(0.0, Coupon + Gearing * (wo - 1.0));

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
```

```
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
}
```

Phoenix WO Step-Up Coupon, short PDI IScript

Monday, May 15, 2017
8:33 AM

Description :

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
double CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
double CouponSpread("0.015", "Coupon", "Coupon Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto
Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
double StepBarrier("1.0", "Coupon", "StepBarrier");
double StepCoupon("1.0", "Coupon", "StepCoupon");
double StepSpread("1.0", "Product", "StepSpread");
/// Pay a given coupon if the WO performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

           // Compute the coupon indicator and pay the coupon
           double nbStep = (1.0 - CouponBarrier) / StepBarrier;
        double sum = 0;
        for (int i = 0; i <= nbStep; i++)
        {
            double indic
= IndicatriceUp(wo, CouponBarrier + i*StepBarrier,i==
0 ? CouponSpread : StepSpread);
```

```
            if (i == 0)
            {
                sum += indic * Coupon;
            }
            else
            {
                sum += indic * StepCoupon;
            }
        }
        aCoupon[date] += sum;

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
}
```

Phoenix Yeti WO, short PDI with LookbackMin IScript

Monday, May 15, 2017
8:33 AM

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");
// Incremental spread
Chooser IncrementalSpread("No;Yes", "Coupon", "Incremental Spread");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;
Calendar LookbackCalendar("LookbackCalendar");

/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the yeti coupon
    double currentCoupon = 0;


    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Coupon incrementation
        currentCoupon += Coupon;

        // Retrieve the WO performance
        double wo
= (basket.Performance(strikeDate, date)/basket.Performance(strikeDate,
 LookbackCalendar).MinTemporal()).WorstOf();

        // Compute the coupon indicator and pay the coupon
        double incrFactor = IncrementalSpread.Value == "No" ? 1.0 :
currentCoupon / Coupon;
        double indicCoupon
```

```
= IndicatriceUp(wo, CouponBarrier[date], incrFactor * CouponSpread[dat
e]);
        aCoupon[date] += indicCoupon * currentCoupon;

        // Decrement the coupon based on whether we paid it or not
        currentCoupon *= (1 - indicCoupon);

        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            double indicKI
= IndicatriceDown(wo, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only if
european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
    }
}
```

Phoenix Zenith WO, short PDI IScript

Monday, May 15, 2017
8:33 AM

Description :
Phoenix WO, short a Down-and-In Put on WO at maturity + Zenith effect = best of perf wo et coupon

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");
Chooser Zenith("Yes;No", "Coupon", "Zenith");

// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall
barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall",  "Auto
Spread");
// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("Autocall calendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "PDI zone", "Barrier
type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Pay a given coupon if the WO performance is above a given
level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    double isZenith = Zenith.Value == "Yes" ? 1 : 0;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
        // Retrieve the WO performance
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // Compute the coupon indicator and pay the coupon
        double indicCoupon
= IndicatriceUp(wo, CouponBarrier[date], CouponSpread[date]);
        aCoupon[date] += indicCoupon * Max(isZenith * (wo-
strike), Coupon);
```

```
        // Compute the recall indicator and pay the swap
        double indicRecall
= IndicatriceUp(wo, AutocallBarrier[date], AutocallSpread[date]);
        aCoupon[date] += indicRecall * swap[date];
        // Recall the product if we're above the barrier
        if(wo > AutocallBarrier[date])
        {
            break;
        }

        // Client is short a PDI at maturity
        if (date == AutoCallCalendar.End)
        {
            // Cômpute the indicator from the worst WO to determine
whether or not KI occurred
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            // Pay the PDI
            aCoupon[date] += indicKI * Min(0, wo - strike);
        }
    }
}
/// Initialize the product : we directly generate the calendar from
strike date to maturity date, depending on the chosen type
Initialize()
{
    // Calendar generation : daily if US barrier, at maturity only
if european
    if(BarrierType.Value == "European")
    {
        // Monitoring at maturity
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "100y");
    }
    else
    {
        // Daily monitoring
        PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeD
ate, maturityDate, "1d");
    }
}
```

Variable Cap Outperformance IScript

Monday, May 15, 2017
8:33 AM

```
/// <summary>
/// Outperf with variable cap to the perf of the benchmark
/// </summary>
double Gearing("1.0", "Product", "Gearing");
Basket Benchmark(";;;;", "Benchmark");
/// The payoff of a vanilla call or put
Evaluate(IVectorCoupon aCoupon)
{
    // Retrieve the performance of the weighted basket at maturity
    double basketPerf =
basket.Performance(strikeDate, maturityDate).Average();
    double benchPerf =
Benchmark.Performance(strikeDate, maturityDate).Average();
    // Pay a final coupon depending on the payoff type
    aCoupon[maturityDate] =
Gearing * Max(0, Min(benchPerf-1.0, basketPerf - benchPerf));
}
```

DRA Hybrid WO Issuer call, short PDI IScript

Monday, May 15, 2017
8:34 AM

Description :
Template for a callable Hybrid product using LSM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of the
code to change if needed
/// </summary>
// Callable calendar
double PDIBarrier("0.7", "PDI", "Barrier");
double BarrierSpread("0.03", "PDI", "Spread");
IPricingSchedule ObservationCalendar;
Calendar CouponCalendar("");
Calendar PDICalendar("PDICalendar");
Calendar CallableCalendar("");
double CouponBarrier("1.0", "Coupon", "Barrier Coupon");
CalendarDecorator Coupon("0.07", "Coupon", "Coupon");
DiscountCurve CurveLibor("Active", "Libor", "Libor Rate Curve");
string LiborMaturity("3M", "Libor", "Maturity");
ObservableVector libors;
InitializeObservable(IObservableFactory aMarket)
{
    libors = CreateLibors(aMarket, LiborMaturity, CurveLibor);
}
double LiborMin("1.0", "Libor", "LiborMin");
double LiborMax("1.0", "Libor", "LiborMax");
double LiborSpread("1.0", "Libor", "LiborSpread");
/// The payoff of a callable product
Evaluate(IVectorCoupon aCoupon)
{
    FixingDate oldDate = strikeDate;


    // Loop through the callable calendar
    foreach(FixingDate date in CouponCalendar)
    {

        double sumCoupon = 0;
        double count = 0;
        foreach(FixingDate subDate in ObservationCalendar.Sub(oldDate,
 date))
        {
            double subWO =
basket.Performance(strikeDate, subDate).WorstOf();
            double indicWO
= IndicatriceUp(subWO, CouponBarrier, 0.005);
            double indicLibor
= IndicatriceRange(libors[subDate],LiborMin, LiborMax, LiborSpread);
            sumCoupon += indicWO * indicLibor;
            count++;
        }
```

```
        aCoupon[date] += sumCoupon * Coupon[date] / count;

        if (date.In(CallableCalendar))
            aCoupon[date] += productPV[date].Callable(swap[date]);


        if (date == CouponCalendar.End)
        {
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

            double wo =
basket.Performance(strikeDate,maturityDate).WorstOf();

            aCoupon[date] += indicKI * Min(0, wo - strike);
        }

        oldDate = date;
    }


}
Initialize()
{
    // Accrual observation calendar
    ObservationCalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate
, maturityDate, "1d");
}
```

Phoenix WO IssuerCall, short PDI IScript

Monday, May 15, 2017
8:34 AM

Description :
Template for a callable product using LSM

```
/// <summary>
/// Template - callable product, LSM version
/// Callable by the issuer in this template, go to the bottom of the
code to change if needed
/// </summary>
// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the coupon barrier
CalendarDecorator CouponBarrier("0.7", "Coupon", "Coupon barrier");
// le spread utilisé pour autocall
CalendarDecorator CouponSpread("0.015", "Coupon", "Coupon Spread");

// Calendar for autocall and coupons dates
Calendar CouponCalendar("CouponCalendar");
// Level for the Down and In barrier
double PDIBarrier("0.7", "PDI zone", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "PDI zone", "Barrier spread");

Calendar PDICalendar("");
Calendar CallableCalendar("");
/// Pay a given coupon if the WO performance is above a given level,
recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    foreach (FixingDate date in CouponCalendar)
    {
        double wo = basket.Performance(strikeDate, date).WorstOf();

        // This coupon is located “above” the Callable function. It is
therefore unconditional of the callable event (if any) at that date.
        double indicCoupon
= IndicatriceUp(wo, CouponBarrier[date], CouponSpread[date]);
        aCoupon[date] += indicCoupon * Coupon;

        // If the current date belongs to the early redemption
calendar, call the exercise function.
        if (date.In(CallableCalendar))
            aCoupon[date] += productPV[date].Callable(swap[date] + (1-
indicCoupon)*Coupon);

        // This coupon is located “below” the Callable function. It is
therefore conditional of the callable event (if any) at that date.
        if (date == CouponCalendar.End)
        {
            double worstEver =
basket.Performance(strikeDate, PDICalendar).WorstOf();
            double indicKI
```

```
= IndicatriceDown(worstEver, PDIBarrier, BarrierSpread);

                aCoupon[date] += indicKI * Min(0, wo - strike);
            }
        }
    }
```

Tuesday, October 25, 2016
8:24 AM

another question about spread. Semi annual Autocall. spread for swap is not average(6m,1y)-1y?

What's fx correlation and what's the number in correlation table.

11.4 Question list

Friday, November 04, 2016
12:07 PM

To Alex: Can we change the bumps in Maps?
To Walid: Can we change the bumps in Maps?
Because trader want to take more vol bumps in VXX.

Timing the question

1.23 Question List

Monday, January 23, 2017
9:15 AM

1. Why Romain_21. Cap spread need to be done in Caesar (Additional underlying missing in RFQ)
2. Why does recovery note for Ucap have 2.5 MU with only 12y or 18y maturity
3. For recovery note, client have a note already expire, right?
4. Insurance Solution, Fund Solution.
5. What do you check when you go to stock?
6. If we have higher price, do we accept higher variance?

1.24 Question List

Tuesday, January 24, 2017
8:47 AM

1. When aren't the CC or MU is needed? For them to adjust the price.
2. Why for ITAU, we take much less MU? It is very aggressive
3. color we got so far is that we are 75bps back. Color is feedback.

1.26 Question List

Thursday, January 26, 2017
7:52 AM

1. For Bank of New York, 1Y MXN => 2% MU. Because of MXN?
   Bank of New York, we could take more. And MXN, we need enter a swap. We need some money for that.
2. Why do they come up with quality of like index?
   Robotic ETF, we do have one
3. VIX as indicator, can we use correlation as indicator?
   ICJ

2.27 Question List

Monday, February 27, 2017
8:36 AM

1. What's CUSIP? Where I can find a deal using CUSIP?
2. What do you think about the index we learn about this morning? What angle to look into it.
3. How to get libor and CMS now in Caesar?
4. What's KODA
5. How to understand PDE script
6. How do you come up with this strategy？

3.2 Question List

Thursday, March 02, 2017
8:09 AM

1. How to find more valuable question?
2. How to become like JB and Fabrice?
3. The way to change the situation now. How to learn more?
    a. To find something, ask for opinion.

3.16 Question List

Thursday, March 16, 2017
6:16 PM

Calendar Offering

Timing(RFQ Data -> tailor made) Monitor the basket they are interested in

Trade Idea consider more information

3.30 Question list

Thursday, March 30, 2017
8:08 AM

What's the right question to think when we look at a strategy

I just feel like I have not gotten used to the brain storm stuff.

I am held by the detail of my strategy.

4.4 Question List

Tuesday, April 04, 2017
3:44 PM

1. What's VISA?
2. How to use sophis to price?
3. How to use Caesar to backtest stxlrategy

5.11 Question List

Thursday, May 11, 2017
11:08 AM

Client doesn't like call spread on hedge fund

11/01 Pricing List

Tuesday, November 01, 2016
2:14 PM

SEBASTIEN.LAFOSSE_604
Structure: Daily Range Accrual Autocall
Nominal: 1,000,000
Currency: USD
Auto-Call: 100%
Callable: Quarterly if all the underlyings above 100%
Coupon Payments: Quarterly
Observation Dates: Quarterly
KI Barrier: 60% European
Coupon Barrier: 60%
Underlying(s): sx7e / sx5e (Worst of)
Tenor: 3yr
Re-offer: 98.00%
Coupon: 8.36% with 50% MU
Can you please price with istoxx 70

Result:
Isx70D5 doesn't price better than SX5E.
ISX70D5 vs SX5E
have better price parameter in forward (low forward drive the coupon higher)
Have worst volatility pricing parameter (low Volatility drive the coupon lower)

It turns out that SX5E and Istoxx 70 have same coupon rate in DRA.

As for worst of with SX7E, the worst of doesn't contribute a lot to the coupon rate.
And most of coupon rate is denoted by SX7E.

Underlying	Coupon
SX5E	1.03%
ISX70D5	1.03%
SX7E	2.06%
SX5E&SX7E	2.10%
ISX70D5&SX7E	2.12%

11/02 Pricing List

Wednesday, November 02, 2016
10:55 AM

PRIVATAM SAM
Notional = Minimum CHF 310,000 (to be upsized today)
Request type = Trading Price

===== DESCRIPTION ======

Booster Autocall on Roche Holding

Underlying:
Roche Holding (ROG VX)

Maturity: 2 years
Currency: CHF
Autocall Trigger : 110%, observed after 1 year
Coupon paid in case of autocall : 15%
Upside Gearing at maturity : 150%
Performance Cap at maturity : 120% (i.e. max redemption is 130%)
Protection Barrier : 90%, European

Mechanism :

- At the end of Year 1:
· If the underlying is at or above the Autocall Trigger, the product is early redeemed and client gets : 100% + 15%
· Else, product continues

- At maturity (if not early redeemed):
· If the underlying is above the Protection Barrier, client gets : 100% + 150% of the positive performance since initial level capped at 120% (max payout = 130%)
· Else, client gets the share

Please solve for offer.

I use Switchable LSM. For CHF, we just use non bullet.
We have +/- 0.5 Veg for one leg! => it means that we only have the bumps in PDI!!!

Reoffer: 96.45%
0.60%CC

##
5y Issuer Callable Phoenix on Wof SPX RTY and iStoxx70
50% EKI
65% Coupon Barrier
@ 98.25
Q Calls,Pay, Observations on the Coupon

Fabrice ask Alex to ask trader to plug the correlation between RTY and ISX70D5 / SPX and ISX70D5.

Paris trader will plug the correlation in Caesar and Maps.
When you price it, make sure that you pay attention to **check the parameters are all set as well.**
And because it is 5 years issuercall. Alex just did it in Maps.
The result show that ISX70D5 is more expensive then SX5E

##
Put Equity Rate weekly refresh

Everything **in USD (quanto for SX5E).**
~ 20bps CC included

1) **Vanilla Put**
    a) 1Y Put 95% SPX : 5.92%
    b) 2Y Put 90% SX5E : 9.86%

1) **Maturity 1Y – Put SPX contingent to CMS USD 10Y**
    a) Put SPX strike 95%, contingent to CMS 10Y USD up ➔ offer = 3.33%
    b) Put SPX strike 95%, contingent to **CMS 30Y** USD up ➔ offer = 3.32%

1) **Maturity 2Y – Put SX5E contingent to CMS USD 10Y**
    a) Put SX5E strike 90%, contingent to CMS 10Y USD > strike ATM Forward ➔ offer = 4.16%

1) **Maturity 1Y – Put SPX * Call spread CMS USD 10Y**
    a) Put SPX strike 95% * 100*Call spread (CMS 10Y ATM) / (CMS 10Y ATM + 1%) ➔ offer = 1.73%
    b) Put SPX strike 95% * 100*Call spread (**CMS 30Y** ATM) / (**CMS 30Y** ATM + 1%) ➔ offer = 1.74%

Ref :
USSWAP10 : 1.67% , 2Y USSWAP10 : 1.92%
USSWAP30 : 2.03%


S Dollar Swaps (30/360, S/A) | 5) Export | 6) Graph | 7) Notice | Forward Curve Matrix
US Dollar Swaps (30/360, S/A) Mid Yield Conventional « Curve List
Two Curve Spreads
Select a curve under "Curve List" for two curre... Bid Yield Conventional
rward Curve Date 11/09/16 OIS Discounting
ot Coupon Zero

		Forwards										
enors	Coupon	11/9/2016	3Mo	6Mo	1Yr	2Yr	3Yr	4Yr	5Yr	10Yr	15Yr	30Yr
r	0.9709	0.9806	1.0295	1.0663	1.1378	1.2940	1.4699	1.6503	1.8478	2.2680	2.2921	2.1136
r	1.0568	1.0586	1.1014	1.1372	1.2156	1.3816	1.5594	1.7481	1.9198	2.2989	2.3029	2.1129
r	1.1343	1.1386	1.1791	1.2177	1.2996	1.4700	1.6539	1.8285	1.9779	2.2918	2.3147	2.1083
r	1.2162	1.2208	1.2624	1.3006	1.3861	1.5626	1.7366	1.8937	2.0244	2.3005	2.3259	2.1040
r	1.3013	1.3055	1.3474	1.3874	1.4755	1.6455	1.8059	1.9467	2.0642	2.3147	2.3376	2.0998
r	1.5441	1.5491	1.5843	1.6197	1.6941	1.8312	1.9542	2.0638	2.1449	2.3147	2.3043	2.0879
r	1.6083	1.6131	1.6464	1.6795	1.7493	1.8758	1.9927	2.0854	2.1635	2.3194	2.2997	2.0835
0Yr	1.6665	1.6699	1.7013	1.7317	1.7969	1.9172	2.0184	2.1073	2.1825	2.3255	2.2958	2.0796
5Yr	1.8597	1.8629	1.8854	1.9076	1.9531	2.0362	2.1109	2.1752	2.2284	2.3028	2.2643	2.0543
0Yr	1.9605	1.9625	1.9803	1.9972	2.0318	2.0946	2.1499	2.1963	2.2327	2.2791	2.2296	2.0299
0Yr	2.0282	2.0294	2.0427	2.0545	2.0784	2.1214	2.1583	2.1881	2.2103	2.2265	2.1761	1.8024

ey values are extrapolated.
1006 11/02 10:31 Realtime Exchanges/Exchange Product Changes Effective November

##
##########

For BanChile:

1) call ATM, 2Y, quantoCLP on ILF
2) callspread 90%/X, 2y , quantoCLP, 15% premium on SX7E

Also try to use ISX70D5 and COP5E to replace SX7E.
Remember that use bumps in Maps is not the same as loading bumps in Caesar.
Remember that in Maps. The bumps will change based on the product and maturity.
CLEWE is Canada Index.

COP5E is cheaper than ISX70D5. both cheaper than SX7E

For ILF, we take different bumps from JB. So the result we take is that, we combine both bumps to get the price in case do something wrong.

##
##########

For Romain_15,
I see bumps 3 vol long call. It may means that we have another 3%vol in bumps. And which lead to 1.75% cost of bumps.
And vega is 50 bps per percentage of vol change.

##
##########

3yr SPX 80%-spot put cost, contingent on 10yr swap rates > ATMf + 50bps?
Indicative for now

ATM Forward should be 3 y ussw 10y, which is 2.01.
Remember to change the underlying.
And remember to keep the digit for the interest rate.

Update:
- JB show the bumps that : 13 correl, 0.5 vol for the vanilla put
- However, the problem we have is that dispersion between Fixed Income teams' number and our numbers.
- If we price a digital call on CMS, we can see 35%, however fix income show 61%. And trader give 31%, however, another fix income show 51%
- So we have to be conscious when we price it. Trader will book it. So we will go with trader's price. We also need to remember how to calibrate the Caesar as well.

Correl @ 39 (vs 47 book)
Vol SPX: +50bps (JB Jacquet)
Rate Vol: +1vol normal (Baptiste Flais)
Rate spread (digit) = 0.25%

Book +bump = 1.90%

Book = 1.06%

- ⇨ SPX vega impact ~ 0.25% (only try on the vanilla put leg)
- ⇨ Since we cannot bump the vol rate in Caesar, to get such a pricing we need to price with a Equity/rate correlation ~ 17% (instead of 39%)

Pricing methodology is given by others. It is the bump we need to use. However, we find that vol bump of rate doesn't affect the price. So that's why we need to calibrate. We need to use correlation to compensate the bumps.

- I need to learn to try the affect of the bumps. Then you can find this effect that bump in the rate doesn't affect the price at all.

With all the bumps, I get 1.93, and without bumps, I get 1.00%

And don't get confused when Fabrice said that this vol is only on the vanilla put

11.3 Pricing List

Thursday, November 03, 2016
9:09 AM

##

1 – lower the contingency to 2.54% … whats the offer => 1.83
2 – then change the 80% put to a 80%/50% put spread … whats the offer => 1.77

With 23 bps vol impact

##
Phoenix yeti vvx up

8277097

Maps parameter will refresh over time. However, Caesar may not be the case.
For the bumps, the same product will not change over time. So we can keep the same bumps.

##

call spread 100%-200%
2y
Quanto CLP
SX7E and SX7P (two seperate call spread prices)

SX7P implied vol = 26, sx7e implied vol =30
Because 100-200 call spread. It is just like a call.
So vol high => price high.
Sx7e have 14.74%
Sx7p have 12.64% (originally, I get 10.74% because the correlfx is missing)

SX7P is missing the correlFX

Result: Very Indicative (still no news from traders)

1/ SX7E => offer = 15.50% (including 0.60% MU)
2/ SX7P => offer = 13.80% (including 0.60% MU)
3/ SX5E => offer = 10.20% (including 0.60% MU) - No Cap
4/ ISX70D5 => offer = 9.20% (including 1.20% MU) - No Cap

SX5E Bumps: Vol 0.5%, Reop -0.02%, Quanto -10%, skew 3%
ISX70D5 Bumps: vol bump = 1%, Repo: -0.03%, quanto : -10% and skew:+3%
##

Turbo
USD 1,000,000
1 Year
SPX

Call Strike ATM
Cap at 6%
Solve for participation: xx%
Strike PUT ATM: No downside capital protection
Reoffer: 99%

<u>Please provide quote with lookback strike option for next 7 trading days</u>

2) Also maybe to include equivalent participation using SPXLTBUP instead

Capped Turbo solve for gearing.

- Remember the reason that we have to long a ATM call and short a ATM put is that we have leverage!
- Next 7 trading days should include the strike date and total 8 days. It means that if the stock price go up all the time, we will have 8 observation date. We will take 100% as our strike.
- Every time, when you are trying to price somethings, you'd better understand what you are doing, with bumps or without bumps.

Because it is about the election, trader don't think it is a good idea to trade ta lookback.

11.4 Price List

Friday, November 04, 2016
9:01 AM

SX5E: Without Cap / Cap 20%
vol 0.35 repo -0.015, correl quanto -10%, skew 3%

ISX70D5: Without Cap / Cap 20%
vol 0.5, repo -0.03, quanto : -10% and skew:+3%

SX7E: with cap 20%
vol 0.6 vol, -6% div, and correl:-7%, skew 3%

SX7P: with cap 20%
vol 0.6 vol, -6% div, and correl:-7%, skew 3%

1/ SX7E => offer = 7.70% (including 0.60% MU)
2/ SX7P => offer = 7.55% (including 0.60% MU)
3/ SX5E => offer = 6.75% (including 0.40% MU)
4/ ISX70D5 => offer = 6.25% (including 0.90% MU)

- See the way that different index differ.

##
##########

~10ync1y SPX & RTY trigger step up
Settle: Nov. 30 2016
First call: Sept 29, 2017
Maturity: Sept 30, 2026
Monthly pay
Quarterly call beginning Sept 29, 2017

7.00% for ~5yrs
10.0% for 3yrs
12.0% for 2yrs
coupons subject to SPX & RTY >/= 50% of intial strike: SPX strike: 2,159.93 RTY strike: 1,246.381
50% Euro Knock In

Solve for fees?

See Annex A in attachment for exact payment and calld dates

Client sell a note. It want to buy another notes to hedge this exposure. Then strike will be fixed. The option price will be very sensitive to spot price. So we need to tell the client, we price with what spot ref and delta. If after 1 hour, the spot goes up by 1%, then the option price will go up by delta as well. Bumps are not affected by the fixing strike situation.

And remember that, the first coupon date need to be considered.

Here, UF is how much we pay to the client.

11.7 Pricing List

Monday, November 07, 2016
9:52 AM

~10ync1y SPX & RTY trigger step up
Settle: Nov. 30 2016
First call: Sept 29, 2017
Maturity: Sept 30, 2026
Monthly pay
Quarterly call beginning Sept 29, 2017

7.00% for ~5yrs
10.0% for 3yrs
12.0% for 2yrs
coupons subject to SPX & RTY >/= 50% of intial strike: SPX strike: 2,159.93 RTY strike: 1,246.381
50% Euro Knock In

Solve for fees?

See Annex A in attachment for exact payment and calld dates

Refresh in the morning:
23.89% Option Premium. Funding 29.26%

Bumps I took : SPX: -1 vol, -3 div, -0.08 repo. RTY: vol -1.5% Repo : -0.1. Correl Parallel: 2%

Delta:
SPX: 14.6%
RTY: 27.02%

##
##########

11.8 pricing List

Tuesday, November 08, 2016
9:56 AM

yo. I look for 750k
2years, not callable, WMT + 2 US stocks, 70% barrier
coupon and capital, 12% annual coupon memory, ONE STAR 100%
reoffer 99
What can be the 2 other stocks?

- I try low correlation. (SPXLTBUP, 0 correl -> 13% premia).
- I also try high correlation(WMT, TGT, AMZN, COST UQ) it also doesn't work very well.
- In this case, we need to find something high vol.
- I can also test the sensitivity of the vol by adding bumps.
- NVDA and NFLX have high vol around 37.79% and 40.86%
- You have to know about this. Or you need to use BBG filter to find them.
- its more a comparison between the stocks than an absolute value
- for popular stocks you will know if they are low vol, high vol, meddium vol, and you will know the most payings dividend stocks (VZ, T...)
- Don't get lazy about checking JB's pricing. You need to find the right bumps and correlation in JB's pricing. Then go to your own script to price it. Cross check is important.
- If JB didn't save the XML, you should ask him. It is your duty to double check the pricing.

##

Phoenix linked to WO SX5E;SPX;UKX

Underlying: SX5E;SPX;UKX
Tenor: 5Y
GBP
Coupon: 6% p.a.
Reoffer: 99.50%
Coupon Barrier: 60%
Call Barrier: 100%
Call Frequency: Annually
Coupon Frequency: Annually
KI: 50% European
Settlement: T+7
Bumps 1.40% MTB 1.90%

Please price on iStoxx 70 / SPXLTBUP / FTSE 150
- 5 years we can have a boost funding.

##
To trade

For 1.2M-1.4M EUR

10Y
EUR
Phoenix Autocall SX5E (without memory)
Coupon 6.20% p.a.
Coupon Barrier 80 (obs yearly)
Autocall Barrier 95 (obs yearly)
European Capital Barrier 50

Solve Reoffer please

- 10 year ISTOXX70 can be priced in Maps. And 10 years are okay as well. Just need to check with trader in Paris.

11.9 Pricing List

Wednesday, November 09, 2016
8:08 AM

Payoff	Phoenix WO	Wrapper	EMTN	
Nominal	1 M	Issuer	Natixis SI	
Currency	GBP	Funding		
Start date	9 November 2016 (EU)		Running	
Maturity	9 November 2017 (EU)		Retro / Upfront	
	Expected Mark up			

Underlyings	S&P 500	SPX	1
	Euro Stoxx 50	SX5E	1
	FTSE 100	UKX	1

Phoenix Autocall WO
GBP 1,000,000
5 Years
Worst of SPX / SX5E / UKX
Annual Observations
Autocall Trigger: 100%
American Close-to-Close barrier: 50%
Coupon Continuous daily at the close observation barrier: 60%
Coupon: xx% paid annually
Reoffer: 99.50%

Without Bump: 4.67% -> 5.63%, 0.5% UF, -> 0.46 Mtb.
With Bumps: 6.50% -> 1.83% COB
Sensitive to coupon 1% p.a-> 6.48%-4.75%=1.73%

- American PDI spread =4%
- Because we don't have bending here. So it means that we take too much spread for this one. So that's the reason we take less spread than 5% .
- Remember when you see the basic trends. We can stop and try the other options.
-

##

Payoff	Taylor Made	Wrapper	US MTN	
Nominal	5 M / 5.01 M	Issuer	Natixis US SPV	
Currency	USD	Funding		
Start date	23 November 2016 (EU)			Running
Maturity	10Y (EU)	Retro / Upfront		
	Expected Mark up			

Underlyings	S&P 500	SPX	1
	RUSSELL 2000 Index	RTY	1
	Euro Stoxx 50	SX5E	1

Hi JBL, I'm in late today around 10am. Can you please start working on the below USMTN request when the market opens. Given the election results I assume the traders will want to look at 10 and 15y structures

5mm
Natixis USMTN

5% subj to spx/rty/sx5e >/= xx%
qtlry obs and pay
50% euro kip
Memory at 100% of initial (if all 3 > 100% client gets paid out on all previous missed 5% cpns)
Lock in event if all 3 > 125% then coupon steps up to 9% and LOCKS IN at that level to maturity.
95.50

10yr bullet=
15yr bullet =

We can see the vol now is SPX: 26.62, RTY: 29.10, SX5E : 21.10

11.10 Pricing List

Thursday, November 10, 2016
10:09 AM

Payoff	Autocall	Wrapper	EMTN	
Nominal	0.62 M	Issuer	Natixis SI	
Currency	USD	Funding		
Start date	10 November 2016 (EU)		Running	
Maturity	10 November 2017 (EU)		Retro / Upfront	
	Expected Mark up			

Underlyings	ISHARES MSCI BRAZIL @ EWZ UP	EWZ UP1

2Y
USD 625k
Autocall on EWZ
Coupon quarterly xx% memory - xx% pa
Autocall trigger 100% quarterly
Barrier coupon 100%
LEVERAGED PUT strike USD 30$
Reoffer 97.50%

Only the strike is fixed. So it means that we should not change the quote.
We should just calculate the strike level based on the strike.
However, the price will change with the spot change .
So there is the delta.

11.11 Pricing List

Friday, November 11, 2016
9:29 AM

JB have strange spread in the coupon barrier.

I should have a method to test whether I am right or wrong.

11.15 Pricing List

Wednesday, November 16, 2016
11:35 AM

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** USD
- **Underlying:** Equally-weighted basket of CAT UN / FLS UN / HAL UN / JPM UN / GS UN / BAC UN / PFE UN / JNJ UN / CELG UQ
- **Buffer:** 5%
- **Upside Leverage/Participation Factor:** 200%, subject to a maximum redemption amount of 30%
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97%

Final Redemption

- If the performance is at or above 100%, investor receives [par + (Upside Leverage*index performance)]
- If performance is at or above 95% but under 100%, investor receives par
- If performance is below 95%, investor loses 1% per 1% decline past 95% performance

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** USD
- **Underlying:** CAT UN / FLS UN / HAL UN / JPM UN / GS UN / BAC UN / PFE UN / JNJ UN / CELG UQ
- **Observation:** Quarterly
- **European Knock in:** 60% on the equally-weighted average of the 3 worst performing stocks
- **Coupon Barrier:** 80%
- **Autocall Barrier:** 100% on Worst-Of stock
- **Coupon:** (2.45% * (1/9)* [Number of stocks above Coupon Barrier]) quarterly
    - If 4 stocks are above the Coupon Barrier, the quarterly coupon will be 2.45%*4/9 = 1.088%
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97%

Final Redemption

- If the average performance of the basket since inception of the 3 worst-performing stocks is at or above -40%, the investor receives par
- Otherwise, the investor loses 1% per every 1% decline of the average performance of the 3 worst-performing stocks beyond the initial level

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** USD
- **Underlying:** CAT UN / FLS UN / HAL UN / JPM UN / GS UN / BAC UN / PFE UN / JNJ UN / CELG UQ
- **Observation:** Quarterly
- **Leveraged Put Strike:** 50%
- **Coupon Barrier:** 80%
- **Autocall Barrier:** 100% on Worst-Of stock
- **Coupon:** (2.10% * (1/9)* [Number of stocks above Coupon Barrier]) quarterly
    - If 4 stocks are above the Coupon Barrier, the quarterly coupon will be 2.10%*4/9 = 0.933%
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97%

Final Redemption

- If the worst is at or above -50%, the investor receives par
- Otherwise, the investor loses 2% per every 1% decline of the worst performance below -50%

Bumps : Correl stock =>-10% parallel or 10% lambda

11.16 Pricing List

Wednesday, November 16, 2016
11:38 AM

Payoff	Twin Win	Wrapper	EMTN	
Nominal		Issuer	Natixis SI	
Currency	USD	Funding		
Start date	16 November 2016 (EU)			Running
Maturity	16 November 2017 (EU)			Retro / Upfront
	Expected Mark up			

Underlyings	S&P 500	SPX	1

Underlying: SPX (100%)
Tenor: 18 months
Notional: USD 1MM equivalent

IMTrust buys Call Spread 100 -???%
IMTrust buys ATM KO put obs: terminal, Barrier: 82%
IMTrust sells OTM Put Strike: 82% Leverage: 1.22x

Reoffer: 99%

a) Currency PEN : we don't have yet the instruments etc to price in PEN, trading should be working on it
b) Currency CLP : subject to legal / treasury / compliance approval
ð Cap = 12.75% with 50bps mtb (cost of bumps ~ 30bps)
c) Currency USD :
ð Cap = 5% with 50bps mtb (cost of bumps ~ 30bps)

New Twin win   Client FOR CREDICORP

USD
Bumps: bumps -0.5vol -1 skew -1 div -0.02 repo
COB: 30 bps
MTB: 65 bps
MU:30 bps

##

11.21 Pricing List

Monday, November 21, 2016
10:38 AM

Payoff	Autocall	Wrapper	EMTN		
Nominal	0.3 M	Issuer	Natixis SP		
Currency	CHF	Funding			
Start date	21 November 2016 (EU)			Running	
Maturity	2Y (EU)	Retro / Upfront			
	Expected Mark up				

Underlyings	NOVARTIS Nom. @ NOVN VX	NOVN VX	1

Notional = CHF 300,000
Request type = Trading Price

===== DESCRIPTION ======

Booster Autocall on Novartis

Underlying:
Novartis (NOVN VX)

Maturity: 2 years
Autocall Trigger : 110%, observed after 1 year
Coupon paid in case of autocall : 15%
Upside Gearing at maturity : 150%
Performance Cap at maturity : 120% (i.e. max redemption is 130%)
Protection Barrier : 90%, European

Mechanism :

- At the end of Year 1,
· If the underlying is at or above the Autocall Trigger, the product is early redeemed and client gets : 100% + 15%
· Else, product continues

- At maturity (if not early redeemed):
· If the underlying is above the Protection Barrier, client gets : 100% + 150% of the positive performance since initial level capped at 120% (max payout = 130%)
· Else, client gets the share

Tips:
1. Remember you have to use Switchable LSM.
2. 15% dividend bumps is not too much.
3. Autocall 15% coupon, I should use 3% autocall spread.

Pricing:
1. 1.75% MU, 2.6%UF,

2. No additional Spread in the swap

##
####

Payoff	Phoenix Yeti WO		Wrapper	EMTN
Nominal	0.2 M	Issuer	Natixis SP	
Currency	GBP	Funding		
Start date	21 November 2016 (EU)			Running
Maturity	21 November 2017 (EU)			Retro / Upfront
	Expected Mark up			

Underlyings	DAIMLER AG @ DAI GY	DAI GY	1
	ING GROEP NV-CVA @ INGA NA	INGA NA	1
	ROYAL DUTCH SHELL PLC-A SHS @ RDSA LN	RDSA LN	1

Notional = GBP 250,000
Request type = Trading Price

===== DESCRIPTION ======

Autocall | Memory Coupons | Daimler + Ing + Royal Dutch Shell

Underlyings: Daimler + Ing + Royal Dutch Shell (worst of)
Tickers = DAI GY / INGA NA / RDSA NA or RDSA LN (whichever prices the best)

Maturity = 6Y
Currency = GBP
Autocall trigger = 100%
First Autocall Observation = 3rd quarter (i.e. 9th month)
Observation = Quarterly
European Barrier Level = 60%
Coupon trigger = 65%
Coupon p.a. Level = 8.00% with Memory Effect

Please solve for offer

Delivery = Cash
Strike = Close
Expected Custodians = RL360

Dates to be used =
- Strike Date = 21/11/2016
- Settlement Date = 28/11/2016
- Final Fixing Date = 21/11/2022
- Redemption Date = 28/11/2022

1. No need to price it. Because it have no call spread. We need to do the last one because of call spread.

11.22 Pricing List

Tuesday, November 22, 2016
3:06 PM

Payoff	Phoenix	Wrapper	US MTN	
Nominal	3 M	Issuer	Natixis US SPV	
Currency	USD	Funding		
Start date	21 November 2016 (EU)			Running
Maturity	21 November 2026 (EU)			Retro / Upfront
	Expected Mark up			

Underlyings	S&P 500	SPX	1
	RUSSELL 2000 Index	RTY	1

3mm
CS
10nc1y
7% x 5y
10% x 3y
12% x 2y
Cpns subj to spx/rty >/= 60%
Monthly obs and pay
50% EKI
11/23 strike
11/29 settle
3mL+153
UF

Price: ==> Upfront 7%, mtb =2.7%
For Jefferies, we use EUR
And remember blanco is issuer call usually

11.31 Pricing List

Wednesday, November 30, 2016
6:02 PM

Overseas Diversified Basket | 5 year(s)	AI FP Equity, ALV GY Equity, AMS SQ Equity, BP/ LN Equity, CBA AT Equity, ENI IM Equity, GSK LN Equity, HMB SS Equity, INVEB SS Equity, KNEBV FH Equity, MC FP Equity, NG/ LN Equity, 9437 JT Equity, RB/ LN Equity, RDSA NA Equity, SREN VX Equity, 4502 JT Equity, TLS AT Equity, VIV FP Equity, ZURN VX Equity, (Equally weighted)
Option Identification	103-46
Start Date (Strike Date)	December 07, 2016
Initial Settlement Date (Strike Date + 2)	December 09, 2016
Valuation Date	October 07, 2021 | November 08, 2021 | December 07, 2021 |
Business Day Conv.	Following
Final Settlement Date (Maturity date + 2)	December 09, 2021
Participation	100.00 %
Strike	107%
Cap	116 % (cap applied on the average not on each valuation dates)
Quanto	CAD
Partial termination dates	January 07, 2020 | January 07, 2021 |

- CAD active

##
#######

Payoff	Taylor Made	Wrapper	EMTN
Nominal	0.8 M	Issuer	
Currency	USD	Funding	
Start date	1 December 2016 (EU)		Running
Maturity	3Y (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings AMAZON.COM INC @ AMZN UQ AMZN UQ 1
NIKE INC @ NKE UN NKE UN 1
FACEBOOK @ FB UW FB UW 1
ELI LILLY & CO @ LLY UN LLY UN 1

JB, could you please let me know if you can price the following:

WO:
AMZN / NKE / FB / LLY
3Y
USD

In 1Y, if WO > XX%, autocalled and client gets 50%
In 2Y, if WO > XX%, autocalled and client gets 75%
In 3Y, if WO > XX%, autocalled and client gets 100%
If not autocalled, client gets 0%

Offer: 26%
Issue price: 32%

- The way to do the low reoffer
- We treat it as loss
- Sophis try all the direction of spread
- Remember we should do the intrisic value and continuous value.
- Sophis is faster and acturate

##
##

Payoff	Turbo	Wrapper		WARRANT	
Nominal		0.5 M	Issuer	Natixis SI	
Currency		USD	Funding		
Start date		1 December 2016 (EU)			Running
Maturity		1 December 2017 (EU)			Retro / Upfront
		Expected Mark up			

Underlyings	UNITED STATES OIL FUND LP @ USO UP USO UP 1

Turbo
6 months and 1 year
USD 500K
USO UP
Put strike at 80% (2x leverage below 80%)
call strike ATM
solve for cap
Reoffer: 100%

- When you see reoffer 100%, you should know it is a note rather than warrant
- Since it is a note, we need to floor at -1
  -0.5vol -1repo on 6m + 50bps CC
  -1vol -1repo on 1y + 75bps CC
  13% and 28% cap

##
#

Payoff	Twin Win	Wrapper	EMTN
Nominal	1 M	Issuer	Natixis SP
Currency	USD	Funding	
Start date	1 December 2016 (EU)		Running
Maturity	3Y (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings Euro Stoxx 50 SX5E 1

JB,
Please shadow price this:
3 & 4 Y twin-win linked to SX5E and istoxx 70
70% Euro barrier
Solve for uncapped upside or if capped, solve for max return with 1.25x leverage
97.75/96.75 reoffer
Thank you

sorry spreads were too aggressive, it would be more :

	3Y - Reoffer 97.75%	4Y - Reoffer 96.75%
SX5E	100% Leverage / 60% Cap	130% Leverage / Uncapped
ISX70D5	115% Leverage / Uncapped	200% Leverage / Uncapped

- When JB mention without CC included, it means it have bumps

##
######
Indication: with 2% MU

RegS – EMTN Offshore
Phoenix Memory Autocall WO
2 Years
Quarterly Observations
Autocall Trigger: 100% (first Autocall Observation Date on March 1, 2017)
European Knock-In / Coupon barriers: 80%
Price: 97.50

Quanto MXN Version:
(USD 500,000 equivalent)
WO SPX / SX5E
Coupon: [6.60]%pa (1.65% paid quarterly) WITH MEMORY

- We keep the correl quanto = -70%
- Spread for MXN : -0.85%;-0.82%;0% because it is indicative.

11.30 Pricing List

Thursday, December 01, 2016
8:40 AM

Phoenix WO
Maturity : 5Y NC1Y
Underlying : worst of SPXLTBUP / RTY
Coupon Barrier = European PDI Barrier = 65%
Quarterly obs
Reoffer 97.50%

==> Coupon = [7.20% p.a ; 8.60% p.a] with currently 1.50% CC at the middle of the range

Bumps for SPXLTBUP: -2% vol, -5% div, -0.15% repo, 2% correl stocks.
And there is 50 bps difference between Sophis and Caesar
Caesar is more expensive than Sophis.

##

Payoff	Digital	Wrapper		EMTN	
Nominal			Issuer		
Currency		USD	Funding		
Start date		30 November 2016 (EU)			Running
Maturity		30 November 2017 (EU)			Retro / Upfront
		Expected Mark up			

Client wants pricing on 2 principal protected notes with digits if:

1) $3mL > 3% (tenor: 5y)
2) XAU < 750 (tenor: 2y)

no downside if wrong, just simple digital if right

- Understand the sentence. If wrong, then no downside, if it is right, we have digital call.
- CLP doesn't mean that we will have coupon.
- Client buy the digital call use the interest rate. This digital call will give more potential coupon than just interest rate funding.

###

Payoff	Call	Wrapper		OTC	
Nominal		1 M	Issuer		
Currency		USD	Funding		
Start date		30 November 2016 (EU)			Running
Maturity		30 November 2017 (EU)			Retro / Upfront
		Expected Mark up			
			Premium		

Underlyings FINANCIAL SELECT SECTOR SPDR @ XLF UP XLF UP 1

UTILITIES SELECT SECTOR SPDR @ XLU UP XLU UP 1

Outperformance Call
6 Months
ATM
XLF on XLU
USD 1,000,000

- XLF on XLU means that long XLF short XLU

##
Issuer Call
1mm
Natixis
15nc1y
xx% subj to SPX >/= 70%
Monthly observation and pay
50% Principal Barrier
96.00

12/12 strike
12/14 settle

Indication subject to risk approval :

Issuer Call
1mm
Natixis
15nc1y
xx% subj to SPX >/= 70%
Monthly coupon
Quarterly issuercall
50% Principal Barrier
96.00

12/12 strike
12/14 settle

==> Coupon = 0.6% monthly (7.20% p.a)

- Remember that usually we use this parameter with quarterly autocall. Because you will find out that monthly autocall will be too good for the client. Coupon will be very low.

##
#########

Payoff	Twin Win	Wrapper	OTC	
Nominal	0.5 M	Issuer		
Currency	USD	Funding		
Start date	30 November 2016 (EU)			Running

Maturity	30 November 2019 (EU)	Retro / Upfront
	Expected Mark up	
	Premium	

Underlyings WISDOMTREE JPN HEDGED EQ @ DXJ UP DXJ UP 1

Package of 4 options:
1) IBBA Sells Put Down and In; 110% Strike / 75% DISCRETE KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 110% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; 130% Strike; Qtt of Shares = Notional / Spot Ref
4) IBBA Buys Put Down and Out; 100% Strike / 75% DISCRETE KO; Qtt of Shares = Notional / Spot Ref
Notional: US$ 0.5MM
Please sort for package Up-Front premium.

DXJ <Equity>
3 Years
Note: on the PUT, physical settlement below 100% and cash settlement above.

- They give more information, change the barrier. But I will keep my spread 6%. I should change it to 7% instead.

##
########

Payoff	Wrapper	EMTN
Nominal	Issuer	
Currency	Funding	
Start date	30 November 2016 (EU)	Running
Maturity	30 November 2017 (EU)	Retro / Upfront
	Expected Mark up	

10nc1y, Monthly Issuer callable Calls
TD 12/12 SD 12/14
(solve for coupon) subj to SPX >= 70%
Monthly observation and pay
50% Principal Barrier EKI
5.75% UF – Assume 2mm+ size but they cannot commit upfront - Thanks
CS pays 3mL + 152

- 2.5mtb

##
########
3/
10nc1y (qtrly berm)
7% x 5y
10% x 3y
12% x 2y
Cpn subj to SPX/RTY >/= xx%

Monthly observation and pay
PDI Barrier 50% EUR
Nat receives 3ml+150
UF = 7.50%

4/
10nc1y (qtrly berm)
8% x 5y
9% x 3y
10% x 2y
Cpn subj to SPX/RTY >/= 65%
Monthly observation and pay
PDI Barrier 50% EUR
Nat receives 3ml+151
UF =

3) ==> Coupon Barrier = 61% with 2.25% mtb

4) ==> UF = 6.50%

###
###

Autocall | AMAZON + FACEBOOK + BANK OF AMERICA + ELI LILLY

Underlyings (worst of)
- AMAZON (AMZN)
- FACEBOOK (FB)
- BANK OF AMERICA (BAC)
- ELI LILLY (LLY)

Maturity = 3Y
Currency = USD

Autocall trigger = 100%
Autocall Observation = on the 18th month
Observation = Semi Annually
Capital Barrier type = European
Capital Barrier Level = 75%
Coupon trigger = 75%
Coupon p.a. Level = 5.00% without Memory Effect

Payoff at Maturity:
- If the worst of ends > 75%, client gets 100%
- Otherwise, if the worst of ends < 75%, client gets Final Performance of the Worst Of – 30%

Delivery = Cash

Strike = Close

- Only one autocall observation
- Strike today

- Floor -100%

12.5 Pricing List

Monday, December 05, 2016
10:52 AM

Payoff	Phoenix Yeti WO	Wrapper	EMTN
Nominal	0.5 M / 0.7 M	Issuer	Natixis SI
Currency	USD	Funding	
Start date	5 December 2016 (EU)	Running	
Maturity	5 December 2017 (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings	TESLA MOTORS INC @ TSLA UQ	TSLA UQ	1
	EXXON @ XOM UN	XOM UN	1
	ISHARES NASDAQ BIOTECH INDEX @ IBB UQ	IBB UQ	1
	EASYJET PLC @ EZJ LN	EZJ LN	1

USD 500-700k
18 months Autocall Phoenix memory
Worst of (TSLA UW ; XOM UN ; IBB UQ ; EZJ LN)
Quarterly obs
Autocall @ 80%
65% EKI barriers (coupon and capital)
X% p.q. cpn memory
Lookback min weekly (2 obs), i.e. tonight and in 1w time
95 reoffer

- take 1.10 MU, there is a difference of 40bps with sophis
- 0.95 Coupon rate p.q
- Bumps from JB email. We shows different bumps load from Caesar.

###

12.6 Pricing list

Tuesday, December 06, 2016
11:21 AM

Payoff	Phoenix Yeti	Wrapper	EMTN
Nominal	2.5 M	Issuer	Natixis SI
Currency	USD	Funding	
Start date	6 December 2016 (EU)	Running	
Maturity	6 December 2018 (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings	BANK OF AMERICA Corp @ BAC UN	BAC UN	1
	MORGAN STANLEY DEAN WITTER @ MS UN	MS UN	1
	WELLS FARGO & Co @ WFC UN	WFC UN	1
	JP MORGAN CHASE & CO @ JPM UN	JPM UN	1

2.5 Mio USD
Decreasing Autocall worst of BAC US / MS US/ WFC US/ JPM US
Maturity 24 Months
Ascending Coupon 2.00% Quarterly when autocalled (memory) – 8.00% p.a
Decreasing Autocall Quarter 1 : 105% ; Quarter 2 : 100% ; Quarter 3 : 95% … At Maturity : 70%
Protection 70% European (30% downside protection)
ONE STAR LEVEL 100% (At maturity if One Stock is up => 100% capital guaranteed)

Solving for reoffer plse

12.6 Pricing List

Wednesday, December 07, 2016
2:18 PM

Payoff	Phoenix WO	Wrapper	US MTN
Nominal		Issuer	Natixis US SPV
Currency	USD	Funding	
Start date	5 December 2016 (EU)	Running	
Maturity	5 December 2017 (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings	S&P 500	SPX	1
	RUSSELL 2000 Index	RTY	1

15nc1y
xx% subj to SPX/RTY > 65% & 0-5% on 6ml
65% EKI
95.5

- It is hybrid. And remember it is HJM replic
- Remember we need to floor the rate
- Remember this DRA is not average times average. But the count(A & B)/ count(n)
- You must remember to make sure whether it is issuer call or not.

12.7 Pricing List

Wednesday, December 07, 2016
2:21 PM

Payoff	Taylor Made	Wrapper	EMTN
Nominal	0.4 M	Issuer	Natixis SP
Currency	USD	Funding	
Start date	5 December 2016 (EU)	Running	
Maturity	2Y (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings	NETFLIX INC @ NFLX UQ	NFLX UQ	1
	WAL-MART STORES @ WMT UN	WMT UN	1
	BANK OF AMERICA Corp @ BAC UN	BAC UN	1

Notional = USD 400,000
Request type = Trading Price

===== DESCRIPTION ======

Autocall with safety feature | NFLX WMT BAC

Underlyings (WO):
- Netflix
- Walmart
- Bank of America

Maturity: 24 months
Currency: USD

Coupon: 12.10% p.a. with memory, if wof > Coupon Barrier
Coupon Barrier: 80%
European Barrier: 70%
No Autocall feature
Coupon Observations: Annually

Payoff at maturity:
SAFETY FEATURE: If at least one underlying is above 100% of its initial level at maturity, the client receives 100% back at maturity

##

Payoff	Taylor Made	Wrapper	EMTN
Nominal		Issuer	Natixis SI
Currency	USD	Funding	
Start date	7 December 2016 (EU)	Running	
Maturity	7 December 2017 (EU)	Retro / Upfront	

Expected Mark up

Underlyings	S&P 500	SPX	1
	FINANCIAL SELECT SECTOR SPDR @ XLF UP	XLF UP	1

call outperformance
2 years
USD
long xlf, short spx
and
long xlf, short xlu
european knock-in 75%
reoffer; 98%

12.12 Pricing List

Monday, December 12, 2016
2:08 PM

Payoff Twin Win		Wrapper	OTC
Nominal	1 M	Issuer	
Currency	USD	Funding	
Start date	12 December 2016 (EU)		Running
Maturity	12 December 2019 (EU)		Retro / Upfront
	Expected Mark up		
		Premium	
Underlyings	SPDR TRUST SERIES @ SPY UP		SPY UP 1

Package of 4 options:
1) IBBA Sells Put Down and In; 110% Strike / 70% DISCRETE KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 110% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; 130% Strike; Qtt of Shares = Notional / Spot Ref
4) IBBA Buys Put Down and Out; 100% Strike / 70% DISCRETE KO; Qtt of Shares = Notional / Spot Ref
Notional: US$500k-1MM
Please sort for package Up-Front premium.
SPY <Equity>
3yrs

##
#

Can you please price the following and request a XVA charge computation to Gilles Franchini?

- Maturity = 5 years
- Notional Amount = $30 million
- BNP Pays 3M libor+58 to Natixis
- Natixis pays 1.85% to BNP Upfront
- BNP is long XXX ATM calls on INDU
- BNP is short DiP @70% in fine
- Solve for call gearing (XXX)

- Vol 2%, div -9, repo -0.25.
- BNP is BS_EUR

12.13 Pricing List

Tuesday, December 13, 2016
11:45 AM

Payoff	Phoenix Yeti WO		Wrapper	EMTN
Nominal	0.5 M	Issuer	Natixis SI	
Currency	USD	Funding		
Start date	13 December 2016 (EU)			Running
Maturity	13 December 2017 (EU)			Retro / Upfront
	Expected Mark up			

Underlyings	BANK OF AMERICA Corp @ BAC UN	BAC UN	1
	CITIGROUP INC. @ C UN	C UN	1
	MORGAN STANLEY DEAN WITTER @ MS UN	MS UN	1
	JP MORGAN CHASE & CO @ JPM UN	JPM UN	1

tradable

15M
500k USD
Autocall Phoenix Autocall Memory
Worst of BAC US / C US / MS US / JPM US
1.90% pq if Worst Of above 65% - With Memory
Autocallable Quarterly if above 100%
Euopean Capital Barrier 65%

Lookback Strike 2 observations : 13/12/2016 & 20/12/2016

Reoffer ?

- Vol is quite old.
- 15M means 15 months rather than 15 million

##
Party A Israel Discount Bank of New York

Party B TBD

Hedge Type Phoenix Autocallable Swap

Currency USD

Notional Amount: 2,000,000

Trade Date: December 13, 2016

Settlement Date: January 05, 2017

Structured Coupon Leg:

Structured Coupon Payer: Party B

Minimum return 0%

Underlying Index: United States Oil Fund LP, as defined by Bloomberg Ticker USO US <Index><Go>

Initial Observation Date: December 30, 2016

Observation Dates: 1st Observation Date: December 29, 2017

2nd Observation Date: December 31, 2018

3rd Observation Date: December 31, 2019

4th Observation Date: December 31, 2020

5th Observation Date: December 31, 2021

Structured Coupon Payment Date: Annually on the 3rd day of the next month following the applicable Observation Date.

Year 1	January 04,2018
Year 2	January 04,2019
Year 3	January 06, 2020
Year 4	January 06,2021
Year 5	January 06,2022

Maturity Date: If the Structure is never called, the Maturity Date will be the Call Date associated with the 5th Observation Date.

In the event of a Call, the Maturity Date will be the applicable Call Date.

Observation Prices: The Closing Price of the Underlying Index on each Observation Date

Initial Observation Price The Closing Price of the Underlying Index on Initial Observation Date

Coupon Barrier Price: Initial Observation Price *100%

Call Barrier Price Initial Observation Price *105%

Structure Coupon Payment Amount: If on any Observation Date, the Observation Price is greater than or equal to the Coupon Barrier Price, Party B pays Party A x.xx% (solve for coupon)

If the Observation Price is less than the Coupon Barrier Price, then Party B pays Party A the Minimum return.

Call Dates: If on any Observation Date, the Observation Price is greater than or equal to the Call Barrier Price, the Swap is Called on the 3rd Day of the next month following the applicable Observation Date.

Floating Rate Leg:

Floating Rate Payer: Party A

Floating Rate Observation Date	Floating Rate Payment Date
05-Jan-17	05-Apr-17
05-Apr-17	05-Jul-17
05-Jul-17	03-Oct-17
03-Oct-17	04-Jan-18
04-Jan-18	05-Apr-18
05-Apr-18	05-Jul-18
05-Jul-18	03-Oct-18
03-Oct-18	04-Jan-19
04-Jan-19	05-Apr-19

05-Apr-19	05-Jul-19
05-Jul-19	04-Oct-19
04-Oct-19	06-Jan-20
06-Jan-20	06-Apr-20
06-Apr-20	06-Jul-20
06-Jul-20	05-Oct-20
05-Oct-20	06-Jan-21
06-Jan-21	06-Apr-21
06-Apr-21	06-Jul-21
06-Jul-21	04-Oct-21
04-Oct-21	06-Jan-22

Floating Rate Payer Payment Dates:

Calculation Period Roll Dates: March, June, September, and December.

Floating rate Index: USD-LIBOR-BBA

Floating Rate Designated Maturity: 3 Months

Floating Rate Spread: 0.25%

Floating Rate Day Count Fraction: Actual/360

Floating Rate Reset Dates: The Third day of each calculation period

Floating Rate Period End Dates: Adjusted in accordance with the Modified Following Business Day Convention

Floating Rate Leg Maturity Date: The swap will terminate on the Maturity Date & the Floating Rate Leg will not accrue or pay interest after the Maturity Date

- Concentrate what we need to solve here. And keep you updated in the chat.

##

12.20 Pricing List

Tuesday, December 20, 2016
10:07 AM

Payoff	Phoenix Yeti WO	Wrapper	EMTN
Nominal	0.4 M	Issuer	Natixis SI
Currency		Funding	
Start date	20 December 2016 (EU)		Running
Maturity	20 December 2017 (EU)		Retro / Upfront
	Expected Mark up		

Underlyings	AXA @ CS FP	CS FP	1
	Airbus Group @ AIR FP	AIR FP	1
	DAIMLER AG @ DAI GY	DAI GY	1
	LVMH MOET HENNESSY LOU VUITTON @ MC FP	MC FP	1

18M
400k EUR
Yeti Decreasing One Star
Worst Of CS FP / AIR FP / DAI GY / MC FP
1.75% p.q. if WO above 60% - Memory
Autocall Quarterly Stepping Down 5% pq
One Star Effect @ 105%
European Barrier 60%

Reoffer x%
Client: UCAP

- The currency is EUR.
- We send Email to
  LD-M-EDA21 Stock Vol. Trading for plug the vol for FP and GY
  Vol plugged, for bumps, please see with **SED (not sure what is SED)**
- SED is a group,LD-M-SED-Action <LD-M-SED-Action@natixis.com>
- Fabrice take 3% for the coupon.
- SED said
  You can go ahead with maps bumps, no need for specific star effect provision
- We got 50 bps MU, -0.48% funding, 45 bps COB, -6.44 Option Premia, Which means UF=5%
- We take little bit more than that. We have 4.8% UF, and 70 bps MU
  [12/20/2016 10:34 AM] Jin Shenrui:
  vol -0.6247%
  Div: -1.4768%
  correl: -6.40%
  lambda

##

Payoff	Phoenix Yeti WO	Wrapper	EMTN	
Nominal	0.4 M	Issuer	Natixis SI	
Currency	USD	Funding		
Start date	20 December 2016 (EU)		Running	
Maturity	20 December 2018 (EU)		Retro / Upfront	
	Expected Mark up			

Underlyings	FTSE 100	UKX	1
	RUSSELL 2000 Index	RTY	1
	MSCI EM	MXEF	1
	NIKKEI 225	NKY	1

LIVE
24M
400k USD
Phoenix One Star Decreasing
UKX Index / RUY Index / MXEF Index / NKY Index
1.5sa if WO above 50% - Memory
Decreasing Autocall : S1 = 100% / S2 = 90% / S3 = 80%
50% European Barrier on Capital
One STar Effect @ 110%
Reoffer x %
Client: UCAP

- Good in sophis(how to load the vol from sophis)
- We have no Provision and
- 3% correl, parellel.
- Short vol, short div, short repo, short quanto. Long correl

##

Payoff	Phoenix Yeti WO	Wrapper	EMTN	
Nominal	0.4 M	Issuer	Natixis SI	
Currency	USD	Funding		
Start date	20 December 2016 (EU)		Running	
Maturity	20 December 2018 (EU)		Retro / Upfront	
	Expected Mark up			

Underlyings	AMAZON.COM INC @ AMZN UQ	AMZN UQ	1
	CATERPILLAR INC @ CAT UN	CAT UN	1
	GENERAL MOTORS CO @ GM UN	GM UN	1
	GOLDMAN SACHS GROUP INC @ GS UN	GS UN	1

400k USD
24 Months
Autocall Decreasing

WO AMZN US / CAT US / GM US / GS US
Autocallable Quarterly, Barrier with a Stepping Down 5.35% pq (with 62.50% at maturity)
1.35% pq ascending coupon
Leveraged Put Strike 62.50%
European One Star @ 140%
Reoffer x%

- Short vol, short repo, short quanto, short div, long correl
- Because the one star is too far, so it is still long the correl
- -1 vol, -5 div, -0.05% repo, 8% correl
- We will take 2.1 mtb, 1.03 cob. Around 1% mu. There is no provision.

##
8 or 10yr
SPX/RTY
5% coupon pa
65% coup barrier qtr
50% princ barrier at mat
X% digital coupon
@97.50

8 or 10yr
SPX/SX5E
5% coupon pa
65% coup barrier qtr
50% princ barrier at mat
X% digital coupon
@97.50

8 or 10yr
SX5E/RTY
5% coupon pa
65% coup barrier qtr
50% princ barrier at mat
X% digital coupon
@97.50

- Client: SAXONY SECURITIES INC
- Not autocall.
- Do another SPX and ISX70D5. Don't mess up the SX7E and ISX70D5

8Y
-SPX/RTY => 31.25% bonus coupon at maturity if Worst of > 100% => 1.05% MU

-SPX/SX5E => 38.00% bonus coupon at maturity if Worst of > 100% =>1.13% MU

-SX5E/RTY => 48.00% bonus coupon at maturity if Worst of > 100% => 1.34% MU

-ISX70D5/RTY => 55.00% bonus coupon at maturity if Worst of > 100% => 3.5 MU

-SPXLTBUP/RTY => 48.00% bonus coupon at maturity if Worst of > 100% =>2.45%

We have around 1% more MU for SPXLTBUP and ISX70D5

[12/20/2016 4:35 PM] Tenga Fabrice:
-1 Vol Bumps
-7.5 REPO
nothing on div
2 on correl parralel
-2 vol on SPXLTBUP
let's do -2 vol on ISX70D5 as well

- React fast. It is 7.5 bps -> 0.075%.
  if it is 75 bps -> 0.75%
- For the combination with SPXLTBUP and ISX70D5, we make correlation =3%. For rest of them, we keep 2%.

12.21 Pricing List

Wednesday, December 21, 2016
11:40 AM

Payoff	CPN Call	Wrapper	EMTN	
Nominal		Issuer	Natixis SI	
Currency	USD	Funding		
Start date	21 December 2016 (EU)			Running
Maturity	21 December 2017 (EU)			Retro / Upfront
	Expected Mark up			

Additional underlying missing in RFQ :

Reference	Quantity
NXSRMFS	1

5.5 Years USD 100% Capital Protected on Natixis Momentum Fund Star Index
Maturity 5.5 years
Upside 100% Participation of the Index
No Cap, Unlimited Gain
Protection 100% Capital Protected
Ticker NXSRMFS Index
reoffer please

- We should make it all IFC No Drift for underlying. Because it is eccess return
- We should not have libor pocket. Change it from add to no.
- Change the calendar to the date you want the performance.
- Underlying:
  PIMEIEA ID
  JPGICEA LX (replacing NARBIEU)
  MGOICEA LN
  OMEIEHA ID
  NIMEHYB LX
- Keep the vol and correl changed.
- Tfactor = 252

##

Payoff	Issuer Callable Phoenix	Wrapper		EMTN
Nominal	0.67 M	Issuer		
Currency	USD	Funding		
Start date	21 December 2016 (EU)			Running
Maturity	21 December 2017 (EU)			Retro / Upfront
	Expected Mark up			

Underlyings	SP500 Low Volatility Target Beta Index	SPXLTBUP	1
	RUSSELL 2000 Index	RTY	1
	Euro Stoxx 50	SX5E	1

two issuer callables:
3y
SPXLTBUP / RTY / SX5E
quarerly callable / observation

barriers:
i) 60% euro, 65% coupon barrier
ii) 65% euro, 70% coupon barrier

reoffer 98.50
targetting 9% coupon

- If the low target beta doesn't work, we will go to istoxx 70. and also check with the normal SPX. To see whether spxltbup outperform
- We target 1.5% MU. Which give us

  i) 60% euro, 65% coupon barrier => Coupon = 8.25% p.a.
  ii) 65% euro, 70% coupon barrier => Coupon = 9.70% p.a.

1.11 Pricing List

Wednesday, January 11, 2017
10:57 AM

Payoff	Phoenix WO	Wrapper	US MTN
Nominal		Issuer	Natixis US SPV
Currency	USD	Funding	
Start date	11 January 2017 (EU)		Running
Maturity	11 January 2018 (EU)		Retro / Upfront
	Expected Mark up		

Underlyings	S&P 500	SPX	1
	RUSSELL 2000 Index	RTY	1

JBL,

A few ideas here to price:

1)

Phoenix Fixed-to-Float Autocall WO
10 Years
7%pa paid quarterly fixed for 4 years
Then, coupon xx% subject to SPX/RTY > 70%

If we can change the strikes to have this reoffer at 88.50% (issue price +5%)

2)

15YRNC5 Issuer Call
RTY
7%pa paid quarterly fixed for 5 years
8%pa paid quarterly fixed for 5 years
10%pa paid quarterly fixed for 5 years
EKI 50%
Reoffer: xx%

Result:
1) Phoenix WO Issuer Call
15Y NC 4Y
USD
Underlying : worst of SPX / RTY / SX5E
European PDI Barrier 75%
Quarterly obs
Reoffer 88.50%

Y1-Y4 : coupon 1.75% quarterly guaranteed
Y4-Y15 : coupon 1.875% quarterly contingent to WO > 75%

2) 15YRNC5 Issuer Call
RTY
7%pa paid quarterly fixed for 5 years
8%pa paid quarterly fixed for 5 years
10%pa paid quarterly fixed for 5 years
EKI 50%

it doesn;t work ==> Reoffer: 126%

###

Payoff	Wrapper	OTC	
Nominal	100 M	Issuer	
Currency	USD	Funding	
Start date	11 January 2017 (EU)		Running
Maturity	2Y (EU)	Retro / Upfront	
	Expected Mark up		
		Premium	

Underlyings	S&P 500	SPX	1

2y 80% SPX puts that KI above 105% in 6m (single look). $100mm notional

- 50bps

##

Payoff	Phoenix Yeti WO	Wrapper	EMTN
Nominal	Issuer	Natixis SI	
Currency	USD	Funding	
Start date	11 January 2017 (EU)	Running	
Maturity	11 January 2018 (EU)	Retro / Upfront	
	Expected Mark up		

Underlyings	S&P 500	SPX	1
	Euro Stoxx 50	SX5E	1
	MSCI EM	MXEF	1

1 year
quarterly observations

Nota	Barrera Pay off	Subyacentes	Emisor	Seguros / Feat.	Yield Anual	Px?
Worst Of Basket global	70%	S&P500 - SX5E - MXEF		Memoria	8,15%	
Worst Of Basket global	70%	S&P500 - SX5E - MXEF		Memoria & Safety Effect	7,50%	
Worst Of Basket global	75%	S&P500 - SX5E - MXEF		Memoria & Safety Effect	9,00%	

Indication on the 2 Star Effect : subject to risk approval

with EEM UP instead of MXEF
with a Star Effect Barrier at 100%
Autocall Barrier 100%

1) European PDI Barrier = Coupon Barrier = 70% - SPX/SX5E/EEM - 7.50% p.a ==> Reoffer = 99.80% with 50bps MU
2) European PDI Barrier = Coupon Barrier = 75% - SPX/SX5E/EEM - 9% p.a ==> Reoffer = 99.70% with 50bps MU

- **When you change from MXEF to EEM, you forget to load the bumps again.**

1.12 Pricing List

Thursday, January 12, 2017
9:25 AM

##

Twin Win ACWI	~	+ 8% - 8%	ACWI	1.2X Upside Leverage	Hasta 10%
Twin Win MXEF	~	+ 8% -16%	MXEF	Lower Strike 1,1905x	Hasta 16%

JB think, the first one is 1 to 1.2 and cap at 10%, 1 to 1 down side, and barrier at 8%
The second one is 1 to 1 up side, cap at 16%, down side is a KO put, 8%, and leverage put 2*

Updated
Half vol
-10%div
-5bps repo

Rob can do the second one, we only need to do the first one.
ACWI have no data
- Half vol means 0.5%

Change into short leverage put.
Then I forget the leverage part.

##
##

- **Wrapper:** OTC
- **Maturity:** 8 months
- **Currency:** USD
- **Underlying:** Equally-weighted Basket of 10 stocks – Apple, Inc. (AAPL UQ), Microsoft Corp. (MSFT UQ), Gilead Sciences, Inc. (GILD UQ), Cisco Systems, Inc. (CSCO UQ), Oracle Corp. (ORCL UN), The Coca Cola Co. (KO UN), PepsiCo, Inc. (PEP UN), Intel Corp. (INTC UQ), Alphabet, Inc. (GOOG UQ), Qualcomm, Inc. (QCOM UQ)
- **Payout at Maturity:**
    - If the EUR/USD is between 0.98 and 1.10, then the investor receives the call option 105% on the Equally-weighted Basket
    - Otherwise, the option expires worthless

→ Offer = 2.00%,
By comparison, offer on regular vanilla call 105% on the same equally-weighted basket of 10 stocks (no contingency feature) = 3.65%

##
####

Payoff	Wrapper	OTC
Nominal	Issuer	
Currency	Funding	

Start date	12 January 2017 (EU)	Running
Maturity	12 January 2018 (EU)	Retro / Upfront
	Expected Mark up Premium	

Underlyings	SPDR TRUST SERIES @ SPY UP	SPY UP	1
	WISDOMTREE JPN HEDGED EQ @ DXJ UP	DXJ UP	1
	Euro Stoxx 50	SX5E	1

ALL CHF QUANTO

Package of 4 options:
1) IBBA Sells Put Down and In; 100% Strike / XX% DISCRETE KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 100% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; XXX% Strike; Qtt of Shares = Notional / Spot Ref
4) IBBA Buys Put Down and Out; 100% Strike / XX% DISCRETE KO; Qtt of Shares = Notional / Spot Ref
Notional: CHF1MM
3yrs
package Up-Front premium=2.20% (ITAU Receievs)

Please sort for:
3) IBBA Sells Call; XXX% Strike-100%=100%-(XX% DISCRETE KI=XX% DISCRETE KO)

i)SPY <Equity>
ii)DXJ<Equity>
iii)SX5E <Equity>

1.13 Pricing List

Friday, January 13, 2017
10:52 AM

Payoff	Twin Win	Wrapper	OTC
Nominal	0.5 M	Issuer	
Currency	USD	Funding	
Start date	13 January 2017 (EU)		Running
Maturity	13 January 2018 (EU)		Retro / Upfront
	Expected Mark up		
		Premium	

Underlyings	WISDOMTREE JPN HEDGED EQ @ DXJ UP	DXJ UP	1

Package of 4 options:
1) IBBA Sells Put Down and In; 110% Strike / 70% DISCRETE KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 110% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; 130% Strike; Qtt of Shares = Notional / Spot Ref
4) IBBA Buys Put Down and Out; 100% Strike / 70% DISCRETE KO; Qtt of Shares = Notional / Spot Ref
Notional: US$500k
Please sort for package Up-Front premium.
SPY <Equity>
3yrs

Package of 4 options:
1) IBBA Sells Put Down and In; 110% Strike / 75% DISCRETE KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 110% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; 130% Strike; Qtt of Shares = Notional / Spot Ref
4) IBBA Buys Put Down and Out; 100% Strike / 75% DISCRETE KO; Qtt of Shares = Notional / Spot Ref
Notional: US$500k
Please sort for package Up-Front premium.
DXJ <Equity>
3yrs

###
###

1.17 Pricing List

Tuesday, January 17, 2017
9:48 AM

Payoff	Taylor Made	Wrapper	EMTN
Nominal	5 M	Issuer	Natixis SI
Currency	USD	Funding	
Start date	17 January 2017 (EU)		Running
Maturity	17 January 2018 (EU)		Retro / Upfront
	Expected Mark up		0.75 (%)

Additional underlying missing in RFQ :

Reference	Quantity
SX5E, UKX	1

Warrant Outperformance ATM Call issued by NSI
6mth and 1yr
quanto USD
~$5mio size

- UKX have skew bumps
- Correl stock is larger in 6m
- Correl FX only change in one leg
- Correl fx is bigger in 12m
- Bumps not come from Caesar
- Only long have bumps
- Long leg vol bumps get smaller when it is 6m

##
2) Phoenix WO IssuerCall
Maturity 15YNC5Y
Underlying : worst of SPX / RTY
Issuercall after 5Y
European PDI Barrier 50%
Quarterly observations

Y1 - Y5 : Guaranteed coupon of 7% p.a (paid quarterly)
Y5 - Y15 : Contingent coupon (Barrier 50%) of 7% p.a (paid quarterly)

==> Reoffer = 97.50%

- Difference between Caesar and Sophis is 80 bps.
- Difference is added over the MU

##

Payoff	Phoenix Yeti WO		Wrapper	EMTN
Nominal	1.5 M	Issuer	Natixis SI	
Currency	USD	Funding		
Start date	17 January 2017 (EU)		Running	
Maturity	17 January 2018 (EU)		Retro / Upfront	
	Expected Mark up			

Underlyings S&P 500 SPX 1
Euro Stoxx 50 SX5E 1
ETF_ISHARES MSCI EMRG MKT IN @ EEM UP EEM UP1

Autocall phoenix memory one star
12 months
USD 1.5M
worst of SPX - SX5E - MXEF
Coupon quarterly 8.50% memory
Autocall trigger 100% quarterly
Coupon barrier = European KI barrier = 70%
One star 100% European

Trading Price = ??%

- Trade Price is just reoffer price
- 50 bps provision
- It doesn't work at first. So Romain Suggest to worsen the coupon barrier and PDI barrier.

##

airbag outperformance note

Maturity 2y

Underlying: RTY and SPX (long RTY, short SPX)

European KI Barrier: -5% (if difference is lower than -5%, client will lose 1 by 1)

Reoffer: 98%

=> 80% gearing upside

I have higher gearing. Double check the pricing.
When there is PDI for outperformance, may short vol for long leg, long vol for short leg.
All in all, you have to try the result.

##

Payoff	Phoenix	Wrapper	EMTN
Nominal		Issuer	
Currency		Funding	

Start date	17 January 2017 (EU)	Running
Maturity	17 January 2018 (EU)	Retro / Upfront
	Expected Mark up	

750k
12 months
Phoenix wof (CCI US y PPG US)
Observaciones quarterly
Cupon del 6%
barriers at 80, conditonal and european

- Although the vol is very old, but JB still try to get COB first.

##

1) **Distribution:**

a) **Income: Phoenix Performance Plus**
Maturity : 3Y
Underlying : KEY UN / FITB UQ / BBT UN **(worst of)**
Quarterly obs
    Autocall Barrier : 100%
    European PDI Barrier : 70%
    Reoffer 97%

⇨ **Coupon = Max(0, 3.60% + 12% * worst perf) quarterly with 1.75% MU**
⇨ Coupon of a regular Phoenix with 70% coupon barrier and everything else the same = **2.45% quarterly with 1.75%MU**

b) **Growth: Buffer Note**
Maturity : 3Y
Underlying : KEY UN / FITB UQ / BBT UN **(equally weighted)**
Put Strike : 90%
Reoffer : 97%

⇨ **Upside leverage : 200% up to 35% maximum return**

1) **Flow:**

-
Variable Cap Call outperformance (subject to risk approval)

Wrapper : OTC
Maturity : 6m
At maturity, the client receives the outperformance of KRE UP over XLF UP floored at 0 and capped at the performance of XLF UP.

⇨ **Offer = 2.25% with 25bps MU included**

⇨ Offer of a regular call outperformance : **4.85%**

Price another parallel product will be helpful
Correlation stock is added into the correlation table. So no matter how much basket you have.
It will not affect the result.
Global bump will be added to all basket.
For stocks, we always use lambda. 8% in the phoenix performance is not because lambda has less impact.
It is just because trader want to take less bumps.

Monday, February 13, 2017
10:16 AM

ROBERT ROMANO
10:10:46 Autocall swap (phoenix)
Itau pays 3mth libor - 0.07%
1 Year with quarterly observations
100% call level
65% european KI (physical)
65% cpn level
BBD <Equity>
X% quarterly cpn
3% upfront
US$1-1.5MM

10:11:22 Package of 3 options:
1) IBBA Sells Put Down and In; 100% Strike / ??% EUROPEAN KI; Qtt of Shares = Notional / Spot Ref
2) IBBA Buys Call; 100% Strike; Qtt of Shares = Notional / Spot Ref
3) IBBA Sells Call; 115% Strike; Qtt of Shares = Notional / Spot Ref
Notional: US$1.5MM
Please sort for KI

Package Up-Front premium.

i) 0.55% ITAU PAYS
ii) 0.45 ITAU RECEIVES

BUD <Equity>
12 Mths

Tuesday, February 14, 2017
1:21 PM

```
/// <summary>
/// Phoenix on the basket ; client is short a PDI at maturity.
/// </summary>

// Level for the coupon payment
double Coupon("0.1", "Coupon", "Coupon");
// Level for the autocall
CalendarDecorator AutocallBarrier("1.0", "Autocall", "Autocall barrier");
// le spread utilisé pour autocall
CalendarDecorator AutocallSpread("0.015", "Autocall", "Spread");

// Calendar for autocall and coupons dates
Calendar AutoCallCalendar("", "Product", "Autocall calendar");

// Level for the Down and In barrier
double PDIBarrier("0.7", "Product", "PDI barrier");
/// Barrier spread
double BarrierSpread("0.03", "Product", "Barrier spread");
// Barrier type
Chooser BarrierType("European;American", "Product", "Barrier type");
// Barrier observation calendar
IPricingSchedule PDICalendar;


/// Initialize the product : we directly generate the calendar from strike date to maturity date, depending on
the chosen type
Initialize()
{
  // Calendar generation : daily if US barrier, at maturity only if european
  if(BarrierType.Value == "European")
  {
    // Monitoring at maturity
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "100y");
  }
  else
  {
    // Daily monitoring
    PDICalendar
= CalendarGenerator.CreateFrequencyCalendar(FixingCalendar, strikeDate, maturityDate, "1d");
  }
}

/// Pay a given coupon if the basket performance is above a given level, recall if it's above another
/// At maturity, client is short a PDI
Evaluate(IVectorCoupon aCoupon)
{
    // Initialize the incremental coupon and the survival indicator
```

```
    double incrementalCoupon = Coupon;

    // For each date in the callable calendar
    foreach (FixingDate date in AutoCallCalendar)
    {
      // Retrieve the basket performance
      double basketPerf = basket.Performance(strikeDate, date).WorstOf();

      // Compute the coupon indicator
      double indicRecall = IndicatriceUp(basketPerf, AutocallBarrier[date], AutocallSpread[date]);
      // Pay the coupon
      aCoupon[date] += indicRecall * (Coupon + swap[date]);

      // Recall the product if we're above the barrier
      if(basketPerf > AutocallBarrier[date])
      {
        break;
      }

      // Update the incremental coupon
      incrementalCoupon = Coupon;

      // Client is short a PDI at maturity
      if (date == AutoCallCalendar.End)
      {
        // Cômpute the indicator from the worst basket performance to determine whether or not KI occurred
        double worstPerf = basket.Performance(strikeDate, PDICalendar).MinSpatial().WorstOf();
        double indicKI = IndicatriceDown(worstPerf, PDIBarrier, BarrierSpread);

        // Pay the PDI
        aCoupon[date] += indicKI * Min(0, basketPerf - strike) +(1-indicKI)*Coupon;
      }
    }
  }
```

4.12 Pricing List

Wednesday, April 12, 2017
10:52 AM

Wof 1 year
Quarterly obs
SPX, MXEF (or EEM?), SX5E
Barriers to 70%
With memory
Re-offer 99% approx
Coupon: quarterly as close as 7%
With safety effect

Pricing Step:

1. Without bump: 0.36
2. With positive correl: 0.71
3. With negative correl: 0.61
4. Change with spxltbup: 0.1
5. Add bumps on spxltbup: 0.32
6. Move barrier up 1%: 0.13. 20bps sensitivity

Tuesday, November 01, 2016
2:14 PM

(sharpe,weights_pd,Strat,newStrat_price)=Maximum_Diverisification_Strategy_Return_NoneZero_Daily
(newStrat1,"monthly","low",1,30,4,30,0.1,0.95,0.01,2,18,2,0.001*0)
4 ETF

11.1 Strategy Test List

Tuesday, November 01, 2016
3:20 PM

4 ETF :

EWT US Equity	EWW US Equity	EWZ US Equity	FXI US Equity

Date: 10/8/2004

5 ETF:

EWT US Equity	EWW US Equity	EWZ US Equity	FXI US Equity	EPI US Equity

Date:2/27/2008

Momentum Strategy/ Sharpe Momentum
7/ 20/120/250 days Horizon
Quarterly/ Weekly/ Monthly/ Daily

Problem:

1. Not sure about the sharpe momentum code(how many days should we go back in momentum function)
2. 5 ETF Universe doesn't have enough data

Result
In 5 ETF and shorter historical data, sharpe momentum outperform the return momentum and EW
In 4 ETF and longer historical data, Sharpe Momentum has similar performance as return momentum.
And EW outperform both of them.

To Do List:
Rainbow Strategy on Emerging Market
ERC on MultiAsset
Vol Screener

11.4 Strategy Test List

Monday, November 07, 2016
2:16 PM

MD on multi asset without short VIX.

	Newest	Old
IRR	0.129927	0.133289
Volatility	0.074281	0.074357
Sharpe	1.749127	1.792557
Sortino	2.965292	3.042824
Max Drawdown	-0.11511	-0.11509

Conclusion: The Sharpe decreases from 1.79 to 1.74, because of the recent decline of the return. Volatility of newest update even decreases

Rainbow on the Emerging Market

Some updates about rainbow. After optimizing the rebalancing frequency and horizon, I get quarterly/ 20 days Horizon and Monthly/ 120 days horizon. However, I cannot improve the Sharpe Ratio by adjust the performance. I try top 2 ETFs with weight [1,0], [0.9,0.1]... [0.1,0.9]. [1.0] performs the best. I also check 1st and 3rd ETFs. I still see no large improvement via diversification. In this case, Best Rainbow has the similar performance as pure momentum we tested before. Because all the performance comes from the top ETF.

Quarterly + 20 days horizon / monthly + 120 days horizon:

Strat_name	IRR	Vol	Sharpe	Sortino	MDD
RainbowQuarterly201	0.087818	0.329417	0.266585	0.42991	-0.66966
Rainbowmonthly1201	0.071376	0.333112	0.21427	0.342486	-0.73644
RainbowQuarterly202	0.090975	0.321094	0.283328	0.455933	-0.66175
Rainbowmonthly1202	0.074878	0.327035	0.228961	0.365672	-0.73199
RainbowQuarterly203	0.093639	0.314631	0.297615	0.478123	-0.65386
Rainbowmonthly1203	0.077863	0.322763	0.24124	0.38511	-0.72773
RainbowQuarterly204	0.095808	0.310099	0.308959	0.495649	-0.64594
Rainbowmonthly1204	0.080329	0.320368	0.25074	0.400086	-0.72357
RainbowQuarterly205	0.097481	0.307547	0.316963	0.50807	-0.64317
Rainbowmonthly1205	0.082272	0.319893	0.257187	0.410213	-0.71951
RainbowQuarterly206	0.098655	0.306994	0.321359	0.515001	-0.64202
Rainbowmonthly1206	0.083691	0.32135	0.260436	0.415262	-0.71557
RainbowQuarterly207	0.099327	0.308429	0.322042	0.516209	-0.64085
Rainbowmonthly1207	0.084584	0.324718	0.260483	0.415253	-0.71182
RainbowQuarterly208	0.099492	0.31181	0.319079	0.511896	-0.63967
Rainbowmonthly1208	0.084948	0.329946	0.257461	0.410381	-0.71267
RainbowQuarterly209	0.099144	0.317068	0.312691	0.502288	-0.63848

Rainbowmonthly1209	0.084784	0.336958	0.251616	0.40094	-0.71372
RainbowQuarterly2010	0.098276	0.32411	0.303217	0.487815	-0.64083
Rainbowmonthly12010	0.08409	0.345658	0.243276	0.387371	-0.71496

I try ERC on emerging market. It outperforms by having 0.36 sharpe ratio instead of 0.31.
But it is still not good enough to be considered as a good way.

11.3 Strategy Test List

Monday, November 07, 2016
2:18 PM

we can still see an improvement from return momentum to sharpe momentum when there are 5 ETF, but less.
However, Sharpe momentum and return momentum are quite similar when there are 4 ETF. And Equal Weighted outperforms both of them.

4ETF					
Strat_name	ret	Vol	Sharpe	Sortino	MDD
EW_daily	0.094065694	0.294409	0.319507	0.507395	-0.63702
EW_month	0.091165627	0.293952	0.310138	0.492129	-0.64303
EW_quarterly	0.093769669	0.294203	0.318724	0.506177	-0.63903
EW_weekly	0.091165627	0.293952	0.310138	0.492129	-0.64303
MomentumDaily120	0.0695	0.3535	0.1966	0.3101	-0.7156
MomentumDaily20	0.0304	0.3296	0.0923	0.1464	-0.7573
MomentumDaily250	0.026413383	0.340364	0.077603	0.121207	-0.78419
MomentumDaily7	0.0111	0.3304	0.0335	0.0527	-0.7794
MomentumMonthly120	0.0841	0.3457	0.2433	0.3874	-0.7150
MomentumMonthly20	0.0380	0.3274	0.1160	0.1851	-0.7415
MomentumMonthly250	0.063847677	0.348439	0.183239	0.291253	-0.71162
MomentumMonthly7	0.0827	0.3493	0.2368	0.3759	-0.7188
MomentumQuarterly120	0.0583	0.3461	0.1683	0.2693	-0.7359
MomentumQuarterly20	0.0983	0.3241	0.3032	0.4878	-0.6408
MomentumQuarterly250	-0.037114997	0.374565	-0.09909	-0.15297	-0.79478
MomentumQuarterly7	0.0627	0.3594	0.1744	0.2809	-0.7105
MomentumWeekly120	0.0675	0.3534	0.1911	0.3007	-0.7602
MomentumWeekly20	0.0246	0.3341	0.0737	0.1168	-0.7990
MomentumWeekly250	0.029725869	0.345628	0.086005	0.13617	-0.75784
MomentumWeekly7	0.0426	0.3396	0.1255	0.1986	-0.7380
Sharpe_MomentumMonthly250	0.064476235	0.366781	0.175789	0.271214	-0.7398
Sharpe_MomentumQuarterly120	0.0363	0.3688	0.0983	0.1512	-0.7858
Sharpe_MomentumQuarterly20	0.0995	0.3248	0.3063	0.4962	-0.5598
Sharpe_MomentumQuarterly250	0.0225	0.3686	0.0609	0.0937	-0.7858
Sharpe_MomentumQuarterly7	0.0662	0.3587	0.1847	0.2973	-0.7105
Sharpe_MomentumWeekly120	0.063748864	0.363545	0.175353	0.278036	-0.73307

5ETF					
Strat_name	ret	Vol	Sharpe	Sortino	MDD

EW_daily.csv	0.000410581	0.302461	0.001357	0.002154	-0.62787
EW_month.csv	-0.002226392	0.30187	-0.00738	-0.01169	-0.63215
EW_quarterly.csv	-0.000360115	0.302179	-0.00119	-0.00189	-0.62898
EW_weekly.csv	-0.002226392	0.30187	-0.00738	-0.01169	-0.63215
MomentumDaily120.csv	0.003865584	0.345741	0.011181	0.017672	-0.60129
MomentumDaily20.csv	-0.01588286	0.330242	-0.04809	-0.07734	-0.6246
MomentumDaily250.csv	0.097335116	0.269035	0.361794	0.593513	-0.38159
MomentumDaily7.csv	-0.060302881	0.337188	-0.17884	-0.28094	-0.77953
MomentumMonthly120.csv	0.016340504	0.333539	0.048991	0.078208	-0.5609
MomentumMonthly20.csv	-0.063533952	0.327957	-0.19373	-0.30608	-0.67298
MomentumMonthly250.csv	0.078177709	0.272311	0.28709	0.465634	-0.41985
MomentumMonthly7.csv	-0.053491097	0.354802	-0.15076	-0.23759	-0.71877
MomentumQuarterly120.csv	-0.016239938	0.335101	-0.04846	-0.07798	-0.53944
MomentumQuarterly20.csv	-0.010038643	0.321716	-0.0312	-0.04994	-0.6402
MomentumQuarterly250.csv	0.051538003	0.268908	0.191657	0.314042	-0.51903
MomentumQuarterly7.csv	-0.027455427	0.374082	-0.07339	-0.11802	-0.62216
MomentumWeekly120.csv	0.019784059	0.346161	0.057153	0.090153	-0.64191
MomentumWeekly20.csv	-0.031539502	0.339903	-0.09279	-0.14656	-0.65417
MomentumWeekly250.csv	0.080012145	0.27218	0.293968	0.484693	-0.39721
MomentumWeekly7.csv	-0.021619282	0.348598	-0.06202	-0.09814	-0.69585
Sharpe_MomentumMonthly120.csv	0.042042076	0.367573	0.114377	0.184281	-0.56253
Sharpe_MomentumMonthly20.csv	0.003732137	0.364584	0.010237	0.016476	-0.60296
Sharpe_MomentumMonthly250.csv	0.098722285	0.265189	0.372272	0.619238	-0.41442
Sharpe_MomentumMonthly7.csv	-0.033038062	0.368994	-0.08954	-0.13957	-0.64074
Sharpe_MomentumQuarterly120.csv	-0.028452368	0.374131	-0.07605	-0.11624	-0.64286
Sharpe_MomentumQuarterly20.csv	-0.003492994	0.32755	-0.01066	-0.01709	-0.57389
Sharpe_MomentumQuarterly250.csv	0.06500157	0.268032	0.242514	0.395528	-0.51903
Sharpe_MomentumQuarterly7.csv	-0.035619175	0.367787	-0.09685	-0.15567	-0.62216
Sharpe_MomentumWeekly120.csv	0.06675637	0.368386	0.181213	0.29133	-0.5451
Sharpe_MomentumWeekly20.csv	-0.010994301	0.362979	-0.03029	-0.04675	-0.64839
Sharpe_MomentumWeekly250.csv	0.079753916	0.269708	0.295705	0.487126	-0.41614
Sharpe_MomentumWeekly7.csv	0.022666216	0.361298	0.062736	0.099007	-0.66575

11.8 Strategy Test List

Tuesday, November 08, 2016
12:19 PM

I try to enrich the momentum type we have.

Remember test is test. It is better to not try to find the bug in the output at the first place. Even though, everything looks alright. You are still not sure about the code.

After you check about the code, you should have good structure to compare the result.
Rather than run each one, we should run it altogether, and you need take note just near the code.

I just implement several variations of strategies.
Different universe: 10 ETF, 7 ETF, 6 ETF
First Layer of Momentum: Filter out the worst from each asset class / Filter out the worst from equity class
Second Layer of Momentum: Filter out the worst from the rest ETF
Different Criteria: Sharpe Ratio, Performance

I list the performance of these strategies as follows:

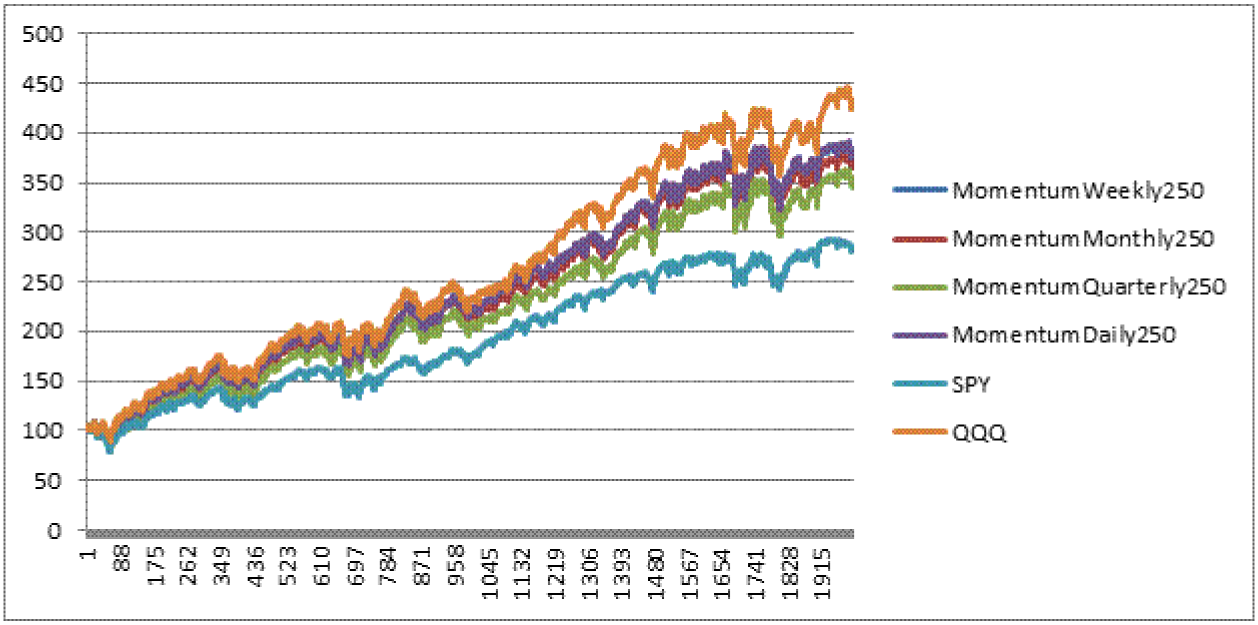
Universe	Strategy Describe	Sharpe Ratio
10 ETFs	5 out of 10(filter out worst per asset class based on return)	1.19
10 ETFs	5 out of 10(filter out worst per asset class based on Sharpe)	1.05
10 ETFs	4 out of 10(filter out worst per asset class based on return. Then filter out the worst asset class)	1.12
10 ETFs	4 out of 10(filter out worst per asset class based on Sharpe. Then filter out the worst asset class)	0.74
7 ETFs (SPY, QQQ +5 ETFs)	6 out of 7(filter out the worst between QQQ and SPY based on return)	1.36
7 ETFs (SPY, QQQ +5 ETFs)	6 out of 7(filter out the worst between QQQ and SPY based on sharpe)	1.38
7 ETFs (SPY, QQQ +5 ETFs)	5 out of 7(filter out the worst between QQQ and SPY based on return. Then filter out the worst asset class)	1.54
7 ETFs (SPY, QQQ +5 ETFs)	5 out of 7(filter out the worst between QQQ and SPY based on sharpe. Then filter out the worst asset class)	1.08
QQQ+5 ETFs	Simply 6 ETF diversification	1.56
QQQ+5 ETFs	5 out of 6(filter out the worst based on return)	1.73
QQQ+5 ETFs	5 out of 6(filter out the worst based on Sharpe)	1.27

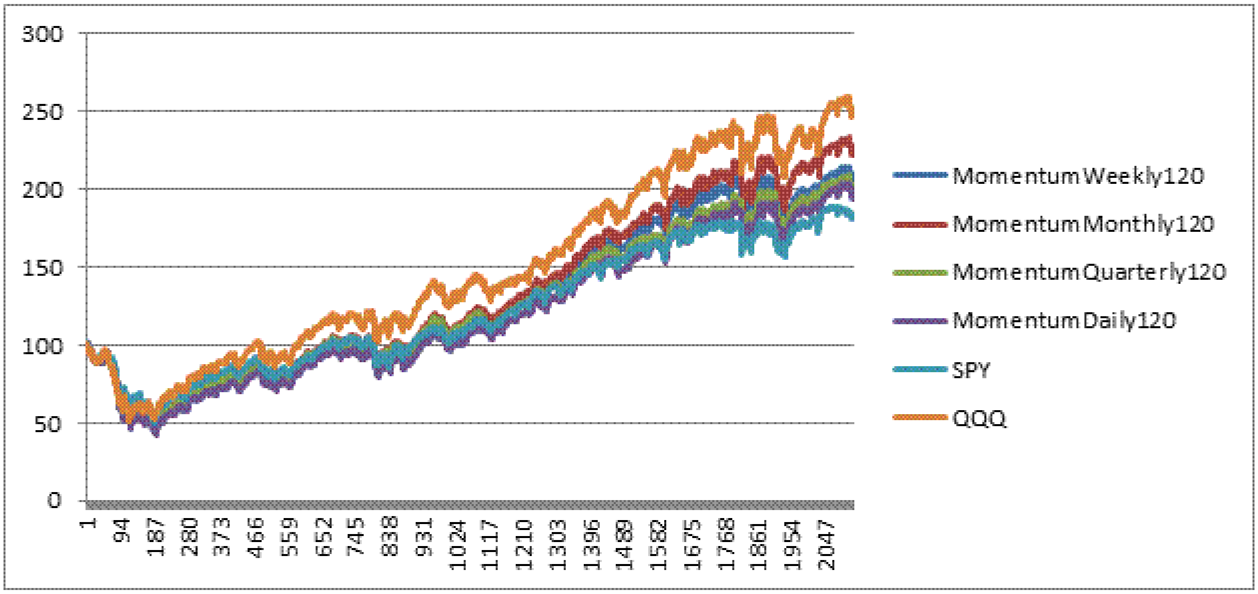
11.9 Strategy Test List

Wednesday, November 09, 2016
1:51 PM

I try to do the momentum on the SPY and QQQ in order to see why momentum of SPY and QQQ doesn't work.
The result shows that . QQQ dominate the momentum on SPY and QQQ

Strat_name	IRR	Vol	Sharpe	Sortino	MDD
Sharpe_MomentumWeekly7	0.100308	0.219901	0.456152	0.710993	-0.4717
Sharpe_MomentumMonthly7	0.096219	0.214224	0.449153	0.702878	-0.50784
Sharpe_MomentumQuarterly7	0.098543	0.22107	0.445753	0.694324	-0.48936
Sharpe_MomentumWeekly20	0.094817	0.220312	0.430378	0.668248	-0.49642
Sharpe_MomentumMonthly20	0.098585	0.217921	0.45239	0.708637	-0.50446
Sharpe_MomentumQuarterly20	0.086942	0.215309	0.403803	0.628649	-0.55607
Sharpe_MomentumWeekly120	0.09023	0.219938	0.41025	0.627764	-0.54298
Sharpe_MomentumMonthly120	0.09028	0.219638	0.41104	0.630643	-0.5403
Sharpe_MomentumQuarterly120	0.085896	0.21814	0.393767	0.608697	-0.55389
Sharpe_MomentumWeekly250	0.192993	0.184684	1.044988	1.689438	-0.20838
Sharpe_MomentumMonthly250	0.181221	0.184784	0.980718	1.584427	-0.22676
Sharpe_MomentumQuarterly250	0.172423	0.18563	0.928849	1.488492	-0.2702
MomentumWeekly7	0.080968	0.214389	0.377667	0.591423	-0.49471
MomentumMonthly7	0.087022	0.216723	0.401536	0.627873	-0.52
MomentumQuarterly7	0.079244	0.221877	0.357155	0.552199	-0.53457
MomentumDaily7	0.069931	0.219302	0.31888	0.486973	-0.56879
MomentumWeekly20	0.095344	0.217971	0.437417	0.681247	-0.51077
MomentumMonthly20	0.097337	0.21684	0.448889	0.702851	-0.50273
MomentumQuarterly20	0.072182	0.215173	0.33546	0.519356	-0.55607
MomentumDaily20	0.098123	0.220241	0.445525	0.688275	-0.51316
MomentumWeekly120	0.091233	0.221374	0.412122	0.634375	-0.54793
MomentumMonthly120	0.101876	0.223476	0.455871	0.701075	-0.54809
MomentumQuarterly120	0.087547	0.217226	0.403024	0.623381	-0.5532
MomentumDaily120	0.084778	0.221097	0.383442	0.583072	-0.5785
MomentumWeekly250	0.181827	0.185541	0.979983	1.585708	-0.20645
MomentumMonthly250	0.18064	0.186472	0.968724	1.567636	-0.22676
MomentumQuarterly250	0.172608	0.18753	0.920425	1.48512	-0.2702
MomentumDaily250	0.184468	0.185655	0.993605	1.607724	-0.20645





###
#####
Then I am given an idea that this combination still work better than SPY individual.
Then I debug more for the momentum function. I see the momentum function never take care of rebalancing.
The result it return looks like it is daily rebalancing.
Another thing is that: in side of the strategy calculation. For index >= filter out index.
We should +=1 rather than > filter out index.
So now, I am trying to optimize the parameter to see whether there are better momentum parameter.

11.10 Strategy Test List

Thursday, November 10, 2016
8:34 AM

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.02,2,40,0,0.001*0,1,20) => 1.36

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.03,2,40,0,0.001*0,1,20) => 1.42

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every XX",2,200,10,40,0.09,0.98,0.03,2,40,0,0.001*0,1,20)=>1.18

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.03,2,40,1,0.001*0,1,20)=>1.3428

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every XX",2,200,10,40,0.09,0.98,0.03,2,40,1,0.001*0,1,20)=>1.10

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.03,2,40,0,0.001*0,0,20)=>1.22

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX(newStrat1,"monthly","every XX",2,200,10,40,0.09,0.98,0.03,2,40,0,0.001*0,0,20)=>1.15

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.03,2,40,1,0.001*0,1,20)=>1.23

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX(newStrat1,"monthly","every XX",2,200,10,40,0.09,0.98,0.03,2,40,1,0.001*0,1,20)=>1.15

Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.01,2,40,0,0.001*0,1,20)=>1.45

(sharpe,weights_pd,Strat,newStrat_price)=Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every X",2,200,10,40,0.09,0.98,0.01,2,40,1,0.001*0,1,20) => 1.5077

(sharpe,weights_pd,Strat,newStrat_price)=Maximum_Diverisification_Strategy_Return_NoneZero_Filter_Mec_Individual_momentum_everyX__stoploss_everyday(newStrat1,"monthly","every XX",2,200,10,40,0.09,0.98,0.01,2,40,1,0.001*0,1,20)=>0.5377

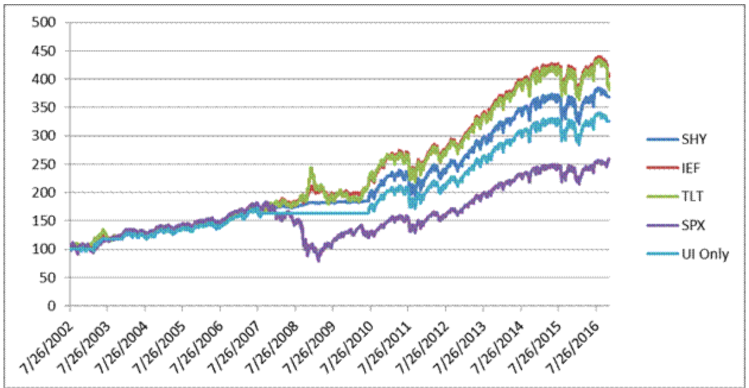
11.15 Strategy List

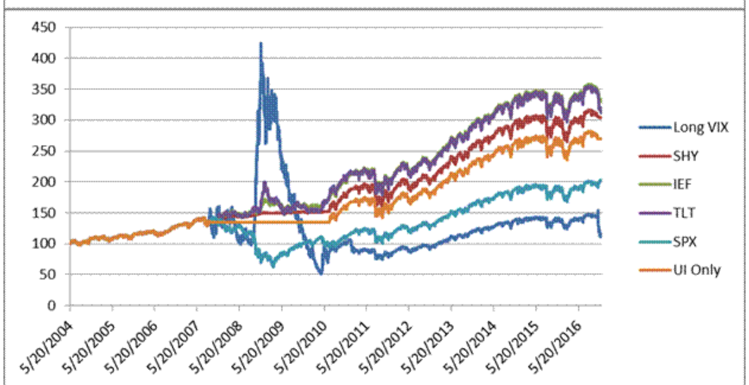
Tuesday, November 15, 2016
9:00 AM

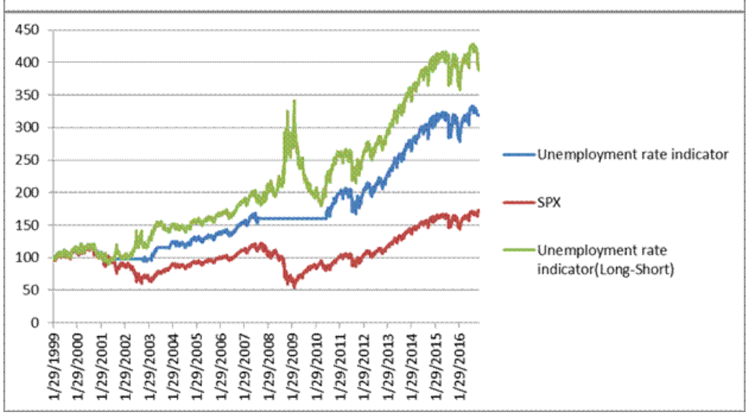
Luxembourg Funds

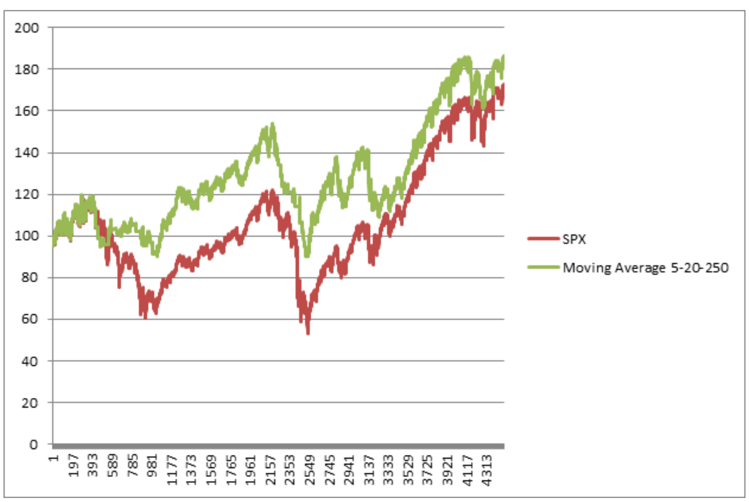
12.3 Strategy List

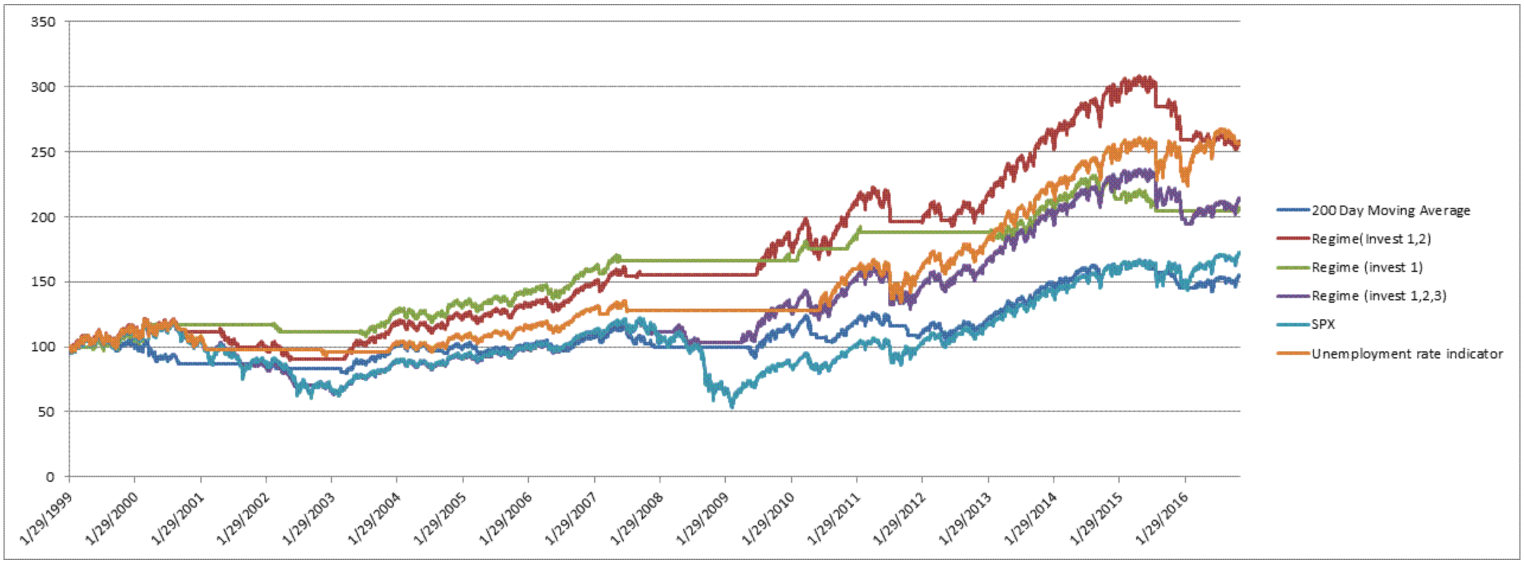
Monday, December 05, 2016
12:09 PM









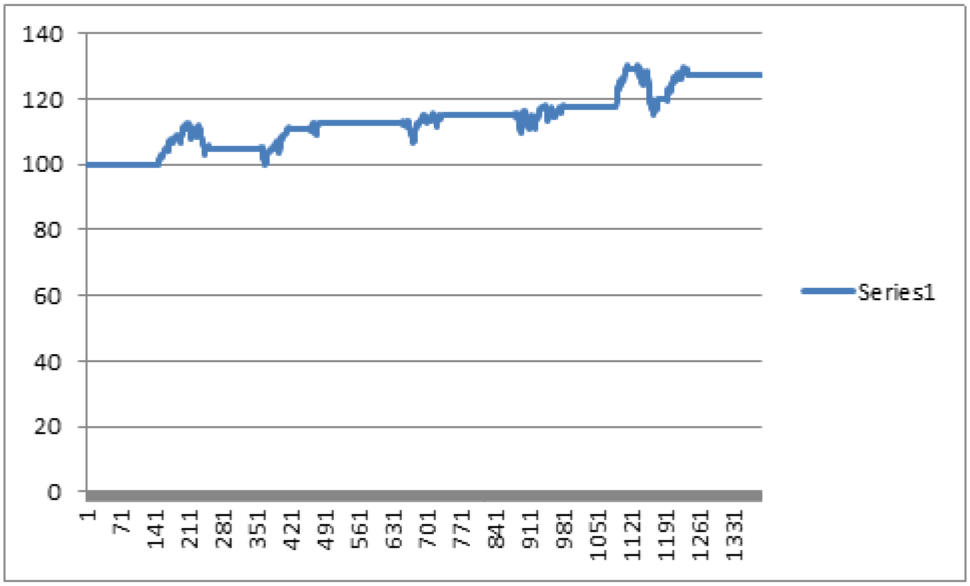


350
300
250
200
150
100
50
0
1/29/1999
1/29/2000
1/29/2001
1/29/2002
1/29/2003
1/29/2004
1/29/2005
1/29/2006
1/29/2007
1/29/2008
1/29/2009
1/29/2010
1/29/2011
1/29/2012
1/29/2013
1/29/2014
1/29/2015
1/29/2016
200 Day Moving Average
Regime(Invest 1,2)
Regime (invest 1)
Regime (invest 1,2,3)
SPX
Unemployment rate indicator

12.5 Strategy List

Monday, December 05, 2016
12:11 PM

As discussed last week, I try the strategy based on the surprise on unemployment rate. I pulled the data from FOMC website from 2011 to 2016.
However, it doesn't work very well. Maybe we should invest like Federal Anomaly. Because here I invest when the projection is higher than actually employment rate. I will need to pull more details like date from the website.



12.7 Strategy Test

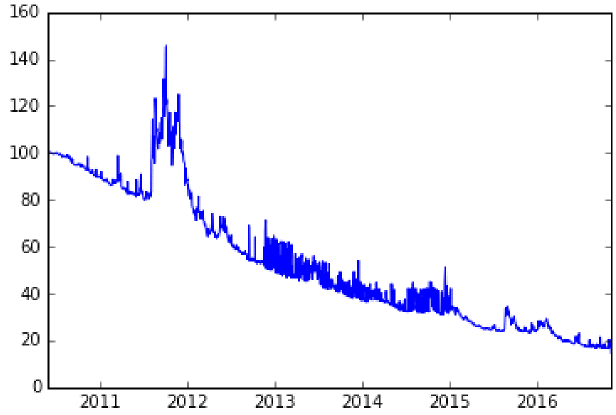
Wednesday, December 07, 2016
9:41 AM

Largest Index Manager:
Invesco
TIAA Global Asset Management
Prudential Financial
Geode Capital Management
BNY Mellon Investment management
Legal & general investment Management
Northern Trust Asset Management
State Street Global Advisors
Vanguard group
BlackRock

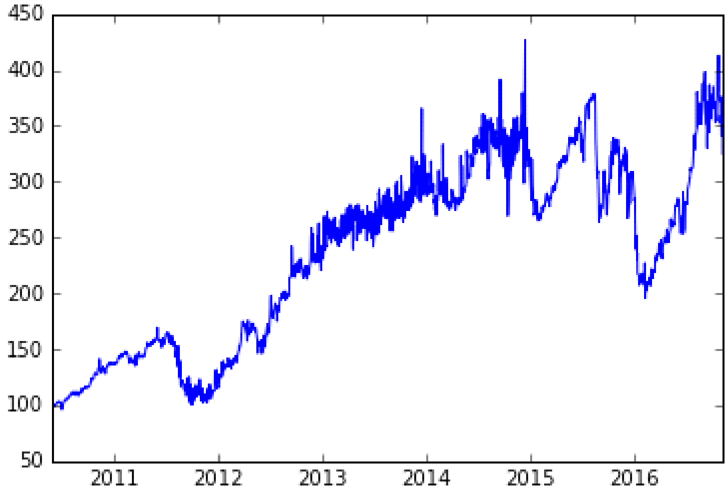
2.13 Strategy Test

Monday, February 13, 2017
4:43 PM

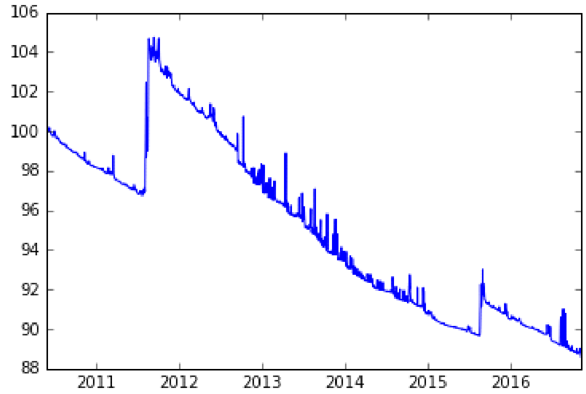
```
In [1067]: WeekNumber=104
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.02
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1067]: <matplotlib.axes._subplots.AxesSubplot at 0x10b85db70>
```



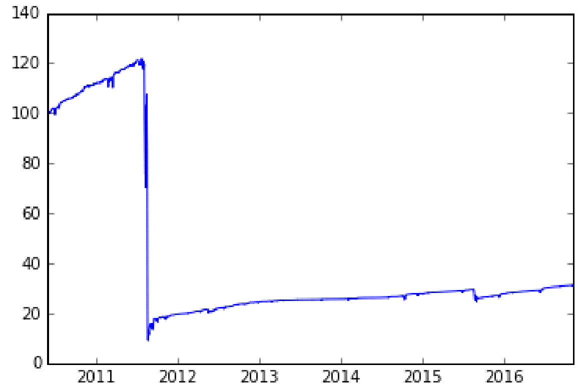

```
In [1063]: k=IndexCalculator([OptionBeta1,OptionBeta2])

In [1064]: k["index"].plot()
Out[1064]: <matplotlib.axes._subplots.AxesSubplot at 0x6bfecbe0>
```



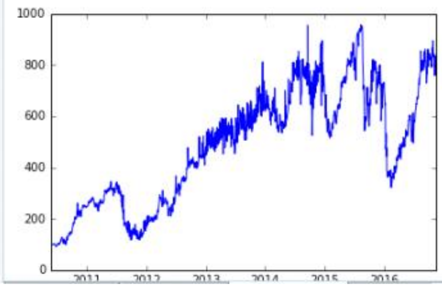
```
In [1068]: WeekNumber=4
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.02
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1068]: <matplotlib.axes._subplots.AxesSubplot at 0x77bb0a20>
```



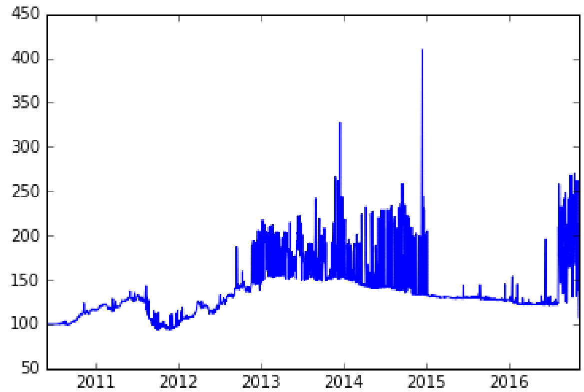

```
In [1049]: WeekNumber=2
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Short"
      ...: percentage=0.3333
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1049]: <matplotlib.axes._subplots.AxesSubplot at 0x65eec2b0>
```



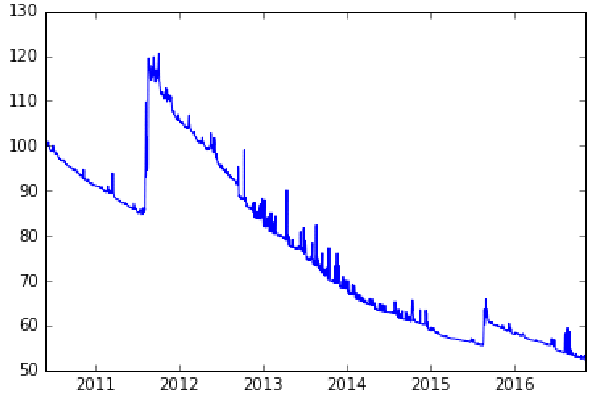
```
In [1042]: WeekNumber=50
      ...: strikeLevel=0.8
      ...: PC="P"
      ...: LongShort="Long"
      ...: percentage=0.5
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
      ...:
      ...:
      ...:
      ...: Beta=OptionBeta
      ...: mtm=Beta.OptionMarketToMarket
      ...: iv=Beta.OptionIV
      ...: Premia=Beta.OptionPremium
      ...: underlyingdata=Beta.underlyingStrike
      ...:
      ...: mtm.to_csv(r"H:\Desktop\20170209\mtmresult_lowstrike_put.csv")
      ...: iv.to_csv(r"H:\Desktop\20170209\ivresult_lowstrike_put.csv")
      ...: Premia.to_csv(r"H:\Desktop\20170209\premiaresult_lowstrike_put.csv")
      ...: underlyingdata.to_csv(r"H:\Desktop
\20170209\underlyingresult_lowstrike_put.csv")
```



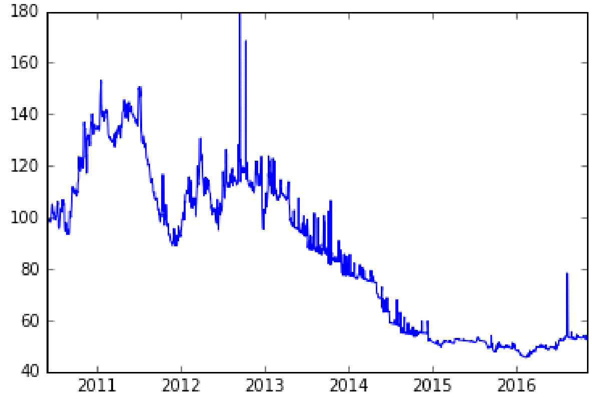
```
In [1038]: WeekNumber=84
      ...: strikeLevel=0.2
      ...: PC="P"
      ...: LongShort="Long"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1038]: <matplotlib.axes._subplots.AxesSubplot at 0x6c18bfd0>
```



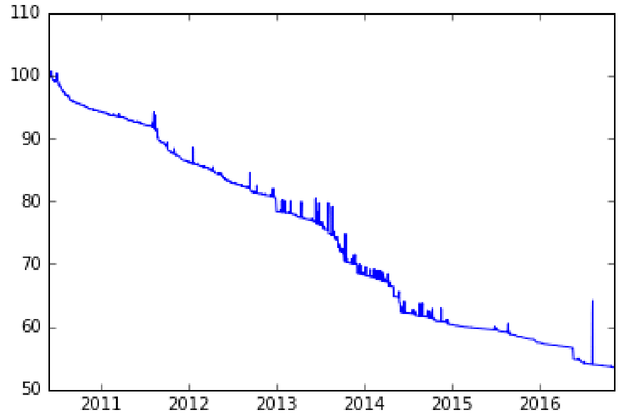
```
In [1070]: WeekNumber=4
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.10
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1070]: <matplotlib.axes._subplots.AxesSubplot at 0xc5a92278>
```



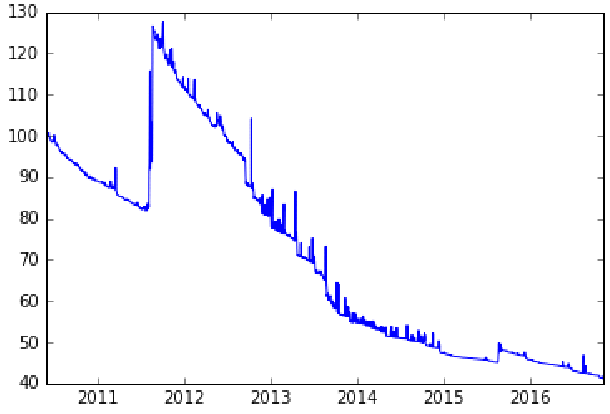

```
In [1020]: WeekNumber=2
      ...: strikeLevel=0.9
      ...: PC="P"
      ...: LongShort="Long"
      ...: percentage=0.50
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1020]: <matplotlib.axes._subplots.AxesSubplot at 0x12f25cf28>
```



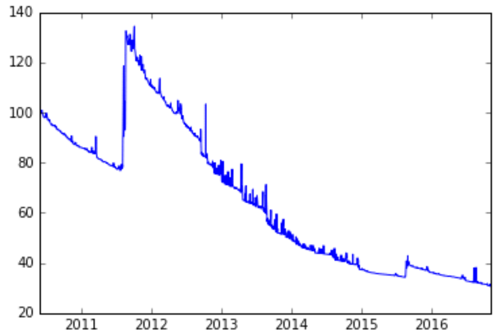
```
In [1076]: WeekNumber=1
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.20
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1076]: <matplotlib.axes._subplots.AxesSubplot at 0x6b1d9dd8>
```



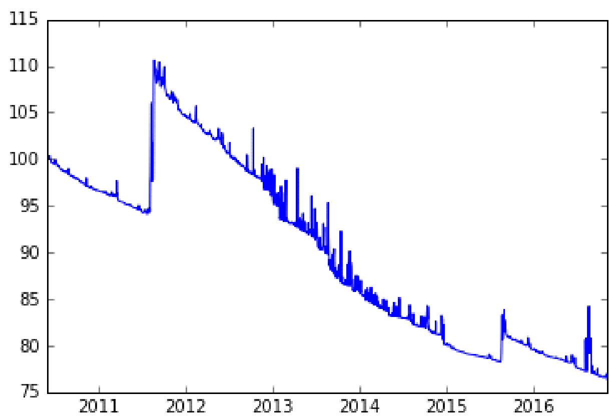

```
In [1077]: WeekNumber=2
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.20
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1077]: <matplotlib.axes._subplots.AxesSubplot at 0x68e8f978>
```



```
In [1078]: WeekNumber=3
      ...: strikeLevel=1.3
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.20
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
      ...:
Out[1078]: <matplotlib.axes._subplots.AxesSubplot at 0x68dcff98>
```

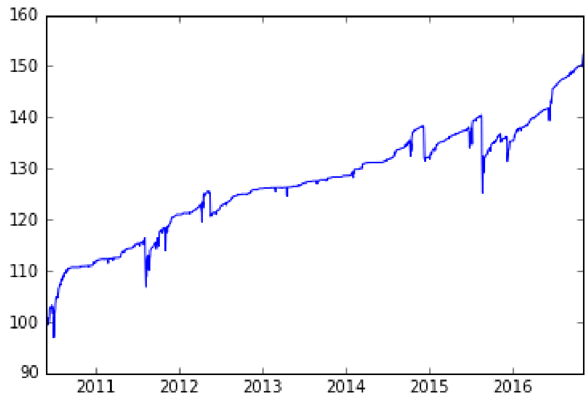



```
In [1080]: WeekNumber=4
      ...: strikeLevel=1.4
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1080]: <matplotlib.axes._subplots.AxesSubplot at 0x68fe3588>
```

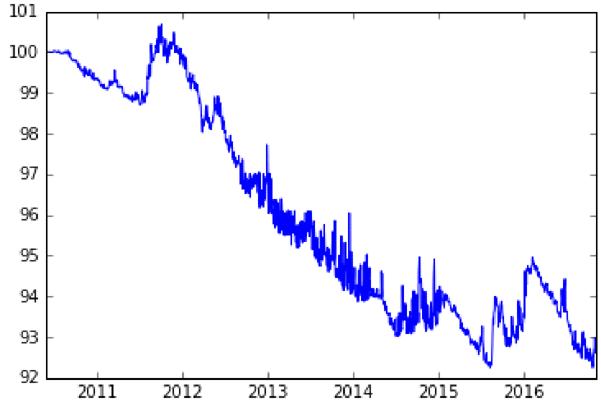


```
In [1081]: WeekNumber=4
      ...: strikeLevel=1.5
      ...: PC="C"
      ...: LongShort="Long"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1081]: <matplotlib.axes._subplots.AxesSubplot at 0x6af29f28>
```

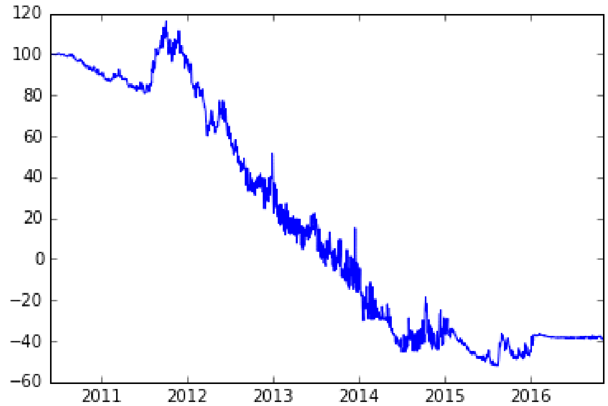

```
In [1062]: WeekNumber=104
      ...: strikeLevel=0.8
      ...: PC="P"
      ...: LongShort="Long"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1062]: <matplotlib.axes._subplots.AxesSubplot at 0x6b234828>
```



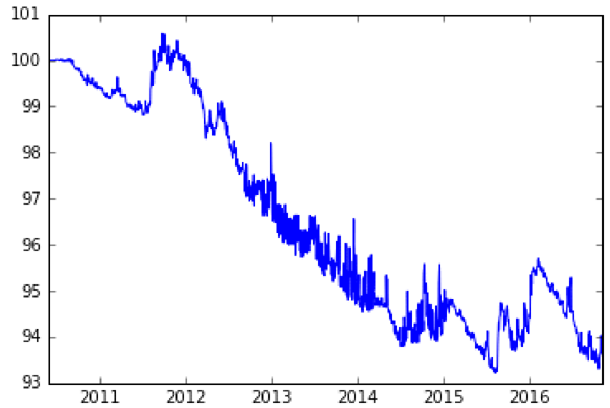
```
In [1084]: WeekNumber=104
      ...: strikeLevel=0.9
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.001
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1084]: <matplotlib.axes._subplots.AxesSubplot at 0x68604b38>
```



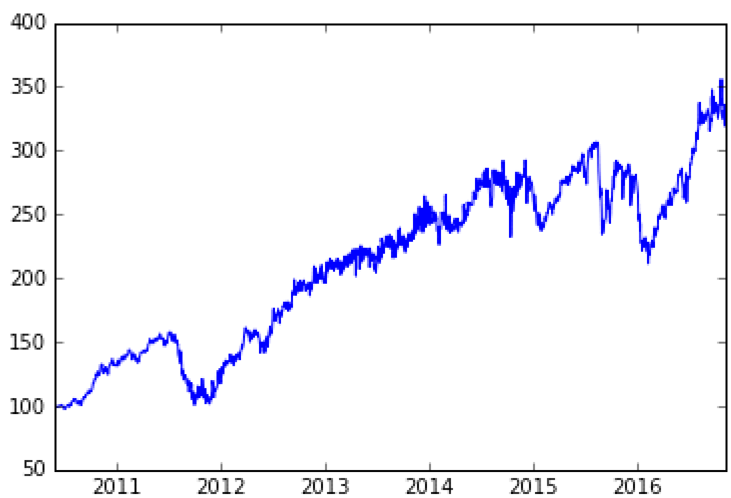

```
In [1083]: WeekNumber=104
      ...: strikeLevel=1.5
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.01
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1083]: <matplotlib.axes._subplots.AxesSubplot at 0x660978d0>
```



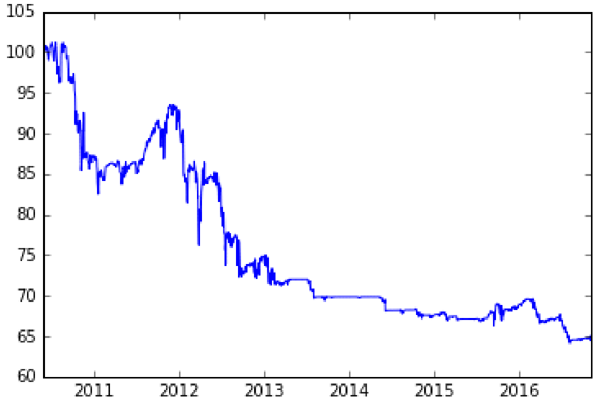
```
In [1085]: WeekNumber=104
      ...: strikeLevel=0.8
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.001
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1085]: <matplotlib.axes._subplots.AxesSubplot at 0x6864beb8>
```



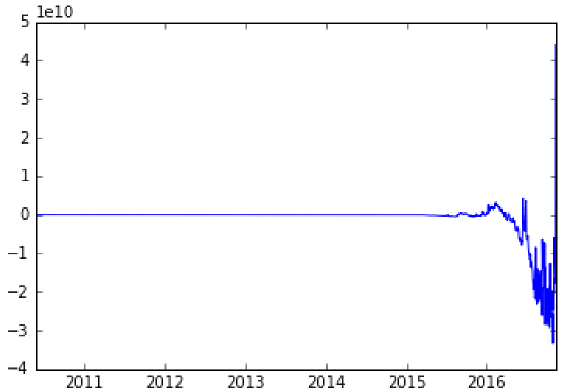

```
In [1086]: WeekNumber=104
      ...: strikeLevel=1.5    #0.8
      ...: PC="P"
      ...: LongShort="Long"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()

In [1087]: k=IndexCalculator([OptionBeta1])
      ...: k["index"].plot()
Out[1087]: <matplotlib.axes._subplots.AxesSubplot at 0x2ebabc18>
```



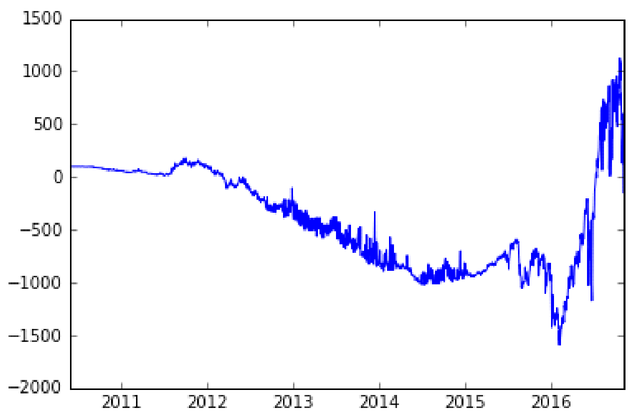
```
In [1089]: WeekNumber=4
      ...: strikeLevel=0.8
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.2
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1089]: <matplotlib.axes._subplots.AxesSubplot at 0x77b684e0>
```




```
In [1090]: WeekNumber=104
      ...: strikeLevel=1
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.2
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
      ...:
Out[1090]: <matplotlib.axes._subplots.AxesSubplot at 0x69391b38>
```

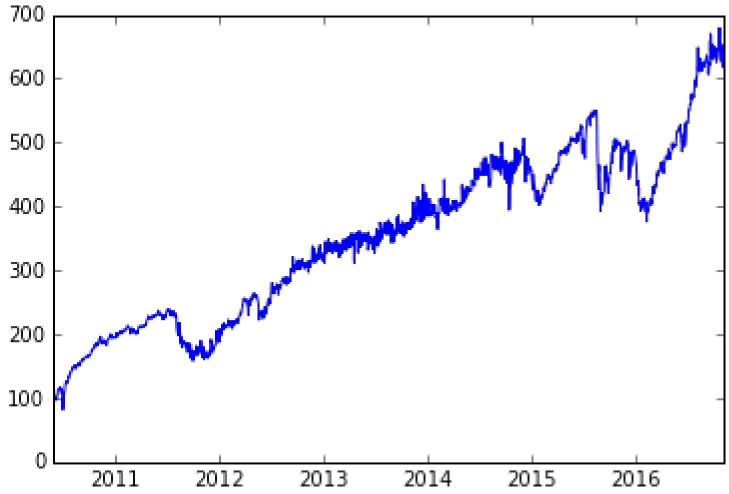


```
In [1092]: WeekNumber=104
      ...: strikeLevel=1
      ...: PC="P"
      ...: LongShort="Short"
      ...: percentage=0.05
      ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
      ...: OptionBeta=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
      ...: k=IndexCalculator([OptionBeta])
      ...: k["index"].plot()
Out[1092]: <matplotlib.axes._subplots.AxesSubplot at 0x2e750518>
```




```
#Long term put
WeekNumber=104
strikeLevel=1.5
PC="P"
LongShort="Long"
percentage=0.05
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday, Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
k=IndexCalculator([OptionBeta1])
k["index"].plot()

#Short term put
WeekNumber=104
strikeLevel=0.8
PC="P"
LongShort="Short"
percentage=0.01
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday, Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
k=IndexCalculator([OptionBeta2])
k["index"].plot()

#Long Short term Call
WeekNumber=1
strikeLevel=1.2
PC="C"
LongShort="Short"
percentage=2.5
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday, Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage)
k=IndexCalculator([OptionBeta3])
k["index"].plot()
```

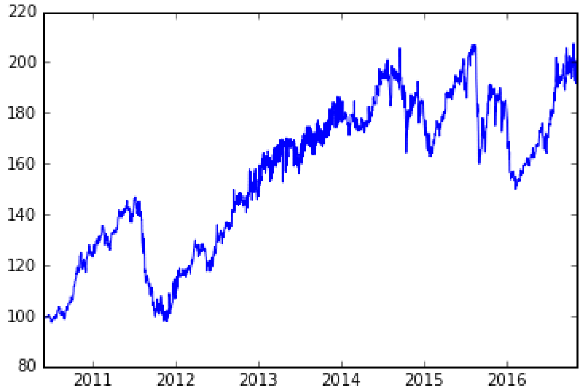
```
In [1103]: k=IndexCalculator([OptionBeta1,OptionBeta2,OptionBeta3])
      ...: k["index"].plot()
      ...:
Out[1103]: <matplotlib.axes._subplots.AxesSubplot at 0xbe677390>
```



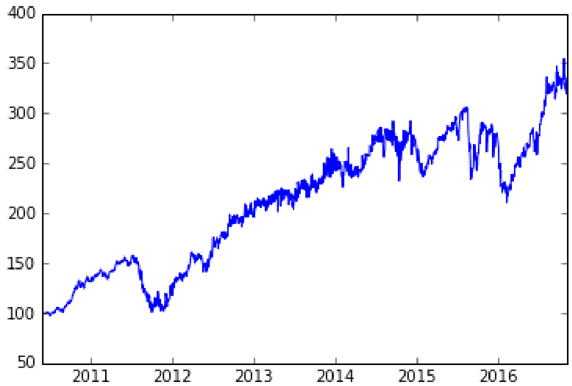
2.23 Strategy Test

Thursday, February 23, 2017
11:04 AM

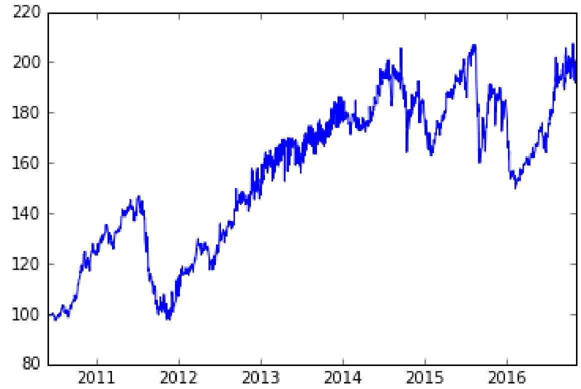
```
In [150]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-0.1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[150]: <matplotlib.axes._subplots.AxesSubplot at 0x69a65198>
```



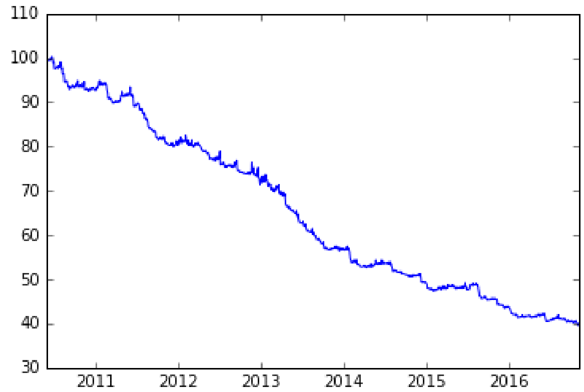

```
In [149]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[149]: <matplotlib.axes._subplots.AxesSubplot at 0xa4e5ef0>
```



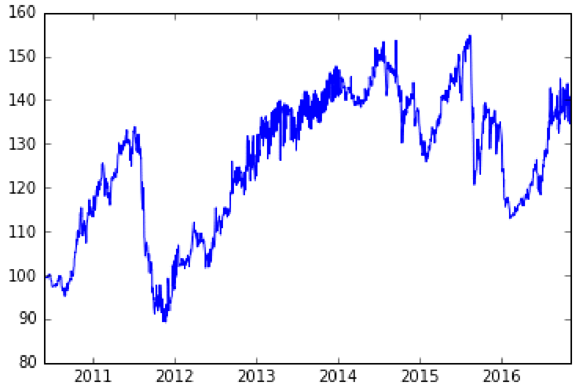
```
In [150]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-0.1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[150]: <matplotlib.axes._subplots.AxesSubplot at 0x69a65198>
```




```
In [148]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=0.1
     ...: stopLoss=-0.03
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[148]: <matplotlib.axes._subplots.AxesSubplot at 0x6b4707b8>
```

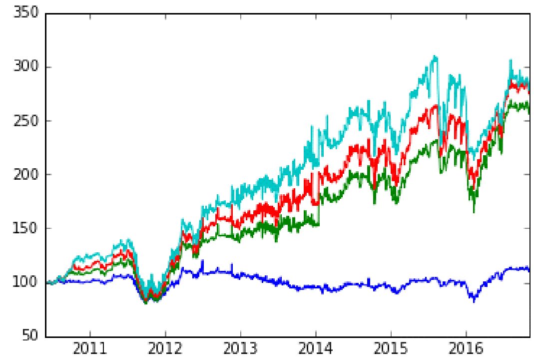


```
In [151]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-0.05
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[151]: <matplotlib.axes._subplots.AxesSubplot at 0x6b6d8588>
```



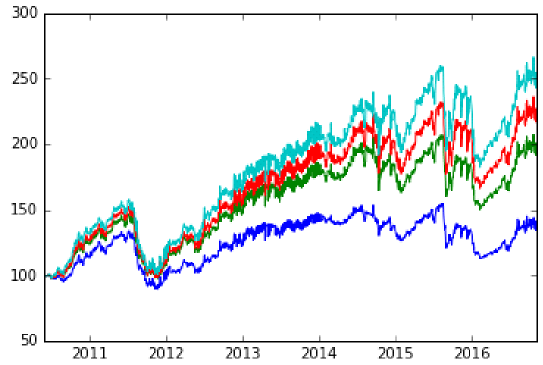
Stop earn - 0.1,0.2,0.3,0.4

```
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
     ...:
     ...: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=0.4
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[152]: <matplotlib.axes._subplots.AxesSubplot at 0x6b76c5f8>
```



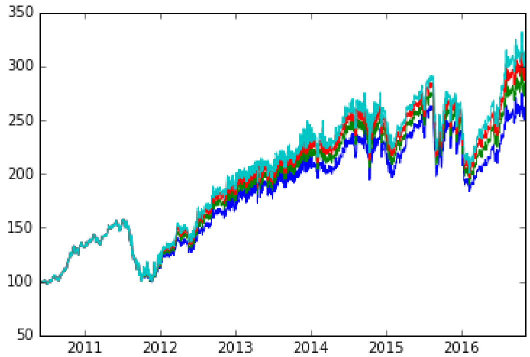
Stop loss -0.1, 0.15,0.2,0.05

```
   ...: k["index"].plot()
   ...:
   ...: WeekNumber=104
   ...: strikeLevel=1.5
   ...: PC="P"
   ...: LongShort="Long"
   ...: percentage=0.05
   ...: stopEarn=1
   ...: stopLoss=-0.2
   ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=Optior
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
   ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
   ...: k=IndexCalculator([OptionBeta1])
   ...: k["index"].plot()
   ...:
Out[153]: <matplotlib.axes._subplots.AxesSubplot at 0x6b696048>
```

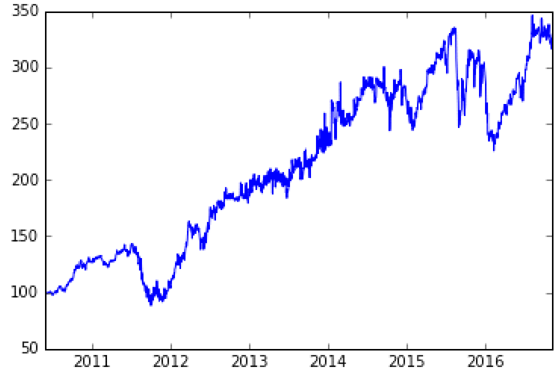


Stop loss - 0.25,0.3,0.35,0.4

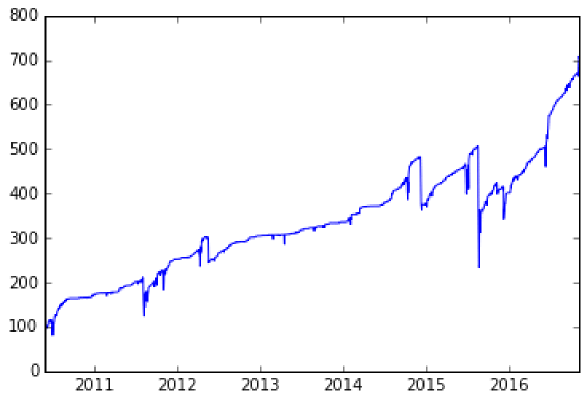
```
   ...: k=IndexCalculator([OptionBeta1])
   ...: k["index"].plot()
   ...:
   ...: WeekNumber=104
   ...: strikeLevel=1.5
   ...: PC="P"
   ...: LongShort="Long"
   ...: percentage=0.05
   ...: stopEarn=1
   ...: stopLoss=-0.4
   ...:
Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
rator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
   ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
ption_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
   ...: k=IndexCalculator([OptionBeta1])
   ...: k["index"].plot()
ut[155]: <matplotlib.axes._subplots.AxesSubplot at 0x6b8d4be0>
```



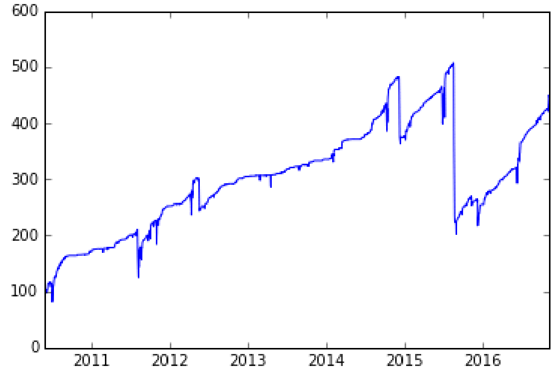
```
In [157]: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=0.45
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[157]: <matplotlib.axes._subplots.AxesSubplot at 0x6b829780>
```



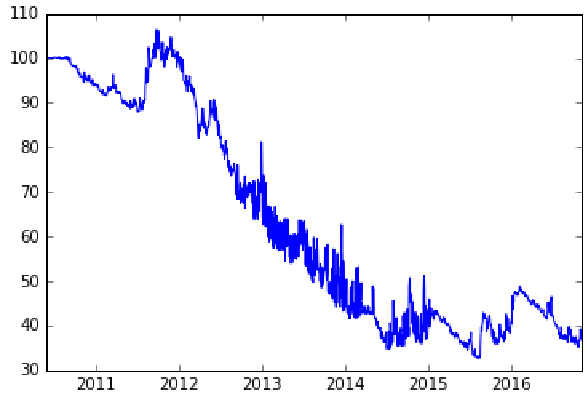

```
In [158]: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Short"
     ...: percentage=2.5
     ...: stopEarn=0.10
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta3])
     ...: k["index"].plot()
Out[158]: <matplotlib.axes._subplots.AxesSubplot at 0x6baca0b8>
```



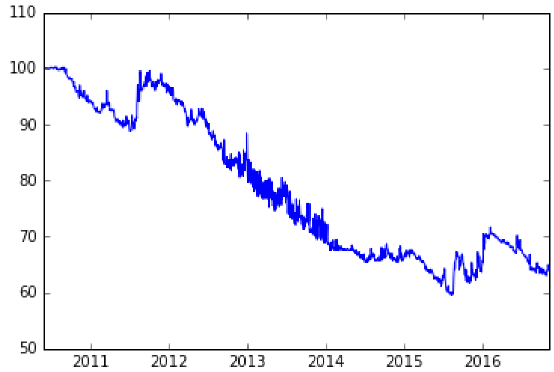
```
In [162]: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Short"
     ...: percentage=2.5
     ...: stopEarn=0.1
     ...: stopLoss=-0.1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta3])
     ...: k["index"].plot()
Out[162]: <matplotlib.axes._subplots.AxesSubplot at 0x6c291780>
```



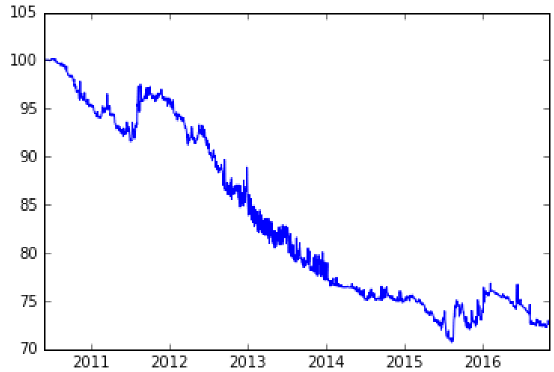

```
In [163]: WeekNumber=104
     ...: strikeLevel=0.8
     ...: PC="P"
     ...: LongShort="Short"
     ...: percentage=0.01
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=O
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta2])
     ...: k["index"].plot()
Out[163]: <matplotlib.axes._subplots.AxesSubplot at 0x70e3ce48>
```



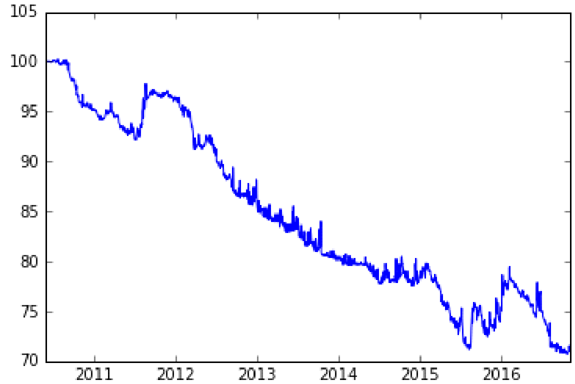
```
In [164]: WeekNumber=104
     ...: strikeLevel=0.8
     ...: PC="P"
     ...: LongShort="Short"
     ...: percentage=0.01
     ...: stopEarn=0.1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta2])
     ...: k["index"].plot()
Out[164]: <matplotlib.axes._subplots.AxesSubplot at 0x70e340b8>
```



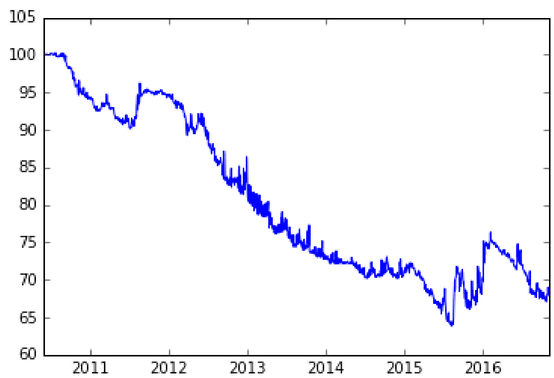

```
In [165]: WeekNumber=104
     ...: strikeLevel=0.8
     ...: PC="P"
     ...: LongShort="Short"
     ...: percentage=0.01
     ...: stopEarn=0.05
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta2])
     ...: k["index"].plot()
Out[165]: <matplotlib.axes._subplots.AxesSubplot at 0x70ec46d8>
```



```
In [167]: WeekNumber=104
     ...: strikeLevel=0.8
     ...: PC="P"
     ...: LongShort="Short"
     ...: percentage=0.01
     ...: stopEarn=0.1
     ...: stopLoss=-0.2
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=Optic
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta2])
     ...: k["index"].plot()
Out[167]: <matplotlib.axes._subplots.AxesSubplot at 0x70ef3940>
```



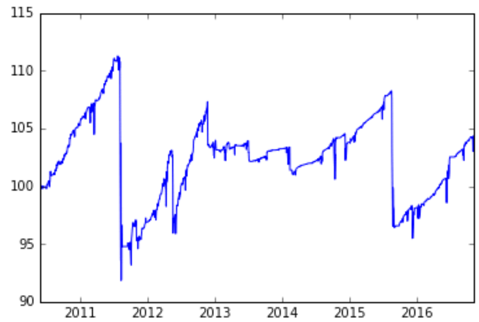

```
In [168]: WeekNumber=104
     ...: strikeLevel=0.8
     ...: PC="P"
     ...: LongShort="Short"
     ...: percentage=0.01
     ...: stopEarn=0.1
     ...: stopLoss=-0.3
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGen
erator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID)
     ...: OptionBeta2=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn)
     ...: k=IndexCalculator([OptionBeta2])
     ...: k["index"].plot()
     ...:
Out[168]: <matplotlib.axes._subplots.AxesSubplot at 0x73dd1710>
```



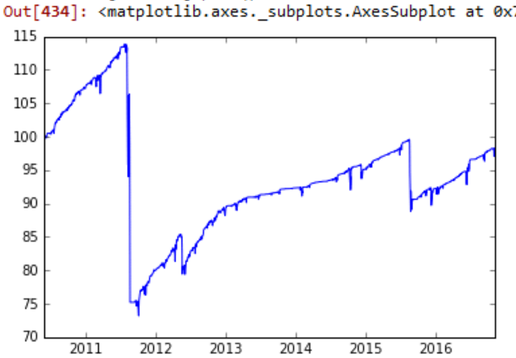
2.28 Strategy Test

Tuesday, February 28, 2017
9:23 AM

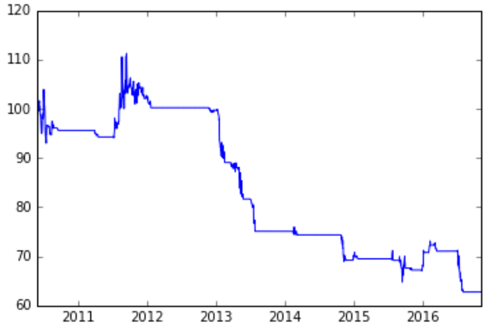
```
In [435]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Short"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOnCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOffCale
ndar)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[435]: <matplotlib.axes._subplots.AxesSubplot at 0x77057080>
```



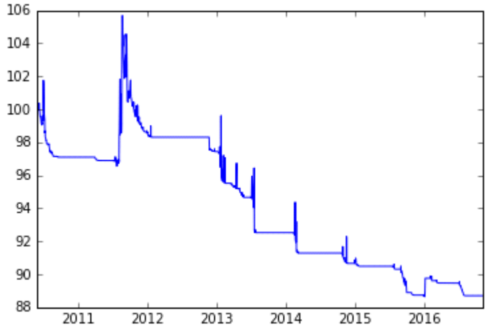

```
In [434]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Short"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOnCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[434]: <matplotlib.axes._subplots.AxesSubplot at 0x7438d630>
```



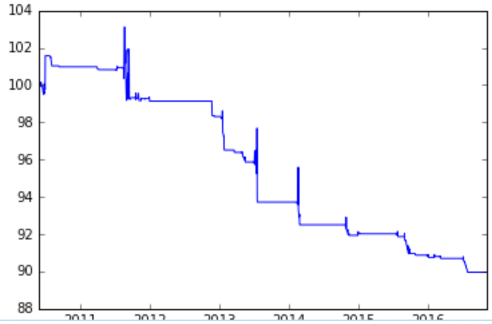
```
In [433]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=0.7
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[433]: <matplotlib.axes._subplots.AxesSubplot at 0x73d798d0>
```



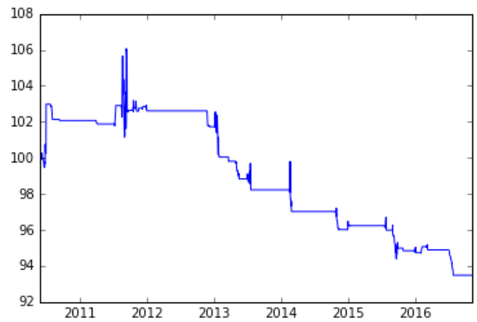

```
In [432]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[432]: <matplotlib.axes._subplots.AxesSubplot at 0x73d5f0b8>
```



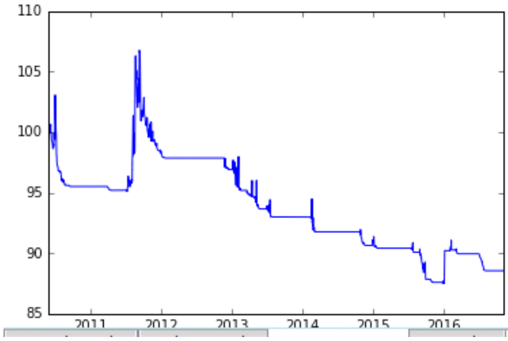
```
In [431]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.2
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOnCaler
dar)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[431]: <matplotlib.axes._subplots.AxesSubplot at 0x76fb3128>
```



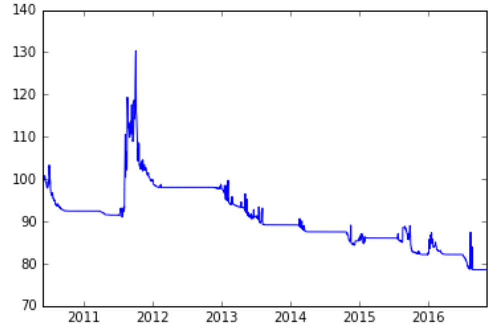

```
In [430]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.1
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOnCalen
dar)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[430]: <matplotlib.axes._subplots.AxesSubplot at 0x76ece5c0>
```



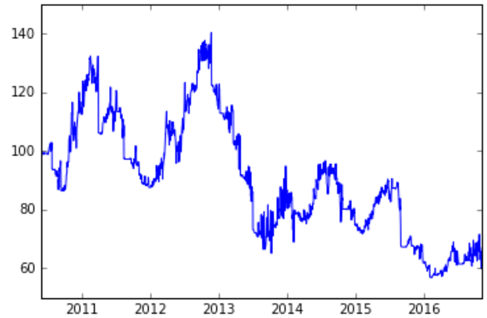
```
In [429]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=1
     ...: strikeLevel=1.1
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[429]: <matplotlib.axes._subplots.AxesSubplot at 0x76fb1e80>
```



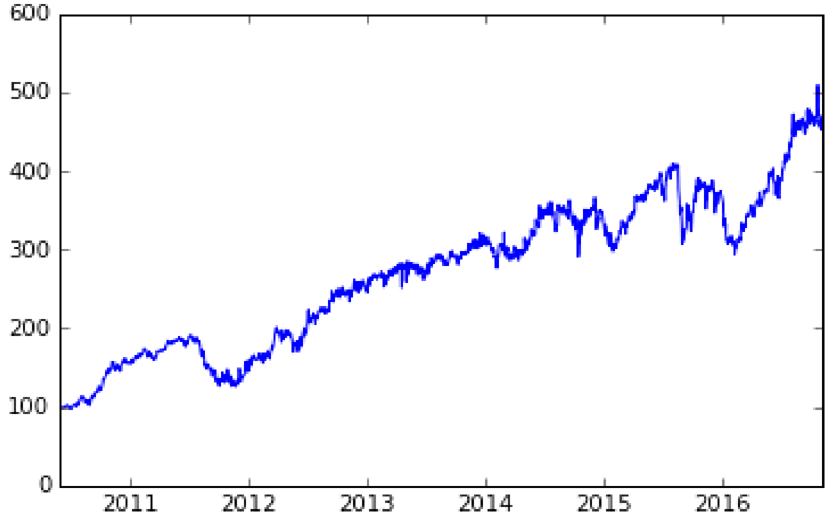

```
In [428]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=4
     ...: strikeLevel=1.1
     ...: PC="C"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOffCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
Out[428]: <matplotlib.axes._subplots.AxesSubplot at 0x73d020f0>
```



```
In [427]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOnCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOffCale
ndar)
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
     ...:
Out[427]: <matplotlib.axes._subplots.AxesSubplot at 0x76f5e898>
```



```
In [426]: newStrat1=data_reading(r"H:\Desktop\20170227\signal.csv")
     ...: newStrat1["date"]=newStrat1.index
     ...: triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
     ...: triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==0,"date"]
     ...: WeekNumber=104
     ...: strikeLevel=1.5
     ...: PC="P"
     ...: LongShort="Long"
     ...: percentage=0.05
     ...: stopEarn=1
     ...: stopLoss=-1
     ...:
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday)=OptionGener
ator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData_withID,triggerOnCalendar)
     ...: OptionBeta1=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,pd.Series())
     ...: k=IndexCalculator([OptionBeta1])
     ...: k["index"].plot()
     ...:
Out[426]: <matplotlib.axes._subplots.AxesSubplot at 0x742e40b8>
```

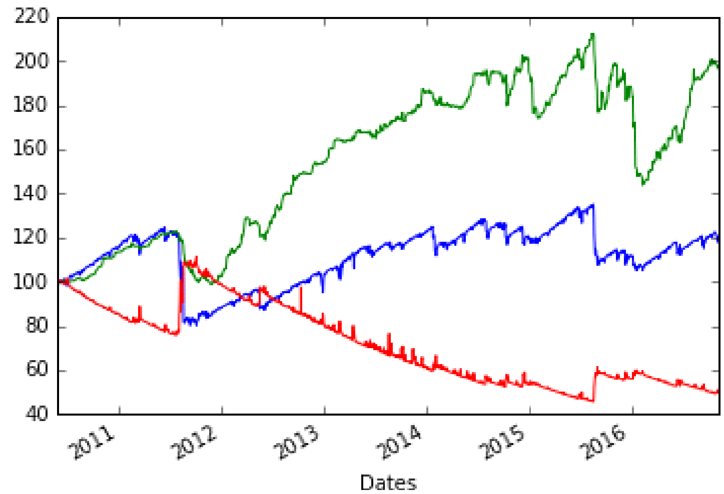


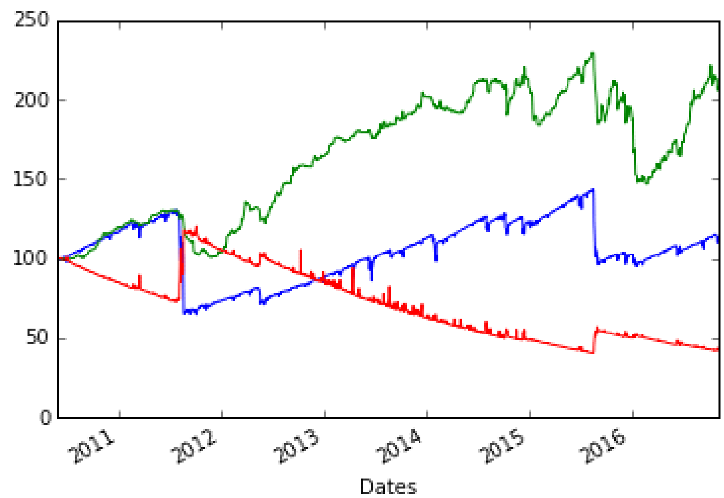
3.15 Strategy Test

Wednesday, March 15, 2017
3:41 PM

4.3 Strategy Test

Monday, April 03, 2017
10:49 AM



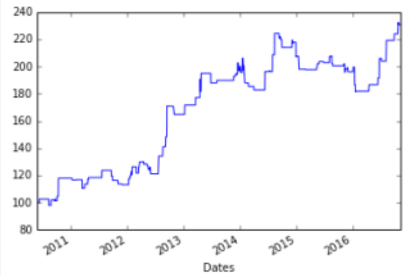


20121127	VXX	VXX	20130216	33	P	179	10	5.65	5.65	5.65	5.65	3.2	7.9	30.36	Standard	ETF	

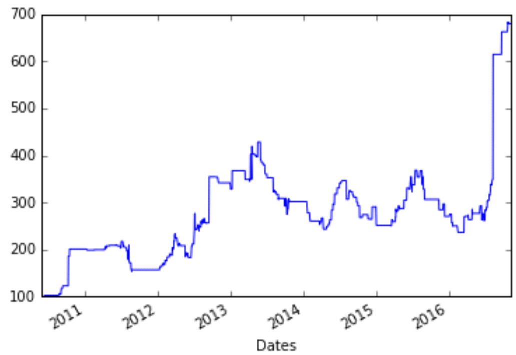
```
path=r"H:\Desktop\20170405\JB_withoutOff"
newStrat1=data_reading(r"H:\Desktop\20170405\signal.csv")
newStrat1["date"]=newStrat1.index
triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==2,"date"]
WeekNumber=12
strikeLevel=0.9
PC="P"
LongShort="Long"
percentage=0.3
stopEarn=0.2
stopLoss=-0.5
#(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option
_Table_HIGH)=OptionGenerator_price(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,Opt
ionData_withID,triggerOnCalendar,2)
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option_
Table_HIGH)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData
_withID,triggerOnCalendar)
OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOf
```

```
fCalendar,'ComparedWithFirstDay',Option_Table_HIGH)

k3=IndexCalculator([OptionBeta3])
k3.index=[datetime.datetime(x.year,x.month,x.day) for x in k3.index]
Strat=Strategy(k3.index,k3["index"])
Strat.Describe()
path=r"H:\Desktop\20170405\JB_withoutOff"
newStrat1=data_reading(r"H:\Desktop\20170405\signal.csv")
newStrat1["date"]=newStrat1.index
triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==2,"date"]
WeekNumber=24
strikeLevel=0.9
PC="P"
LongShort="Long"
percentage=0.3
stopEarn=0.2
stopLoss=-0.5
#(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option
_Table_HIGH)=OptionGenerator_price(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,Opt
ionData_withID,triggerOnCalendar,2)
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option_
Table_HIGH)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData
_withID,triggerOnCalendar)
OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOf
fCalendar,'ComparedWithFirstDay',Option_Table_HIGH)

k3=IndexCalculator([OptionBeta3])
k3.index=[datetime.datetime(x.year,x.month,x.day) for x in k3.index]
Strat=Strategy(k3.index,k3["index"])
Strat.Describe()
path=r"H:\Desktop\20170405\JB_withoutOff"
newStrat1=data_reading(r"H:\Desktop\20170405\signal.csv")
newStrat1["date"]=newStrat1.index
triggerOnCalendar=newStrat1.loc[newStrat1["Signal"]==1,"date"]
triggerOffCalendar=newStrat1.loc[newStrat1["Signal"]==2,"date"]
WeekNumber=52
strikeLevel=0.9
PC="P"
LongShort="Long"
percentage=0.3
stopEarn=0.2
stopLoss=-0.5
#(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option
_Table_HIGH)=OptionGenerator_price(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,Opt
ionData_withID,triggerOnCalendar,2)
(Option_Table_BID,Option_Table_ASK,underlyingStrike,underlyingStrike_everyday,Option_
Table_HIGH)=OptionGenerator(WeekNumber,strikeLevel,PC,OptionID_noDuplicate,OptionData
_withID,triggerOnCalendar)
OptionBeta3=OptionCashFlow(underlyingStrike,underlyingStrike_everyday,
Option_Table_ASK,Option_Table_BID,PC,LongShort,percentage,stopLoss,stopEarn,triggerOf
fCalendar,'ComparedWithFirstDay',Option_Table_HIGH)

k3=IndexCalculator([OptionBeta3])
k3.index=[datetime.datetime(x.year,x.month,x.day) for x in k3.index]
Strat=Strategy(k3.index,k3["index"])
Strat.Describe()
```

```
IRR de  13.8465%
Volatility  14.8869%
Daily Volatility  0.9378%
Sharpe Ratio  0.9301
Sortino  1.9413
Max Drawdown  -19.1278%

Annual Performance:
   Year      Perf
0  2010  0.179552
1  2011 -0.040824
2  2012  0.457282
3  2013  0.214267
4  2014  0.034611
5  2015 -0.053054
6  2016  0.177488
```




```
Annual Performance:
   Year      Perf
0  2010  1.012274
1  2011 -0.218877
2  2012  1.089641
3  2013 -0.080401
4  2014 -0.036771
5  2015 -0.070048
6  2016  1.514543
```



This is after I change the BID table to ASK table because we don't want shitty data to affect the result.

1
0.493375481501
2
0.278984807791
3
0.348461023331
4
0.655333774572
5
0.731016595827
6
0.776517300778
7
0.679188975503
8
1.25733960549
9
0.636697125535
10
0.448021626512
11
0.534466226832

12
0.54742474215

11.4 Project Goal

Tuesday, November 01, 2016
2:15 PM

11.9 Project Goal

Wednesday, November 09, 2016
10:49 AM

Build a data collection vba

Build a strategy comparison

Build the sharpe calculation vba

11.18 Project Goal

Friday, November 18, 2016
4:20 PM

https://www.youtube.com/watch?v=icE7-pMYRik#t=85.289579

https://www.youtube.com/watch?v=TRlMr3BWIQg

Useful Info

Wednesday, December 14, 2016
10:23 AM

918884075042
Then we dial the pin code .

1.11

Wednesday, January 11, 2017
8:25 AM

- Please rename “Reset Amount” by “Equity Payment Amount with Cap”
- We will need to add a Notional Amount Cap: the idea is that if we start with a Notional Amount of $25 million on the long leg (ie FLAG ETF), then we will want to cap the Swap to 150% of $25 Million such that we will start reseting the swap (ie selling shares of the ETF) if the Notional Amount of the swap becomes in excess of $37,5 million
- Based on an initial hedge ratio that we assume constant and equal to the beta (91% in your example), we will want to adjust the quantity of hedge on each valuation date (ie monthly) if the basis (ie the “Total Cumulative Reset Amount with Cap) is above a certain threshold. The idea is that if the hedge doesn’t work such that the basis grows too much and the Notional Amount of the Long leg becomes so much greater than the Notional of the short leg, then we will want to readjust the hedge and reset the Notional Amount of the Short to be equal to Notional Amount of the long times the beta ONLY IF I’m above a certain threshold (ie I don’t want to readjust my short SPX every month for very small amounts)

11.2 Macro Reading

Tuesday, November 01, 2016
2:16 PM

Euro-area inflation accelerated at the fastest pace in more than two years in October. But what looks like progress in stoking consumer prices actually contains some bad news for the European Central Bank

Pasted from <http://www.bloomberg.com/news/articles/2016-10-31/inflation-pick-up-comes-with-bad-news-for-ecb>

Policy makers including ECB chief economist Peter Praet have warned repeatedly that they're lacking convincing signs of underlying price pressures, and inflation data published Monday proved them right. Digging deeper into the figures shows the core rate, which excludes volatile items such as food and energy, fell to the lowest in six months. That's critical since the central bank views the measure as a guide for where headline inflation will settle.

Pasted from <http://www.bloomberg.com/news/articles/2016-10-31/inflation-pick-up-comes-with-bad-news-for-ecb>

For Holger Sandte, chief European analyst at Nordea Markets in Copenhagen, soft inflation data and the prospect of core inflation remaining "firmly anchored" below 1 percent seal the case for an extension of quantitative easing beyond its current end-date. "The ECB cannot just sit and watch and let the asset purchases end in March next year," he wrote in a note to clients.

The ECB next sets policy on Dec. 8, when it will also publish fresh economic forecasts. Policy makers have recently suggested that inflation may reach the goal of just under 2 percent at the end of 2018 or early 2019 — a level it hasn't touched since early 2013. If that's to be sustained, the core rate is going to have to improve substantially

Pasted from <http://www.bloomberg.com/news/articles/2016-10-31/inflation-pick-up-comes-with-bad-news-for-ecb>

11.3 Macro Reading

Thursday, November 03, 2016
2:54 PM

Trump => low growth, high inflation, high unemployment
Hillary=> infrastructure spending, aggressive monetary => inflation , and higher eco growth.

Trump's immigration policy
Trump tax reform

1.23 Macro Reading

Monday, January 23, 2017
1:54 PM

Idea: Even thought we don't know the news on spot, we don't know which news create flucture.
But through the past analysis. We can see how the fast trader react at the market. We can see the relative performance between different sector and different period. So that we know how they think.
Since we can know when it is Trump to give the information. So we can somehow backtest the impact of the news.

11.2 Trade Idea(Emerging Market)

Tuesday, November 01, 2016
2:16 PM

I jotted down some criteria for EM. Let me know if there is anything else you want to add to the list!

Thanks,
Su

1. Fed rate hike :
   in a tightening environment **in the past**, how did each EM country perform? The **speed** of hikes and the **duration** of hiking cycle should be considered to fully understand the potential impacts on the EM countries. Or, would it be **different this time**? What are the differences compared to the previous hiking cycle (**global GDP growth, global monetary policy rate, DXY**)
2. Sensitivity to Oil (raw materials): **Improving oil prices** should benefit some commodities dependent countries, while hurting others.
3. China growth: Is China's **slow-down over**? Countries with heavy reliance on trades with China should underperform if China's slack continues, or things can turn around, as improving evidences of Chinese government's ability to install financial stability.
4. Political Risks: Some EM countries have become more vulnerable to regional and international (Brexit, US election) political risks. With no less political risks waiting for us going into 2017, which EM countries should outperform/underperform?

Another point in mind (not convinced though)->ECB/BoE Tapering? (I need to check but QEs from both ECB and BoE should have small influence on EM flows.)

Comment:

- Is China's slow down over? => we should be able to throw the question.
- The speed of the hikes and duration should be considered. => we should be able to capture the variable
- How do they perform in the past? What's the difference.
- Who are vulnerable regarding politic stuff?

##

Has the outcome of the 2016 US presidential election already been decided? How accurate are the current polls? At this point, the polls are indicating a lead for Hillary Clinton. With election day nearing (November 8), Natixis provides research and a strategy to play on the scenario of Clinton winning the presidential election and which asset classes are poised to perform well in the event of a Clinton victory

Scenarios

- The most likely base scenario for a Clinton victory is with a divided/Republican-controlled Congress. But given the polarization of Congress, it would be difficult to achieve bipartisan agreements on bills. In this scenario, estimated GDP will grow 2.2% and 1.9% in 2017 and 2018, respectively*
- The other scenario is for a Clinton victory with a Democrat-Controlled Congress. This situation would allow Clinton to push her political agenda with a favorable impact on growth in the short term due to a strengthened dollar by an aggressive monetary policy

The Impact of Clinton's Two Major Proposals

- **Infrastructure spending**
  - Clinton is planning to invest an additional $275bn over five years financed with a repatriation tax holiday on profits held overseas and higher taxes on the wealthy. If linearized, her plan would add an additional 0.3% of GDP growth
  - Although the possibility of a Republican Congress is high, the FAST Act serves the example of bipartisan agreements regarding infrastructure that may nonetheless by voted in. FAST is a 2015

bipartisan agreement to spend $305bn over 6 years and takes over MAP-21, a preceding law

  - Additionally, although Donald Trump, the Republican candidate, has not provided figures for infrastructure expenditures, his speeches, career and convictions have emphasized infrastructural development. Furthermore, the project of building a wall along the US-Mexico border will support cement-makers and major construction firms

- **Increased inflation** through a rise in minimum wages from $7.25 to $12 per hour
  - In theory, an increase in minimum wage leads to a rise in inflation and unemployment among low wage earners. However, this distortion of human capital and increased working efficiency will eventually result in positive impact on disposable income.
  - Fed guidelines state that a $1 increase in minimum wage per year would increase inflation by 0.5% the first year and 0.1% the year after. However, this policy could dampen corporate profitability and business investments
  - The assets that benefit from higher inflation are high-yield, equities and commodities. The assets that deliver best real performances during shocks and/or upward revisions of inflation are commodity indices (energy, industrial metals, gold), equities, REITS and TIPS

For a Clinton victory, Natixis suggests either a (1) worst-of phoenix note or (2) worst-of phoenix note with a swing effect on a basket of high-yield corporate bond, SPDR S&P 500, real estate and SPDR S&P Homebuilders ETFs that are all poised to benefit under the Clinton presidency

- Remember Clinton Hillary will lead to high wage -> inflation. And more infrastructure spending -> higher economy growth
- Basic knowledge about that what sector will give the benefit from the high inflation and better economy growth.

##

Sell low strike USD CMS10Y and EURO STOXX 50® Index leveraged put with a tenor of 1 year

Rationale

- Long term US yields have been trending lower since 2013. Hikes in the mid-term (2017) are expected on the back of strong economic data leading to possible upside on the USD CMS10Y (limiting the downside risk).
- Implied correlation levels between equity indices (e.g. EURO STOXX 50® and S&P 500®) are relatively high, hence providing little added pick up in engaging with multi-index structures where investors are buying correlation. Playing cross-asset correlation between USD CMS10Y and EURO STOXX 50® Index worst-of put offers better risk premium than equity correlation on the back of lower correlation levels. Equivalent coupon on the worst-of S&P 500® Index and EURO STOXX 50® Index would be around 2.50% (vs 7%).

- Eco data is good-> hiking is possible.
- Correlation is low now. It is cheap to buy correlation.
- Key variable: inflation, unemployment, low eco growth.
- Everything have a short term and long term version effect
- Fiscal and monetary are important for economy
- Given the expected GDP impact, we can draw better conclusion.

##

Has the outcome of the 2016 US presidential election already been decided? How accurate are the current polls? There remains a chance that Donald Trump surprises the nation and becomes the next president of the United States of America. With election day looming in a couple of weeks, Natixis provides research and a strategy to play on the scenario of Trump winning the election and which asset classes are poised to perform well in the event of a Trump victory.

Overview

- Donald Trump's proposed policy program would likely create an environment characterized by high inflation, high unemployment, and low economic growth, which would be considered stagflation.

- Even if Trump becomes Executive in-Chief with an opposing Congress, he would still have far-reaching power to enact a number of significant policy changes.

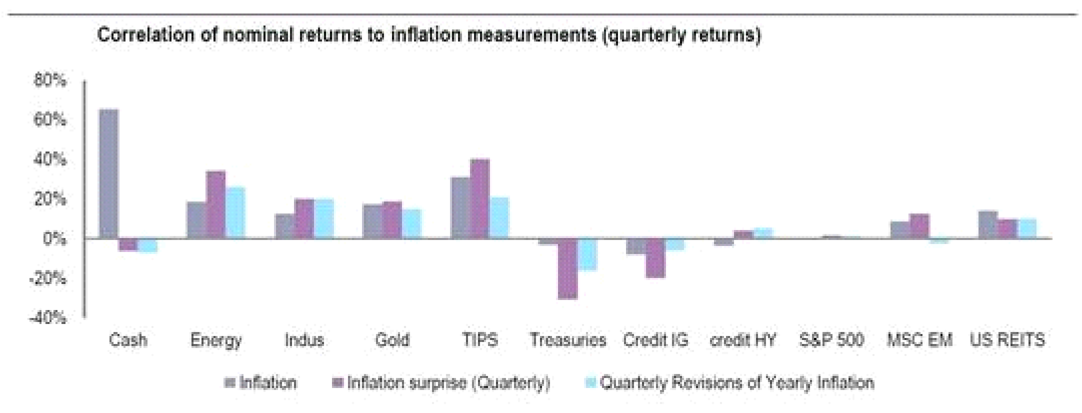
For a Trump victory, Natixis suggests a worst-of buffered note with a basket of gold, Treasury Inflation-Protected Securities, and gold miners ETFs as underlyings, all poised benefit

A Trump Presidency: What are the expected effects on the US economy?

- An election of Trump accompanied by Republicans taking control of both houses in Congress, would be likely to trigger a rebound in volatility in the short-term, along with an inflation shock and a fiscal shock over the medium term.
- With Trump as the potential winner, there is a high level of uncertainty as to the effect of tax reform and trajectory of public spending and finances. The negative impact on US GDP would be 1 point in 2017 and 1.5 points in 2018, and Mexico could enter recession in 2017 (-2.1%).
- The new president would be able to take a number of decisions that do not require Congressional approval. Particularly, in terms of foreign trade (for example to leave NAFTA). A recent study shows that under certain circumstances, the president could introduce tariffs. The executive could also act on immigration and energy policies. The future president will also have the power to renew or not renew Janet Yellen's term as Fed Chair in 2018 (the announcement will have to be made in late 2017).
- Trump's immigration policy is likely to have the following effects: 1.) a negative impact on potential growth, as population growth is one of the main drivers of potential growth; 2.) more pressure on the labor market (and potentially on wages) via lower growth in the labor force.
- Given the structure of US external trade, the proposal to increase tariffs will generate a rise in import prices of 10% to 20%. The corresponding loss of US consumption could amount to 1.0pt to 2.0pts of GDP.

What factors would drive the high-inflation environment in the Trump era?

- The outlook for 2017 and 2018 is that inflation will rise considerably, however the rate of inflation and its effects on the economy will be greatly impacted by the outcome of the election.
- If Donald Trump wins, an increase in inflation would be generated by a depreciation of the US dollar, via a major increase in public spending (fiscal deficit) on infrastructure and defense and a restoration of tariff barriers with China and Mexico.
- A rise in non-oil tariffs on China (45%), Mexico (35%) and other countries (10%) should lead to higher inflation and lower consumption in the US (-3.5%).
- Since 2008, the US economy has been in a low-inflation regime, after flirting with deflation. US inflation expectations have remained very low and relatively inert, be it inflation expectations based on the market for inflation-indexed bonds (TIPS) economists or households.



Sources: Natixis, Bloomberg, Datastream

Asset allocation in the event of a Trump victory

- If Donald Trump goes to The White House, investors will have to come to grips with a host of uncertainties. With the economy teetering on the edge of stagflation and a deterioration in US external relations, there could be a pronounced shift in TNote yields, CDS, inflation premiums, also in the TNote-Bund spread, which could be at its widest level, reached back in the 1980s.
- Breakeven inflation for Treasury Inflation Protected Securities (TIPS) would recover to levels more commensurate with the official inflation target.
- The introduction of trade tariffs would be likely to result in stagflation. Growth would slow from 1.5% in 2016 to 1.2% in 2017 and 0.4% in 2018.
- Observed results in the graph above are as expected: the assets that deliver the best inflation-adjusted (i.e. real) performances during shocks and/or upward revisions of inflation are the commodity indices (energy, industrial metals, gold), EM equities, REITS and TIPS.

We have selected the following underlyings to benefit from a Trump victory in the 2016 US presidential election:

1. **iShares TIPS Bond ETF (TIP UP)**
   The iShares TIPS Bond ETF seeks to track the investment results of an index composed of inflation-protected U.S. Treasury bonds. Provides exposure to U.S. TIPS, which are government bonds whose value rises with inflation. Gives access to the domestic TIPS market in a single fund and seek to protect against intermediate-term inflation.

2. **SPDR® Gold Shares ETF (GLD UP)**
   SPDR® Gold Shares (GLD) offer investors an innovative, relatively cost efficient and secure way to access the gold market. Originally listed on the New York Stock Exchange in November of 2004, and traded on NYSE ARCA since December 13, 2007, SPDR® Gold Shares is the largest physically backed gold exchange traded fund (ETF) in the world.

3. **VanEck Vectors Gold Miners ETF (GDX UP)**
   The VanEck Vectors Gold Miners ETF seeks to replicate as closely as possible, before fees and expenses, the price and yield performance of the NYSE ARCA Gold Miners Index (GDMNTR), which is intended to track the overall performance of companies and major players involved in the gold mining industry.

One possible result analysis

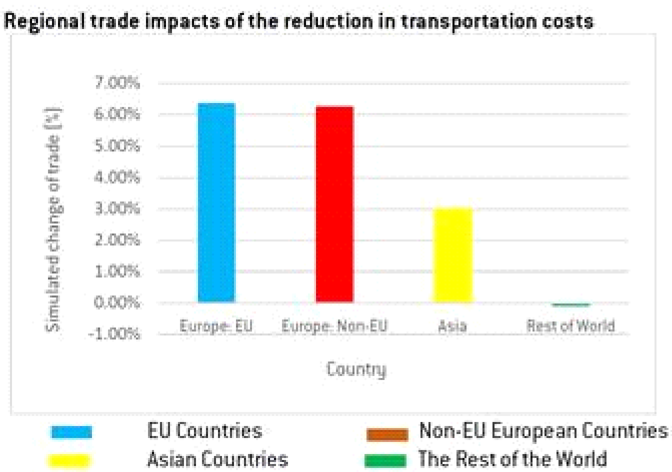
##

China's Belt and Road initiative is predicted to foster global trade through a substantial reduction in transportation costs.

Rationale

- The Belt and Road project, recently **embarked on by China**, aims to ease bottlenecks for cross-border trade, in particular through transport infrastructure. With six major economic corridors extending over Eurasia, this massive project covers 64 percent of the world's population and 30 percent of global GDP. Given the huge economic and population size of the covered area, this project appears to be a huge opportunity for Chinese and EU exporters.

- **The huge investments in infrastructure are predicted to foster trade** through a substantial reduction in transportation costs. A recent research results show that a reduction in transportation cost should increase trade globally and also for Europe. More specifically, a 10 percent reduction in railway, air and maritime costs within the Belt and Road area would increase EU trade by 2 percent, 5.5 percent and 1.1 percent respectively.



Source: Bruegel, http://bruegel.org/wp-content/uploads/2016/09/WP-05-2016.pdf

We have selected 3 Chinese and EU exporters that could potentially benefit from the China's Belt and Road initiative.

1) AAC Technologies Holdings Inc (2018 HK)

AAC Technologies, based in Shenzhen, is a global leading supplier of miniature acoustic and non-acoustic components to Apple, Blackberry, Samsung Electronics, Cisco, LG Electronics, Dell, HP and major Chinese smartphone brands. AAC produces a broad range of miniaturized components that include speakers, receivers and microphones in the acoustic segment and others such as haptics vibrators, RF and antennas, and optical lenses. The company owns production sites in China, Vietnam and Philippines.

2) Lenovo Group Ltd (992 HK)
Lenovo is a $39 billion global personal technology company and the world's largest PC vendor. The company also provides internet services and IT services, and contracting manufacturing business. The company has more than 54,000 employees serving customers in over 160 countries. A global Fortune 500 company, the company has manufacturing sites around the world from Greensboro, North Carolina and Monterrey, Mexico to India, China and Brazil.

3) Adidas AG (ADS GR)
Adidas AG manufactures sports shoes and sports equipment. In 2015, the company produces more than 778 million product units and generates sales of €17 billion. The company has outsourced most of its production to over 1,000 independent factories worldwide that manufacture the company's products in 61 countries. Around 75% of the supplier sites are located in Asia and EMEA.

International Big Project

##

Who will be the next President of the United States? Democratic nominee Hillary Clinton or Republican nominee Donald Trump? With less than 40 days remaining until election day, how will this affect the markets? We propose a volatility play to capitalize on market uncertainty

Volatility in past political events

- During the previous two years, there has been a number of high-stake political events in the developed markets. In 2015, we experienced the **Scottish Referendum, the UK General Election, the Greece Referendum and the Spanish Election and in 2016, Brexit occurred**
- Although the consequences of such political events are unpredictable, this difficulty itself lends to market volatility. **Two weeks before each event, market volatility typically increases and peaks**
- During the very last days before the UK and Scottish Referendums, the UK equities market experienced a huge "volatility of volatility". The daily volatility change ranged from -14% to 13% for the UK referendum and from -4% to 9% for the Scottish Referendum. This **volatility was more so influenced by changes in popular polls data and less by the changes in the possible outcomes**

VIX Index and "Clinton-Trump" Spread

Opportunity in political uncertainty

- Instead of looking towards which candidate will succeed as the next President of the United States, we should focus on market volatility as a risk factor due to political uncertainty
- As the **country nears the voting period, the risk of a rise in the EPU (Economic Policy Uncertainty) doubles**
- Uncertainty also picks up after the elections in early January (first session for the new Congress) and late January (handover of presidential powers)
- According to current market sentiment, a Clinton victory would be "good" for the market while a Trump victory will be "bad". Therefore, **a tightening of polls and a victory for Donald Trump would increase political uncertainty and therefore, volatility.** As the "Clinton-Trump spread"*, tightens (Trump receiving more votes), the higher the VIX index becomes. **On average, for every 1% more a Republican nominee leads in polls, the VIX increases by 3 points**
- In addition, the S&P 500 Volatility index has retreated from its highs in September and now being traded at levels similar to August. **As a result, there is more upside risk than downside risk for the VIX index**

We have selected the following underlying to benefit from increased volatility following the presidential election:

iPath S&P 500 VIX Short-Term Futures ETN (VXX UP)

- The iPath® S&P 500 VIX Short-Term Futures™ ETNs are designed to provide exposure to the S&P 500 VIX Short-Term Futures™ Index Total Return (the "Index"). The Index is designed to provide access to equity market volatility through CBOE Volatility Index® (the "VIX Index") futures. The Index offers exposure to a daily rolling long position in the first and second month VIX futures contracts and reflects market participants' views of the future direction of the VIX index at the time of expiration of the VIX futures contracts comprising the

Index.

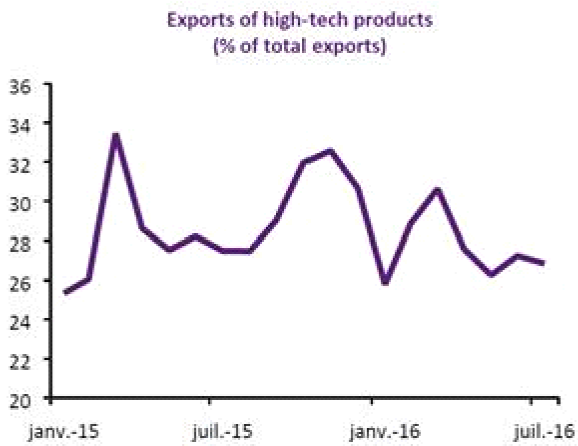
Volatility Play
##
##########

HIGH-TECH MANUFACTURING AND THE RISE OF CHINA

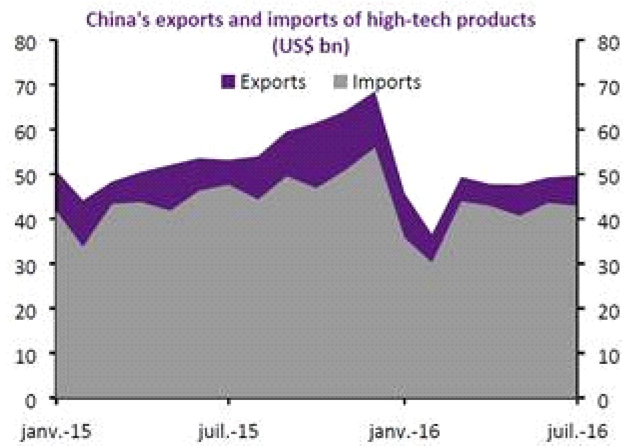
- China's latest official manufacturing Purchasing Managers' Index (PMI) shows that high-tech **manufacturing PMI** stood at 52.6 in August, a number significantly higher than the official headline number of 50.4. The figure reflects that the high-tech sector in China has been growing at a high speed.

- Investment in the high-tech sector has reached 9.8% of total investment in all industrial sectors in China. These products range from smartphone handsets to solar cells to industrial robots. Numerically, investment in this sector totaled RMB 1181 billion YTD in July, **growing 11.7% year-over-year.**

- Looking ahead, we anticipate that China aims to widen its current account surplus to cushion potential foreign reserves loss from capital outflows. Given that the high-tech sector roughly takes up 25% of total exports, there is little doubt that more investment and resources could be channeled into the sector to support its growth.



Source: Bloomberg, Natixis



Source: Bloomberg, Natixis

We have selected 3 semiconductor suppliers that could benefit from the rising high-tech sector in China:

1) Intel Corp (INTC US)
Intel has been a leader in the semiconductor industry with 14.8% of market share by revenue in 2015. According to market research firm IHS Markit, the company retained its no. 1 ranking in 2015 with 2.9% growth in revenue to US$ 51.42 billion. Earlier this month, the company has announced its plan to acquire Irish chip firm Movidius to accelerate its initiatives in new and emerging technologies through Movidius' low-power and high-performance system-on-chips (SoCs).

2) Broadcom (AVGO US)
Broadcom ranked no. 8 in semiconductor revenue in 2015. In the last few years, Broadcom has taken a number of steps to increase its penetration in China. China accounts for more than 90% of Broadcom's exports; these exported semiconductors are shipped to China both for re-export and national sale. The company aims to become the best semiconductor solutions provider in the Chinese market, making the region its largest market outside America. The issuance of 4G licenses, the promotion of the Broadband China project, and the popularization of HD video provide significant growth opportunities in the region. Given that China is the world's most populous country and the fastest growing economy in the world, Broadcom seems to be investing its resources in the right direction.

3) Nvidia (NVDA US)
Nvidia has four offices in China; two in Shanghai, one in Beijing, and a manufacturing plant in Shenzen. Nvidia receives 54.3% of its revenue from China and Taiwan, as of FY 2015. Asia is expected to play an important role in global mobile and online games' revenue growth. More than 50% of the global growth is expected to come from Asia—32% in China, 12% in South Korea, and 10% in Japan. Gaming serves as a large flow of Nvidia's GPU and semiconductor processing with their processing units and chips serving the wave of new virtual reality and mobile gaming platforms. Also, Chinese search engine Baidu and chipmaker Nvidia announced a partnership in September 2016 that will focus on using artificial intelligence to develop a computing platform for self-driving cars. The platform will include cloud-based high-definition maps. Nvidia has operated in China for more than ten years through its local representative, Atlantic Semiconductor Products Co. Ltd, and has developed close partnerships with local industry leaders, including Lenovo, Founder, Tsinghua Tongfang, and TCL.

Index indicator, sector investment, sector growth, governor relationship

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11.3 Trade Idea

Thursday, November 03, 2016
12:00 PM

Market Reaction :
Market goes down.
Volatility Goes up
Investors are weary about the uncertainty.

US Election
Story line of the election

Market and Eco outlook
Two different situation. =>
Variable: Inflation, unemployment, economic growth, monetary policy, minimum wage, infrastructure spending

Experience:
Two weeks before every significant political event, market volatility typlically increase and peaks.
Other future events : session for new congress, handover of presidential power.

Data back up: on the average, for every 1% nominee leads in polls, the vix increase by 3 point.

Effect explanation:
Tighten, the higher.

Historical price analysis:
Since decrease all the time, more upside risk than downside risk.

Political decision analysis: Trump's inflation , tax reform, immigration policy.

Pros and cons analysis, the effect of the policy that increase the wage increase.

12.14

Wednesday, December 14, 2016
3:35 PM

Yes. This is the infamous equity structured product that wiped out the wealth of a lot of Asian High Net Worth individuals in 2007-2008. The product is also dubbed as "I kill you later" because what it did. The buyer of an accumulator contract agrees to buy a fixed number of stocks on each observation date, at a given strike price which is usually at around 10% discount to the prevailing price of the underlying in the market, till expiry or early termination date. The contracts terminates early [i.e. knocks out] when the underlying breaches prespecified high barrier called **autocall barrier**.

The buyer benefits the most in a moderately bullish market when the underlying price **(=S_0)** is close to but still less than the autocall barrier price. In this situation, the contract keeps on accumulating stocks at a discount. If the underlying breaches the autocall barrier, the contract terminates yielding a payoff of **(S_0-K_0)** on each unit accumulated till the autocall date. However, if the market collapses the trade keeps on accumulating shares (now at a premium = **[K_0-S_0]**). We see that the upside potential of the contract is limited while is the downside is unlimited, hence these contracts are deemed dangerous for naiive investors.

We are however going to evaluate here the risks of the accumulator contract from the seller's point of view. Lets assume that we have sold a contract that accumulates x stocks of company A for the investor **everyday** till maturity at price **K_0** unless the stock breaches a high barrier **K_h**. If the stock does breach **K_h** some day before maturity the contract terminates. If we look closely, we will notice that the contract could be structured by **selling** a series of put options with Strike **K_0** and **buying** a series of binary options paying **K_h** - **K_0** with knock out barrier = **K_h** expiring in 1D, 2D, 3D so on and so forth till expiry. In effect the seller finances the binary options from the premium received from selling the puts.

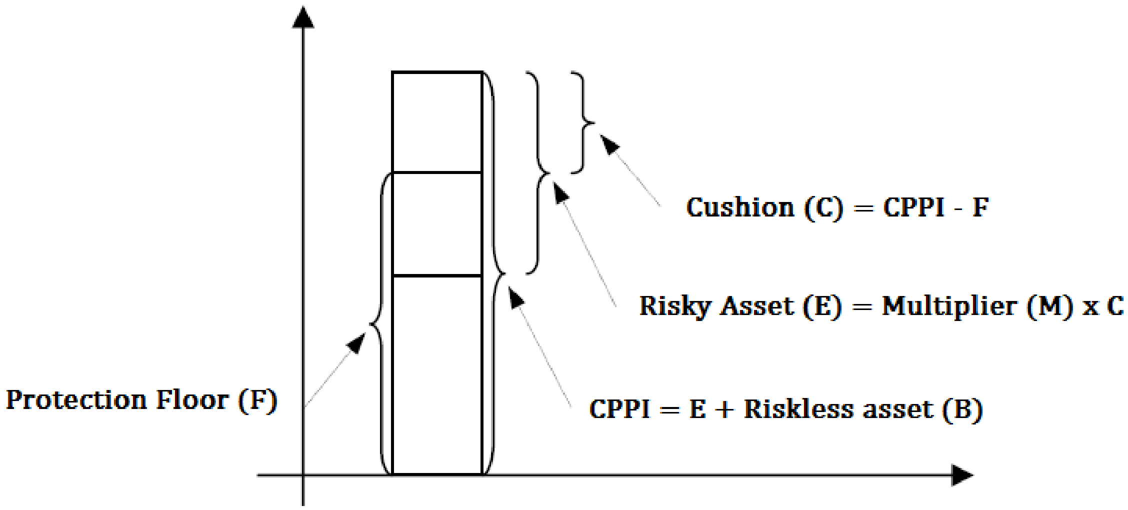
Having split the payoff into vanilla components, it becomes straight forward to analyse the risks of the structure now. Because the seller is long the puts with strike **K_0** and short the binary option with knock out at **K_h**, the seller is short delta, long vega and long gamma on the overall structure.

Pasted from <http://deltaquants.com/risk-analysis-of-equity-accumulators>

Constant Proprtion Portfolio Insurance or CPPI products are capital guarantee product based on a dynamic asset allocation strategy. The strategy actively allocates between two asset classes - a riskless asset and a risky asset which could be from equity, hedge funds, funds, equity or commodity indices etc. In rising markets the strategy allocates more towards the risky asset while in falling market, the strategy allocates more towards the safe asset. CPPIs are also one of the most popular derivative products because of their capital protection feature. Although CPPIs were first developed for the retail investors, they are now popular even with pension funds and insurance companies as the structure still ensures minimum future cash flow required by these industries.

Understanding the Payoff

Suppose we have a CPPI product expiring in 5 years time and the buyer has invested £100 worth CPPI. Also lets assume that £90 worth zero coupon bonds today will yield £100 in 5 years time. CPPI products allocate to risky asset based on the pre-specified **Multiplier (or leverage)**. So lets say that the Multiplier is 4, then the strategy allocates 4*(£100-£90)=£40 to the risky asset initially and the rest £100-£40=£60 to riskless bonds. If now lets say that the market rallies so that the new portfolio (risky asset + riskless asset) value is £105, the strategy will now allocate 4*(£105-£90)=£60 to the risky asset whereas now only £40 to bonds. On the other hand if the market falls so that the new portfolio value is £95, the strategy will now allocate 4*(£95-£90)=£20 to risky asset whereas now £80 to bonds. By allocating more and more progressively to the riskless bond when the market falls, the strategy ensures capital protection **(on most ocassions - see discussion on GAP risk below)**.



In the example above, £90 is the amount the strategy requires to guarantee the principal £100 back at maturity and is termed as the **Protection or Bond Floor**. The investment in Protection or Bond Floor is £40. The excess of portfolio over the protection floor is referred to as the **Cushion amount** (=£10 in the example above). If at certain stage the portfolio value declines to the protection floor level, the strategy allocates completely to the riskless asset and will stop investing in the risky asset for rest of the duration of the product. This situation is sometimes called "**cash lock**".

Comparison to bond + a call investment

CPPIs are sometimes compared to a bond + a call option capital protected strategy. In the example above, lets say that £90 were invested in a riskless asset so that they yield £100 at maturity and the rest £10 giving you participation in the risky market through a call option. While the exact difference in the payoff of a CPPI and this bond+call option strategy will depend on the path taken by the risky asset along with its value at maturity, we can make a few comments on how their payoffs compare in different market environments. In rallying market, its straightforward to see that the CPPI product will outperform the call + bond investment strategy because the CPPIs would progressively increase the allocation to the risky asset giving you more and more exposure. In falling markets both the strategies would yield back the principal at maturity. On occasions where the risky asset falls below the Protection floor and then rebounds above its initial level, the payoff of a call + bond would yield a higher payoff as the CPPI strategy would have allocated everything to the riskless asset cutting off the exposure in the risky asset for rest of the life of the product.

Negative gamma product

CPPIs are negative gamma products for the buyer. To replicate the product, one would be buying the risky asset in the rising markets while selling in falling markets i.e. buying high and selling low.

GAP Risk

If the prices of the risky asset change gradually then the seller has sufficient time to deallocate from the risky asset and allocate to the riskless asset in case the markets start collapsing. However a critical situation can occur if there is a dramatic fall in the value of the risky asset between two rebalancing dates. In worst possible scenario, the CPPI portfolio can fall below the Protection floor before the manager could rebalance. In such a situation the CPPI portfolio would loose its capital protection. We notice that higher the value of Multiplier (M) higher would be the GAP risk. (1/M) is often referred to as the GAP size. It refers to the maximum loss that could be sustained between two rebalancing date before the portfolio breaks the protection floor. In the example above M=4, thus risky can fall upto 1/4 = 25% between two rebalancing dates before the CPPI portfolio falls to the Protection floor risking the capital protection.

To minimise the GAP risks it is essential to select the risky asset carefully (use liquid and less volatile assets). The multiplier should be small to keep the GAP risk limited yet large enough to provide decent leverage. Also by increasing the frequency of rebalancing the GAP risk can be kept under control.

Interest rate risk

So far we have been guilty of using the term "riskless" for the non-risky asset in the CPPI structures. However these non risky assets bear interest rate risks that influence the Protection floor (the amount required to bear the principal at maturity) and hence the cushion and the amount invested in the risky asset.

Pricing and hedging considerations

To account for the GAP risk, the pricing methodology should incorporate abrupt movements or "jumps" in the price movements. Often the seller guarantees the capital protections so that he bears the GAP risk of the product. If the risky asset is a liquid one then he sometime hedges the GAP risk by buying and rolling OTM put options on either the underlying asset or a correlated index. If however the risky asset is not a liquid one, buying and then hedging put options would not be easy and hence it would be prudent for him rather to keep the Multiplier as small as possible than investing in put options.

Pasted from <http://deltaquants.com/Introduction-to-risks-in-CPPI-products>

This article introduces the concepts of martingale and markov processes and their application in derivatives option pricing. The text assumes a simple discrete time binomial model framework.

Martingale process

Any martingale process is a sequence of random variables that satisfies

$$E(X_{n+1}) = X_n$$

.....(1)

The discounted stock price under the risk neutral probability measures is a martingale process. The risk neutral probabilities are chosen to enforce the fact. i.e.

$$\frac{S_n}{(1+r)^n} = \overline{E}_n\left[\frac{S_{n+1}}{(1+r)^{n+1}}\right]$$

.....(2)

here the

$$\overline{E}_n(x)$$

indicates the expected value under risk neutral measure.

Lets take a one period process, the stock price

$$S_o$$

can either go to either

$$uS_o$$

with a risk neutral probability

$$p$$

or

$$dS_o$$

with a probability

$$1-p$$

[u>1+r>d]. It is important at this stage to distinguish the risk neutral probabilities from the actual probabilities. This framework is based on the risk neutral premises [i.e it uses risk neutral probabilities] which determines the fair value of the option based on its hedging costs.

$$\overline{E}_1(S_1) = \frac{pu+(1-p)d}{1+r}S_o = S_o$$

......(3)

so that p solves to ,

$$p = \frac{1+r-d}{u-d}$$

...(4) and

$$1-p = \frac{u-1-r}{u-d}$$

....(5)

with continuous discounting these formulas become

$$p = \frac{e^{r\Delta t}-d}{u-d}$$

...(4a) and

$$1-p = \frac{u-e^{r\Delta t}}{u-d}$$

....(5b)
Its straightforward to see that we get the same results for an n period process as well. What the result means is that the discounted stock price [or forward price] for the (n+1)th period depends only on the stock price of nth period.

Markov property

Within the binomial asset pricing model. Let X_0, X_1,....X_N be a random process. If for every n between 0 and N-1 and f(x), there exists another function g(x) such that

$$E_n[f(X_{n+1}]=g(X_n)$$

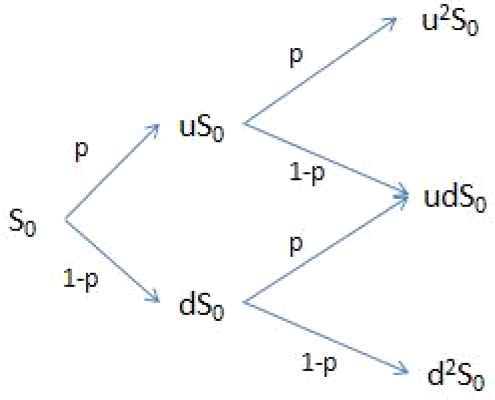
....(6)
We say that X_0,X_1...X_N is a Markov process.
Again what this means is that the information required to evaluate

$$E_n[f(X_{n+1}]$$

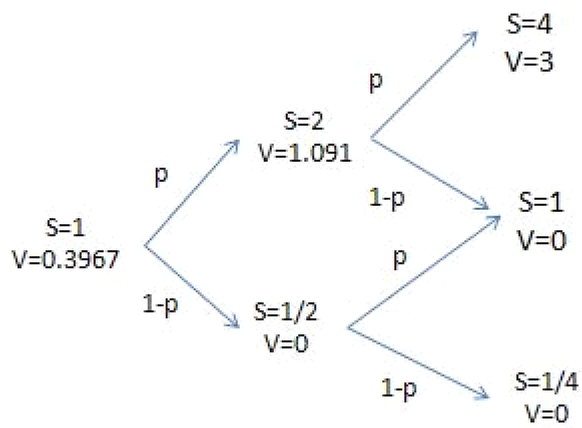
is available in X_N i.e the path that the variable took to get to X_N is not required. What this means in terms of derivatives option pricing is that we do not need to save the path information when the option payoff is Markov. On occasions we encounter non Markov processes. As an example consider an Maximum to date payoff for the option. The option payoff for the nth period not only depends on the stock price at the nth period but also the path taken to get to it. When we encounter these non-Markov processes we sometimes recover the Markov property by adding one or more so called state variables. [for example in this case the extra variable stores during maximum till date stock price]
Martingale is a special case of Markov wth f = x and g = x. However for the process to be Markov we require for every function f a corresponding function g such that (6) holds. So not all Martingales are Markov. Similarly not all Markovs are martingales. The function g required to make the process Markov need not necassorily be x.

Risk Neutral Pricing

We continue the discussion of risk neutral premises. One might wonder why risk neutral probabilities as opposed to actual probabilties lead to fair option values. To answer this lets assume a european call option under a two period binomial model framework. The arguments that we present would be applicable to a multi period framework as well.



Lets assume that the initial stock price is 1 and u = 2 and d = 1/2 so that after first period the stock price can take either 2 or 1/2 so on an so forth. See the image below. Also lets assume that the interest rate is 10%. i.e. r=0.1. The strike of the european call option is 1.



Using equations (4) and (5) we get the risk neutral probabilities p = 0.4 and 1-p = 0.6. Under the risk neutral pricing framework, it is possible to construct a riskless portfolio that yields the same option payoff which therefore can be used to hedge the option. From the figure above, we take the fair price of the option as the expected payoff under the risk neutral measure equating to 0.3967. This is the amount that the seller of the option receives as premium at period 0 as the cash component. The seller delta hedges at the end of each period by either buying or selling underlying stock using the available cash or borrowing if need be. The discrete risk free rate is 10% which will also be the borrowing cost.
The amount of stocks at the end of each period [=delta] is calculated using the formula

$$\Delta_n = \frac{\Delta V}{\Delta S} = \frac{V_{up} - V_{down}}{S_{up} - S_{down}}$$

So that at period 0 the seller would buy n = (1.09091 - 0)/(2 - 0.5) = 0.7273 stocks with (0.7273 - 0.3967) = 0.3306 borrowed cash. [option premium cash already available to him]
At the end of first period the stock either goes to S = 2 or 0.5. The seller now owes cash = (1+r) 0.3306 = 0.3636 cash due the interest accrued on the borrowed cash. Let us now assume that the stock ended at S = 2 after the first period. He will again readjust the amount of stocks to n = (3 - 0)/(4 - 1) = 1. He already owns 0.7273 stocks. He purchases rest of (1 - 0.7273) = 0.2727 shares using 2 * 0.2727 = 0.5455 more cash. So that he now owes 0.5455 + 0.3636 = 0.9091 in all and owns n= 1 stock at the end of period 1.
Given that the stock was S = 2 at the end of period 1, we now show that irrespective of whether the stock rises to S = 4 or goes back 1 he will have enough resources to settle the call option contract. Given the interest accrued on the borrowed money in period 2, the seller now owes cash = 0.9091 * (1+r) = 1. He owns n =1 share from period 1. If now the stock rises to 4, he needs to pay the buyer payoff = 4 - 1 = 3 so that he pays 3 to the buyer and using the remaining 1 he pays off the borrowed money.
We can do a similar analysis for the stock price S = 0.5 at the end of the first period but is left to the reader. We found that the option price calculate using risk neutral probabilities yields enough resources to be able to complete hedge the option. We hence conclude this article by emphasing that in the risk neutral premises its possible to construct a riskless portfolio that yields the same payoff as the option and hence the fair price of the option should be the price calculated using the risk neutral probabilities [law of one price otherwise we can contruct an arbitrage portfolio].

Pasted from <http://deltaquants.com/markov-and-martingale-processes>

With very strict limits on the delta exposure that the trading desks are permitted, most profit/losses that the desk realizes is explained by changes in equity volatility, gamma PnL, changes in equity correlations markings, FX vols, Equity FX correlations, interest rates, repo rates and expected dividends. Ocassionally windfalls [applicable to overhedges] also contribute to the PnL. The trading strategies of the desks to a large extent center around the gamma and the volatility exposures based on the market view they have. In this article we shall try to understand the gamma risks.
While being long gamma requires funding costs (i.e requires investment to buy options), being short gamma earns that investment money. So by being long gamma you would realize negative PnL on theta whereas positive PnL on theta by being short gamma [well almost always - one exception being long

deep ITM puts are long theta]. One common practise is to be long gamma in trending markets and short gamma for ranged bound (or sluggish) markets.
In the discussion that follows we assume that the portfolio is delta hedged at discrete intervals. Of course if we keep the portfolfolio continuously delta hedged, we would not realized any PnL [the argument assumes that the other risk factors do not change] i.e the realized PnL is due to the deltas accumulated between the rehedgings. It will be worth noticing in the discussion that follows how the perspectives of the risk managers and traders sometimes (may be often) differ.
Lets take the first scenario, the **market is rallying (stocks moving up)**. The traders would like to have **long gamma** exposures in such a market. With a long gamma exposure, as the markets rally the portfolio picks up more delta between rehedgings. To keep the portfolio delta hedged as the market moves up and the portfolio picks up positive delta, the trader will sell the stocks [or forwards]. With markets going up the trader is selling at a high **[sell at a high while have bought at a low]** thus making profits. When the trader expects that the market will continue to rally, he would delta hedge less often to be able to accumulate more deltas [and hence more profits].
In another situation we suppose that the **markets were crashing**, the trader would again like a **long gamma** exposure. The portfolio would be picking up negative delta which the trader would cover by buying stocks **[buying low]** in a falling market. The trader is making a profit in this situation by accumulating negative deltas on the way down.
It would start to appear that being long gamma always gives you a profit. Well umm.. not always. Remember that we told that positive gamma is an expensive strategy because of the time decay. To be able to earn profits overall, the stock movements should be able to compensate for the loss in time decay. So when the trader believes that the market is going to be sluggish [small moves], he would keep a short gamma position and be happy to earn PnL due to theta. But, being **short gamma** is a risky strategy. The trader will start **loosing money in trending markets**. The analysis is similar to the discussion above, when the market crashes the portfolio picks up positive delta and the trader will find himself in a situation where he is selling when the market is crashing [selling low]. Similarly when the market rallies, the portfolio would pick up negative delta and the trader would find himself in a situation where he's buying in the peaking market to delta hedge. In a collapsing market the traders sometimes might like to hedge less often in the hope that the market would rebound [after all you dont realize profit or loose unless you book it]. But then the risk manager should know that this strategy runs the risk of realizing even more losses in future by not booking small ones today. Hence short gammas can get the risk managers worried.

Pasted from <http://deltaquants.com/an-introduction-to-the-gamma-risk>

Lookback options as many of you would already know are path dependant options whose payoff depends on the maximum or the minimum value of the underlier (depending on whether a call or a put) attained during the life of the option. The most basic Lookback options include the floating strike and the fixed strike (payoffs given below). More exotic lookbacks would include discrete monitoring, lookback features within other products, asianing lookback observations and so on and so forth. In this article we present the analysis of the risk factors of the most basic payoffs which could be extended (hopefully!!) to the more advance variations. Lets begin with the payoffs first.

$$\text{Call}_{\text{fixed strike}} = \text{Max}[S_{\text{max}} - K, 0]$$

$$\text{Put}_{\text{fixed strike}} = \text{Max}[K - S_{\text{min}}, 0]$$

$$\text{Call}_{\text{float strike}} = \text{Max}[S_{\text{final}} - S_{\text{min}}, 0] = S_{\text{final}} - S_{\text{min}}$$

$$\text{Put}_{\text{float strike}} = \text{Max}[S_{\text{max}} - S_{\text{final}}, 0] = S_{\text{max}} - S_{\text{final}}$$

Trade motivation
An investor in stocks is always in a dilemma whether to sell and book the current profit or hold and hopefully earn still higher profits in future while risking loosing some or all of the unrealized profits.The investor wants to avoid the feeling of REGRET - the regret of holding for too long or the regret of selling

too early. As it turns out, the lookback options are just the options that act as insurance against regret. For example, with floating strike calls the investor can buy the stock at the minimum price during the life of the lookback option and with floating strike puts the investor can sell at the stock at the maximum price during the life of the lookback option.
Let elaborate one example - Skip this section if you already have guessed it. Suppose I own a stock which currently trades at 150. I had originally bought that stock for 100. I have the option of selling it at 150 now and booking the profit of 50. If however I do so and the stock goes to 200, I will regret having sold it and on the othe hand I dont sell and the stock crashes to 90, I loose all the unrealized profit. So what do I do? I buy a floating strike put (ofcourse you have to pay a premium for this). Lets say the stock ends at an even stevens 100 i.e. no profit no loss. If the stock did however reach a maximum of 200 during the life of the put option. The buyer receives a payoff of 100 from the lookback put and likewise if indeed the stock crashed after reaching 150 and ends at 90, the buyer receives the payoff of 60 from the lookback put. In the first case, he earns 0 from the position in stock and 100 from the lookback put that is net 100 profit which is the maximum he could have got. In the second case, he gains 60 on the put and looses 10 on the stock making the net profit 50 which is again the maximum he could have got.

Risk analysis

Lets first consider the **Fixed Strike Lookback Call**. The payoff is shown again below for handiness purposes.

$$\mathrm{Call}_{\mathrm{fixed\ strike}} = \mathrm{Max}[S_{\mathrm{max}} - K, 0]$$

The first thing we notice is that the payoff

$$Max[S_{max} - K, 0] =$$

$$Max[S_{max} - S_{final} + (S_{final} - K), 0]$$

is greater than

$$Max[S_{final} - K, 0]$$

which is the payoff of classical European call option. Hence this option should be costlier than a European call and as a rule of thumb mostly twice as costly as the the European calls.
We also realize that whenever the underlying stock reaches a new high (since option start date), the option locks in a payoff = $S_{max} - K$. This is the minimum the option buyer receives no matter where the stock ends at the expiry date.
The option buyer clearly benefits from higher stock prices i.e it is **long delta, long interest rates and short dividends**. The payoff also benefits from higher volatility (much like a simple call and additionally, the volatility helps attain higher S_{max} on the upside and the downside being floored leads to a still higher fair value) meaning that the option buyer is also **long volatility**.
The hedging argument - (read Goldman, Sosin, and Gatto (1979) or Gatheral's book, The volatility surface). Suppose I have sold a lookback call that pays $Max[S_{max} - K, 0]$, to hedge the short position in such an option I'll buy two ATM european call options with strike K. If the underlier crashes and never reaches K, both the short position in the lookback option and the two european calls expire worthless so that I need not do anything else to hedge. If however, the underlier rallies and the reaches $K + \Delta K$. Notice that that the S_{max} is now $K + \Delta K$ and the option has already locked in the payoff ΔK. I sell the two european calls that I own and but two new ATM European call i.e I sell a call spread (aha!! the skew exposure). We know that the delta of the ATM call option is approximately 0.5 so that when the underlier moves by ΔK, the option price moves by approximately $\Delta K/2$. Hence we are hedging using two options.

As a result of the above argurment, the seller is long skew and the buyer is **short skew**. Higher the skew, more valuable will be the call spread and the seller gets more money by selling it. We can conclude that when priced under local volatility, this lookback option will be overpriced. We should be using stochastic volatility for valuing this option.
Gamma is also an important risk for lookbacks. For these fixed strike calls, we observe that the **gamma is maximum when the underlier is at its high** and tends to come down when the underlier declines away from the high.
Lets take the **Fixed Strike Lookback Put options** now. The payoff is given below:
$$\mathrm{Put}_{\text{fixed strike}} = \mathrm{Max}[\mathrm{K} - \mathrm{S}_{\min}, 0]$$
This lookback tends to lock in payoff =
$Max[K - S_{min}]$
whenever the underlying stock reaches a new low. This is the minimum no matter what path the stock follows thereafter.
The option buyer is short delta, **short interest rates and long dividends**. The payoff again benefits from higher volatility and hence the buyer is long volatility. For hedging, the seller will but two ATM European puts initially. If the stock rises both the lookback put and the european puts both expire worthless. If the stock declines to
$K - \Delta K$
, the seller would sell the two ATM european puts he holds and buys two new ATM puts with strike
$K - \Delta K$
i.e he is buying put spreads. In the presence of skew the
$K - \Delta K$
puts that the seller buys to hedge would be costlier and hence he is short skew which means that the **buyer is long skew**.
The gamma for these lookback puts is highest when the stock is at its lowest and reduces as the stock rises.
For **Floating strike Lookback calls**, the payoff is:
$$\mathrm{Call}_{\text{float strike}} = \mathrm{S}_{\text{final}} - \mathrm{S}_{\min}$$
It helps to compare these lookbacks against **ATM** (
$K = S_{initial}$
)European calls. The expected payoff of these lookback options is higher than ATM european calls as the
$S_{min} <= K (= S_{initial})$
making it more expensive than a European ATM call. When the underlier is at or near its low, these lookbacks would behave like ATM calls and when the stock rises higher these options would start behaving like ITM calls.
The buyer is **long delta** (the delta picks as the stock rises above the minimum) - closer to stock's minimum the delta would be around 0.5 and would rise to 1 as the underlying stock rises to its maximum.
He is also **long volatility** since higher volatility would pull apart
S_{final}
and
S_{min}
leading to higher payoffs. **Gamma is maximum when the stock is at the lowest** and decreases as the stock rises. The buyer is **long skew** (argument is similar to lookback fixed strike puts above)
Floating strike Lookback puts, the payoff is:
$$\mathrm{Put}_{\text{float strike}} = \mathrm{S}_{\max} - \mathrm{S}_{\text{final}}$$
The arguments pretty much remain on the same lines as the discussion so far. Let me just quickly summarize and wrap up this article. The buyer is **short delta, long volatility, the gamma is maximum when the underlying stock is at it maximum** and finally the buyer is also **short skew**.

Pasted from <http://deltaquants.com/risk-analysis-of-lookback-options>

Understanding the sticky delta and sticky strike rules for volatility will help us determine how the volatility skew changes when the markets move.
The sticky strike rule:

Some market players believe that when the stock/index moves, the volatility skew for an option remains unchanged with strike. This behaviour is referred to as the the sticky strike rule. The rule is appliacable when the markets are expected to range bound in near future without significant change in realized volatility.

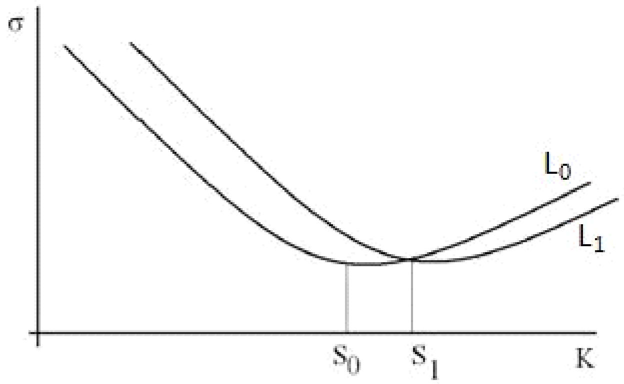
The sticky delta rule:

There are some market players that tend to believe that the volatility skew remains unchanged with moneyness. For example lets say that the implied volatility for an ATM option is 30% with the index leve being at 100. Now if the index declines to 90, this rule would predict that the implied volatility for 90 stike option would now be 30%. Hence the behaviour is known as sticky moneyness or sticky delta.

The sticky delta rule is more applicable when the markets are trending without a significant change in realized volatility.

The Figure 1 below shows figuratively how the volatility skew gets affected under the two rules. If the current level of the underlier was S_0 and the volatility skew for a specific tenor was indicated by L_0. Under the sticky strike rule, the skew remains the same L_0. Under the sticky delta rule the skew moves in the direction of the underlier move. Thus when the underlier moves from S_0 to S_1, the new skew is indicated by L_1.

figure 1:Volatility skew as the market moves



Both the sticky strike and sticky delta rules have been proven to provide arbitrage oppportunities. However, these rules do help us understand the risks of the traded products.

It is known that when the market falls, the impied volatility is observed to increase. E. Derman describes a sticky implied tree rule which is consistent with this observation and is also argued to be arbitrage free.

Pasted from <http://deltaquants.com/volatility-sticky-strike-vs-sticky-delta>

Cliquets are one of the most popular structures traded. These are also known as ratchet options due the resetting strikes in the structure. This resetting strike feature is what makes cliquet structures unique as they create an exposure on the forwad skew and vega convexity (we'll come back to this). First lets look at the payoffs of the two commonly traded cliquet structures.

Payoffs

Among the cliquets, the two most commonly traded variations are the Global Cap Local Floor (GCLF) and the Local Cap Global Floor (LCGF). Their payoffs are given below:

$$Payoff_{LCGF} = max\left[GF\ ,\ \sum_{i=1}^{n} min(LC\ ,\ Ret_i)\right]$$

where GC is the global cap and LF is the local floor prestated in the trade terms. Obviously, n*LF should be less than the GC for the payoff to make sense.

$$Payoff_{LCGF} = max\left[GF\ ,\ \sum_{i=1}^{n} min(LC\ ,\ Ret_i)\right]$$

where GF is the global floor and LC is the local cap stated in the trade terms. Again, the GF should be less than n*LC.

Trade motivation

Cliquets could be viewed as a series of forward starting options. This strategy locks in periodic returns from the underlier unlike the conventional european options.Lets suppose we have a local floor global cap cliquet option and further the local floor is 0 and the global cap is set as 18%. Figure 1 below shows the sample payoffs of this structure under three scenarios and compares it with the payoff of a standard european call. The returns shown in the figure are periodic say yearly.

figure 1-Payoffs for a cliquet option

	Year 1	**Year 2**	**Year 3**	**Year 4**	**GCLF**	**European call**
Scenario 1	2%	5%	6%	2%	15%	15.797%
Scenario 2	-30%	2%	5%	6%	13%	0%
Scenario 3	2%	-5%	6%	-3%	8%	0%

In the first scenario in which the stock always increases (example-in bullish market where the stock rallies), the normal european call outperforms the cliquet payout. In the second and the third scenario, (example-an extremely volatile market especially after a crash or indeed as the second scenario indicates a sort of crash in the first year followed subsequent steady recovery) the cliquet outperforms the standard call option.

Because the structure locks in periodic returns which are subject to a floor of 0, the trade picks up only positive periodic performances which could be a strategy employed in volatile markets. Also the investor benefits when the future volatility of the underlier increases. After all, he's been charged for a specific implied volatility, if the realized volatility is infact greated than the expected, he benefits from a wilder positive underlier moves.

Risk analysis

First lets look at the global cap local floor cliquets. If we breakdown the payoff:

$$Payoff_{GCLF} = \min\left[\mathrm{GC}\ ,\ \sum_{i=1}^{n} \max(\mathrm{LF}\ ,\ \mathrm{Ret_i})\ \right]$$

which can be rewritten as

$$= \mathrm{nLF} + \sum_{i=1}^{n} \max(0,\mathrm{Ret_i} - \mathrm{LF}) - \max\left[0, \sum_{i=1}^{n} \max(0,\mathrm{Ret_i} - \mathrm{LF}) - (\mathrm{GC} - \mathrm{nLF})\right]$$

The payoff has been simply broken into three components, first the fixed component = n time the local floor, the second is the excess return of the asset over the local floor - simply put its a series of forward starting call option with strike LF, the third component is the subtracts the excess return over the global cap - which can be viewed as a compound option with strike GC-nLF (remember GC-nLF will be greater than zero for the cliquet payoff to make sense)

First lets talk about the vega, both the forward starting options(second component) and the compound option (the third component in the expression above) increase in value with increase in volatility. However since the buyer is actually short the compound option and long the series of forward starting options, the net vega whether positive or negative would be determined by the values of Local Floor and the Global Cap. For example, if the Local Floor is zero, the buyer is long a series of ATM forward starting options and as we know that the vega for ATM options are the maximum, the first component in the above expression might dominate and the buyer might actually be long vega.

We know that ITM call option benefits from skew, whereas an OTM call option is short the skew. The second component max(0,Reti-LF) whether long or short the skew, depends on the value of LF. If LF >0, the option becomes OTM whereas when LF< 0, the option becomes ITM. The position in the third component (the compound option) is not clear. Likewise, the overall skew position in cliquets is not clear.

Compound options generally have high exposure to vega convexity (dvega/dvol). Hence the overall structure becomes sensitive to the vega convexity.

Now we consider, Local cap global Floor cliquets.

$$Payoff_{LCGF} = max\left[GF\ ,\ \sum_{i=1}^{n} min(LC\ ,\ Ret_i)\right]$$

We know caps can be viewed as a combination of long asset and short OTM call options and as we do know that OTM call options are short skew [OTM puts and ITM calls are costlier in the presence of a

skew] making the cap structures for the buyer long skew. As a result the LCGF cliquet structure, is long skew for the buyer.
Depending on whether what the values of the local cap and global floor are, the LCGF cliquet structure has exposure to vega convexity. [Remember ATM options calls & put have lower vega convexity (dvega/dvol)].

Pasted from <http://deltaquants.com/risk-analysis-of-cliquets>

Autocallables are quite commonly traded exotics with quite a few variations in structures. As the names suggests, these structures get automatically redeemed (or autocalled) when the the underlying price breaches the autocall barrier. Essentially the maturity of the trade is not fixed, the trade might autocall on any of the observation dates prior to final observation (or expiry) date. Lets begin with the simplest autocall structure and later on we shall discuss some more complicated variations.

Single Asset Autocalls

Lets say we have a 4 year trade with annual observations. The buyer receives coupon say 15% of the Notional Amount on each payment date (a week after the observation date) given that the underlying stock is above 70% of the stock price at inception (Barrier B) and trade has not be autocalled yet. The trade gets autocalled on any of the observation date if it the underlying asset price is greater than the Autocall trigger level (Barrier H=110%).

$Payoff$:

$$Coupon_i = 11\%\ of\ NA\ if\ S_i > B(=70\%)\ and\ S_{1..i} < H(=110\%)$$

figure 1-Stock price as a percentage of price at inception

	Year 1	**Year 2**	**Year 3**	**Year 4**
Scenario 1	98%	80%	101%	104%
Scenario 2	88%	92%	130%	105%
Scenario 3	106%	98%	67%	76%

Lets take the first scenario. The stock is above the coupon barrier (=70%) at the end of each year and at the same time it never breaches the autocall barrier(=110%). As a result the note pays a coupon of 11% for each of the 4 years. The buyer gets back the notional at the end of the fourth year.
In the second scenario, the stock breaches the autocall barrier in the third year. Consequently, the trade expires in the third year. Because the stock price is above the coupon barrier for each of the three years the trade is live, the note pays a coupon of 11% for the first three years. The buyer gets back the notional at the end of the third year.
Similarly for the third scenario, the note pays a coupon of 11% at the end the first, second and the fourth year. The buyer gets back the notional at the end of the fourth year.

Investment motivation

An autocallable is a yield enhancing strategy. The investor receives an above market yield and in turn he risks not receiving any coupon if the stock is stock is below the coupon barrier (70% in the example above) on the observation date. If the stock however breaches the autocall trigger(110%) trigger, the trade expires and the investor gets back the investment. This would be the case when the market rallies, the investor would be happy to get his investment back which could be deployed in a more bullish strategy (or simply in equity).

Risk Analysis

To understand the risk factors of an autocallable note it helps if we visualize the autocallable payoff as a series of digital payouts with each payout being contingent on the stock being above the coupon barrier on the given observation date but not being above the autocall barrier on any of the previous observation dates. The risks of an autocallable would hence be quite similar in nature to the risks of a digital option.
The buyer of the autocallable note would be long the forward (meaning long the underlier, short the dividends and long the interest rates). He would also be long the skew (think of digital payouts as spreads).

Equity/Interest rate correlation (EQ/IR)

Autocallable is a structure in which the Interest rate/Equity correlation plays an important role. This is because the expiry of the autocallable is not fixed and depends on the performance of the equity. To make things clearer lets assume we have a 5 year autocallable structure that has an autocall trigger at 110% of the initial stock price. For simplicity we assume that the structure just has one autocall observation say 2 year after inception i.e if the stock price is above 110% of the inital level after 2 years, the trade expires otherwise the trade continues till 5 years. We assume that the structure is already delta hedged and the seller buys 2year and 5year zero coupon bonds to hedge his interest rate exposure. (Ahhh!!! Now do you start seeing why the stopping time expiry makes a difference.)
Lets first say the EQ/IR correlation is positive. So if the equity increases, there is a higher probability that the structure will be autocalled after 2 years. The seller sells some of 5 year zero coupon bonds he holds and buys some more 2 year zero bonds. Also since EQ/IR correlation is positive, the interest rates would on average have increased. He would incur a net loss on selling 5 year zero bonds and buying 2 zero year bonds as the interest rates increased and hence price of the bonds decreased meaning that he sells the 5 year bond at a loss and the 2 year bond would be still cheaper to buy. The impact would however be higher for a larger maturity (compounding). So the seller incurs a loss when equity rises and EQ/IR is positive. Now if the equity falls (meaning the interest rates also fall), the probability of the structure being autocalled decreases. So to hedge his exposure the seller sells some of his 2 year bonds and buys 5 year zero coupon bonds. Since the interest rates have also fallen, the bonds would have become more expensive. He makes some profit by selling 2 year bonds but he makes a net loss as the 5 year bonds would have become even more expensive. Again the seller incurs a loss while hedging.
Lets assume now that the EQ/IR correlation is negative. So if the equity increases, the interest rates would fall on average so that the bond prices would increase. Increase in equity increases the probability of the structure being autocalled at the 2 year mark. To hedge the seller would sell some 5 year bonds and but 2 year ones. Since he makes more profit by selling 5 year bonds than he loses on buying 2 year bonds, the seller makes a net profit when equity increases and EQ/IR correlation is negative. It can be argued in similar fashion (and is left to the readers to do that the seller makes a net profit again when the equity falls.
So to summarize when the EQ/IR correlation is positive, the seller makes losses while hedging the interest rate exposure and when the EQ/IR correlation is negative, the seller makes a profit while hedging the interest rate exposure. This loss/profit should be compensated while pricing the structure. So pricing models that assume deterministic interest rates(or EQ/IR correlation=0) would underprice the structure when EQ/IR correlation is positive and overprice when EQ/IR correlation is negative.

Single asset autocallables with down and in Put feature

If the investor thinks that the stock would never fall below a certain level during the life of the trade, he could could work up the coupon for the autocallable by adding a short down and in put feature to the structure. So in the resulting payoff, the buyer receives the autocall coupon whenever the stock is above the coupon barrier and the trade has not been autocalled. In the final settlement either on the contractual maturity or when the trade gets autocalled, the buyer gets back the notional if the coupon barrier is never breached otherwise the actual return on the underlying stock if the coupon barrier is indeed breached on any of the previous observation dates.

$Payoff$:

$$Coupon_i = 15\%\ of\ NA\ if\ S_i > B(=70\%)\ and\ S_{1..i} < H(=110\%)$$

$$Final\ Redemption = \begin{cases} NA\ if\ the\ stock\ is\ never\ below\ 70\% \\ of\ the\ of\ initial\ amount \\ otherwise, \\ \frac{S_f}{S_0} * NA \end{cases}$$

Snowballing Coupon

This feature is seen mostly when the autocall trigger level is equal to the coupon trigger level. It means that whenever the trade pays coupon it gets autocalled too. If the trade is still alive after i observations, the investor sometimes receives the sum of all previously missed coupon (and hence snowball coupon).

$Payoff$:

$$Coupon_i = (4*i)\%\ of\ NA\ where\ i\ is\ the\ period\ when$$
$$the\ trade\ gets\ autocalled$$

MultiAsset worst-of Autocallables

In the worst-of autocallable trades the buyer receives the coupon C whenever none of the underliers (this a basket trade), is below the coupon barrier level. The trade pays back the notional when the trade expires i.e the autocall date if the trade is autocalled otherwise the contractual maturity.

In a variation of the above structure, the buyer could be short down and in worst of put. This feature is generally added to increase the coupon at the risk of not receiving a portion (or even the entire notional) of the notional amount.

Pasted from <http://deltaquants.com/risk-analysis-of-autocallable-notes>

Payoff Description- Shark notes are short to medium capitial protected structure. The payoff comprises of a zero coupon bond (for capital protection) and an up and out call option sometimes with a rebate upon being knocked out. The shark note could be structured on a single asset or a basket of underlying stocks/indices. Depending on the where the barrier of the up and out call option is, the structure can fulfill two different motivations of the investors -

1. With little or no rebate and a large knock out barrier, this structure gives the buyer a participation in the upside movements of the underlyings. A large knock out barrier serves the purpose of making the initial investment cheaper ofcourse at the added risk of being knocked out.
2. With a large Rebate(R) (=above market yield) and a low barrier level (so that the knock out probability is large), it can be used to receive above market yield at the expense of not receiving any interest if the knock out event does not happen.

For a single asset structure, the payoff can be summarized as below. NA is the notional amount invested at inception, S(T) and K are the spot level at expiry and the strike respectively.

$$Payoff = \begin{cases} \text{if KO event occurs, NA+Rebate} \\ \text{else,} \\ \text{NA+max[0,S(T)}-\text{K]} \end{cases}$$

$$KO\ Event\ occurs\ if\ the\ spot\ goes\ above\ the\ barrier$$
$$level\ on\ any\ of\ the\ observation\ dates$$

The KO event observation could be made on a continuous, daily, monthly, quaterly etc basis.

Risk Analysis

The risks of a shark note is dictated by implicit up and out call option. The delta of the option initially increases with the increase in the stock price (when the stock price is away from barrier) and then becomes negative as the stock price approches the barrier.

Similarly the vega of this option initially increases with the increase in volatility when the stock price is away from the barrier (similar to a European call option). When the stock approches the barrier, the vega approaches zero and becomes negative.

The position in skew is unclear and would depend on current level of spot relative to the barrier level and the level of rebate defined within the trade definition.

Multi Asset Shark notes

The payoff of a multi asset shar notes is based on performance of the basket of underlyings.

$$Basket\ Perf(T) = \frac{1}{n}\sum_{i=1}^{n}\frac{S_j(t)}{S_j(0)}$$

$$Payoff = \begin{cases} \text{if KO event occurs, NA+Rebate} \\ \text{else,} \\ \text{NA+max[0,Basket Perf(T)−K]} \end{cases}$$

KO Event occurs if the Basket Perf goes above the barrier level on any of the observation dates

It is important to realize that the Basket performance could be lesser than the predecided barrier even when some of the underlyings individually are above the Barrier level (because the basket perf is the average of the returns). This makes the knock out event in the case of multi asset structures even more unlikely.

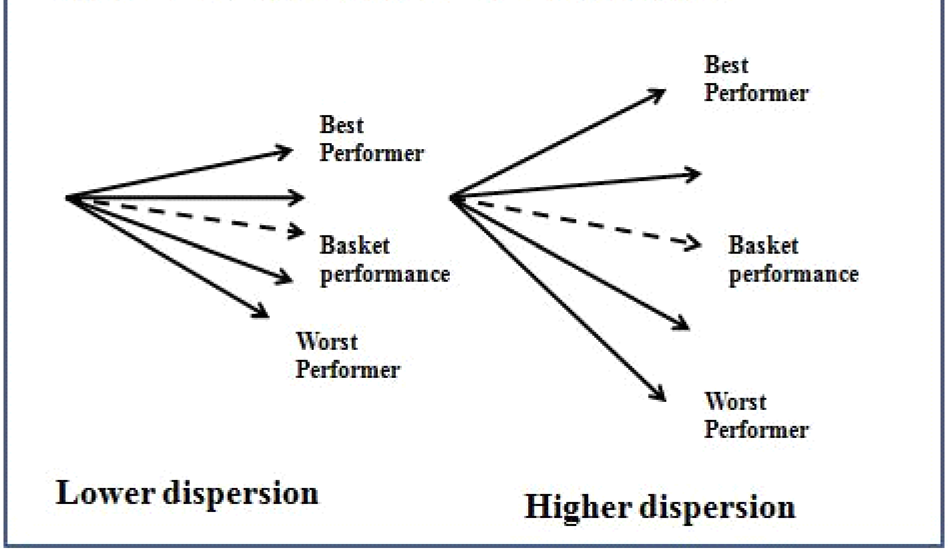
The risk analysis of a multi asset shark note would be similar to the single asset note. We just need to account for correlation. Correlation affects the payoff of this structure by affecting the overall volatility of the basket. Increasing the correlations increases the overall volatility of the basket and vice versa. If the current spot is far away from the barrier, increasing correlation increases the price of the structure and when the spot price is closer to the barrier it decreases the price of the structure.

Pasted from <http://deltaquants.com/risk-analysis-of-shark-notes>

n this article we shall consider the risk factors of the Worst-Of and the Best-Of trades. Before we start digging in, it is important to understand the concept of dispersion. Used in the context of multi asset trades, a high (or low) dispersion means that the underlying asset returns are quite different (or similar) from each other. Statistical measures of dispersion include variance, standard deviation, inter quartile range of underlying asset returns.

Figure below shows the effect of dispersion on the returns of the underlying asssets. For higher dispersion, we can expect a higher asset return level from the best performer and a lower asset return level from the worst performer while the basket performance remains unaffected. Similarly a lower dispersion leads to lower expected asset return level from the best performer and a higher expected asset return level for the worst performer.

Figure 1. Affect of dispersion on Worst and Best performing asset



To analyse the effect of correlations and volatility on the Worst-Of and best-Of options it is important to understand how these factors affect dispersion. If the pairwise correlations between the underlying assets is low, the returns of these underlyings would be quite apart from each other and vice versa. Also, a higher asset volatality leads to asset returns with large deviations from it's expected return. Hence, a higher volatility and a lower correlation leads to higher dispersion. Worst-Of and Best-Of trades are good examples of how dispersion dictates some of the risks of multi asset trades. So lets get started!!

Worst-Of Call

$$Payoff\ =\ max\Big[0,\ min\big(R_1(T), R_2(T) .... R_n(T)\big)\ -\ K\Big]$$

It's straightforward to see that the a Worst-Of call options are cheaper than a basket call options (see figure above) on the same underlyings. Because they are cheap and offer a large leverage potential, these options are quite popular with the exotic desks.

Interest rates and dividends - Higher the forward prices of the individual underlying stocks, higher will be the price of the call option on the worst performing stocks and vice versa. Since higher interest rates and lower dividends increase the forward prices, a buyer of Worst-Of call is long interest rates and short dividends.

Correlation and Volatility - Higher dispersion would lead to a lower payoff for the call option on the worst performing stock. Since lower correlation would lead to highly dispersed returns of the underlying assets, lower correlations would lead to lower payoffs for Worst-Of call options. Therefore a buyer of Worst-Of call option would be long correlation.

Positions in volatility is however not clear. On one hand increase in volatility increases option prices, on the other hand increase in volatility leads to higher dispersion (as discussed before) which leads to lower payoffs for Worst-Of call options. While a lot of time the dispersion effect dominates, a seller has to be careful about the vega of the trade.

Skew - Since the position in volatility is not clear, we dont know whether the option holder would benefit or loose due to volatilty skew. Hence skew dependance would again depend on the actual trade parameters.

Worst-Of Put

$$Payoff\ =\ max\Big[0,\ K\ -\ min\big(R_1(T), R_2(T) .... R_n(T)\big)\Big]$$

The payoff for a Worst-Of put option is always higher than a payoff for a basket put option on the same underlyings and consequently a Worst-Of put option is costlier than a basket put option on the same underlyings.

Interest rates and dividends - Higher the forward prices of the individual underlying stocks, lower will be the price of the put option on the worst performing stocks and vice versa. Since higher interest rates and lower dividends increase the forward prices, the buyer of worst-Of put is short interest rates and long dividends.

Correlation and Volatility - We should be able to see that a higher dispersion would lead to a higher payoff for the put option on the worst performing stock. Since lower correlation would lead to highly dispersed returns of the underlying assets, lower correlations would lead to higher payoffs for Worst-Of put options. Therefore a buyer of a Worst-Of put option would be short correlation.

We know that higher volatility results in higher put option prices. At the same time, higher volatility leads to higher dispersion which again increases the price of the option. Consequently a buyer of Worst-Of put is long volatilty.

Skew - Skew results in a return distribution that are negatively skewed with higher probability of downward movements leading to higher implied volatilities on the downside. As we now know higher volatility leads to higher Worst Of put options. Consequently a buyer of a Worst-Of put is long skew.

Best-Of Call

$$Payoff\ =\ max\Big[0,\ max\big(R_1(T), R_2(T) .... R_n(T)\big)\ -\ K\Big]$$

Best-Of call options are costlier than a basket call option on the same underlying assets. As a result they are not as popular as the Worst-Of call options.

Interest rates and dividends - Higher the forward prices of the individual underlying stocks, higher will be the price of the call option on the best performing stocks and vice versa. Since higher interest rates and lower dividends increase the forward prices, a buyer of Best-Of call is long interest rates and short dividends.

Correlation and Volatility - Higher dispersion leads to a higher payoff for a Best-Of call option. Since a decrease in correlation leads to higher dispersion, we conclude that a Best-Of Call is short correlation.

Higher volatility leads to higher option prices and also increases the dispersion. Both cases a higher volatility leads to a higher payoff for a Best-Of call options. We can thus conclude that a buyer of a Best-Of call is long volatility.

Skew - A presence of a skew implies a lower implied volatility on the upside, leading to a lower payoffs for Best-Of call options. Hence a buyer of a Best-Of call is short skew.

Best-Of Put

$$Payoff = max\left[0,\ K - max\left(R_1(T), R_2(T) \ldots R_n(T)\right)\right]$$

Best-Of put options are cheaper than a basket call option on the same underlying assets. Since they offer a higher leverage potential they are quite popular.

Interest rates and dividends - Higher the forward prices of the individual underlying stocks, lower will be the price of the put option on the best performing stocks and vice versa. Since higher interest rates and lower dividends increase the forward prices, a buyer of Best-Of put is short interest rates and long dividends.

Correlation and Volatility - Higher dispersion leads to a lower payoff for a Best-Of put option. Since a decrease in correlation leads to higher dispersion, we conclude that a buyer of Best-Of put is long correlation.

The effect of volatility is unclear as in Worst-Of call options. One one hand a higher volatility leads to a higher option price, on the ther hand it also increases dispersion which has the oppsosite effect.

Skew - Since the effect of volatility is unclear, the effect of skew is also unclear.

For feedbacks or question write to us at feeback@deltaquants.com.

Pasted from <http://deltaquants.com/risk-analysis-of-worst-of%20and-best-of-options>

There are variety of ways an investor can gain exposure to foreign market indices and stocks, this article hopes to give you an introduction to these fx based structures and their implications from modelling perspective. Essentially we are talking about derivatives contracts which have payment currencydifferent to the currency of the underlying. We shall talk about three basic types of FX exposures, namely Quantos, Composites and FX foreign market derivatives. To begin with lets describe these major FX expsuer types:

Quantos

These are derivative contracts in which the payoff is based on a foreign index/stock in local currency. Imagine a call option again on NIFTY 50 based in USD (hence they are also called ADR style) with strike 123.88 so that the payoff is Max[0,S_{usd}-123.88]. To highlight the difference in the case of composites, At expiry suppose the NIFTY climbs from 5600 in INR to 5800 but the USD weakens against INR from 45.2043 to 48.2010 (1 USD = 48.2010 INR) resulting S_{usd}=120.32 so that the call payoff=0. So even though the index climbs in the local currency, its the index value in the foreign currency that determines the payoff i.e. both exchange rate and spot should be modelled together for pricing purposes.

Essentially then the payoffs for a composite forward, call option and put option are respectively:

$$\text{Forward payoff} = X_T S_T - K$$

$$\text{Call option payoff} = \max[0, X_T S_T - K]$$

$$\text{Put option payoff} = \max[0, K - X_T S_T]$$

The effective volatility of a composite option is given by

$$\sigma_{composite} = \sqrt{\sigma_x^2 + \sigma_{fx}^2 - 2\rho\sigma_x\sigma_{fx}}$$

FX market derivatives

FX market derivatives are derivatives whose payoffs are driven by the underlyings in the local currency but the final settlement is made in the foreign currency.

Imagine a call option again on NIFTY 50 based in INR which makes the final settlement in USD based on existing exchange rate at expiry. If we revisit the above example, lets say the call option has the strike 5600 (corresponding to the strike 123.88 in the example above). At expiry lets say the NIFTY climbs from 5600 to 5800 and at the same time the USD weakens against INR from 45.2043 to 48.2010 (1 USD = 48.2010 INR). So that the final payoff = USD 4.15.

Essentially then the payoffs for a FX market forward, call option and put option are respectively:

$$\text{Forward payoff} = X_T(S_T - K)$$

$$\text{Call option payoff} = X_T \max[0,(S_T - K)]$$

$$\text{Put option payoff} = X_T \max[0,(K - S_T)]$$

From pricing perspective, we can model the FX and Equity seperately.

Pasted from <http://deltaquants.com/quanto-composites-and-FX-market-derivatives>

Local volatility model generates the forward (skews estimated for a future date) skews that are too flat. Stochastic volatility models or the Jump diffusion models on the other hand estimate forward skews that have shapes similar to that observed in the market today. This significant consequence is not obvious and can be worked out only when studying/researching the model in detail. This consequence has a significant impact when pricing the forward skew dependant trades such as Cliquets. Many market players have lost a lot of money due to lack of knowledge of this property.

Let's assume we have a locally capped, globally floored cliquet based on periodic contribution to the final coupon.

$$payoff = \max\left\{\sum_{i=1}^{n} \min\left\{\max\left\{\frac{S_i - S_{i-1}}{S_{i-1}}, 0\%\right\}, 1\%\right\}, 2\%\right\}$$

The final payoff is a sum of periodic contributions (say monthly) with each contribution capped at 1% and floored at 0% and the sum of all contributions is subject to the global floor of 2%. If we ignore the global floor, the payoff could also be viewed as comprising of periodic payments subject to a floor of 0% and cap of 1%. Essentially then, we have a series of forward starting call spreads.

A call spread is a skew sensitive strategy. Suppose we are long a call option with strike k1 and short a call option strike k2>k1, the value of the call spread increases with the skew. (Remember option prices increase with increasing implied vol). With increasing difference in implied volatilities

$\sigma_{k_1} > \sigma_{k_2}$

the value of the call spread also increases.

It thus becomes clear that the local volatilty would underestimate the price of this cliquet payoff and indeed the numerical experiments confirm that stochastic volatility models as opposed to the local volatility model generates higher (and more accurate) prices for cliquets.

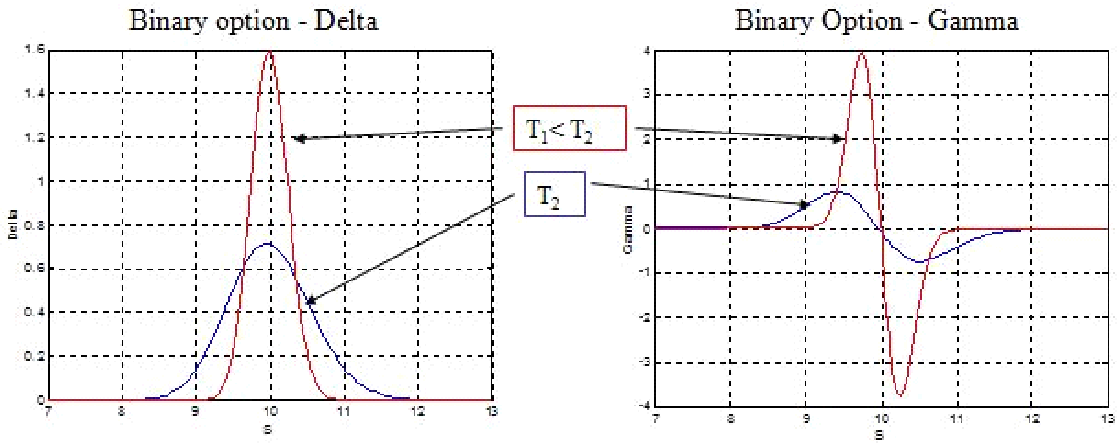
Pasted from <http://deltaquants.com/local-volatility-model-inappropriate-for-cliquet-trades>

When a new trade comes to the risk manager in a bank for approval, he tries to determine both the quality and the quantity of the risks inherent in the trade. If he's not comfortable with either of the two, he may not approve it. Some of the factors that are considered are:-

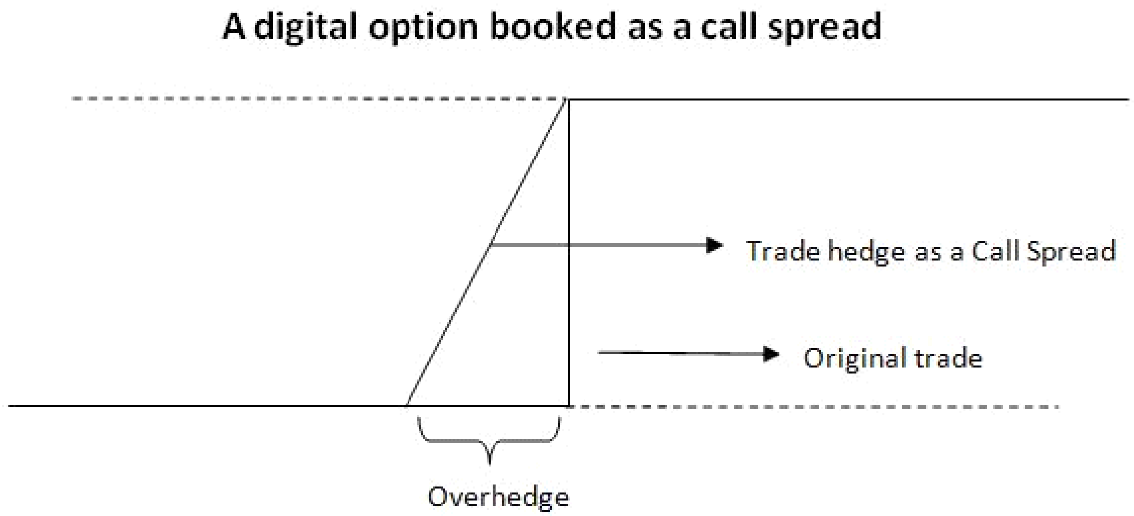
1. Whether the bank has a model to price and determine the risk of the trade. (And yes it happens, with virtually any payoff possible in the OTC equity derivatives markets, the bank will not always have the model to handle the trade).
2. Number of underliers to the trade and whether these underliers are liquid indices or thinly traded stocks. Managing the risks of a multi asset trade with illiquid stocks as undeliers would be the most difficult.
3. Discontinuities in the payoff. The greeks-delta and gamma in general as the spot approaches the barrier become extremely volatile. With a standard digital option, everytime the spot moves over/below the strike, there would be a need to rebalance the hedges.

Ofcourse, Not all trades require pre approval esp. ubiquitous trades like single asset cliquets, autocallables, CYNs etc. whose risks have been studied and researched well generally do not require approval. For new payoffs the trader will come up wth an overall hedging strategy for the trade. Often the most important aspects of the hedging strategy revolves around managing greeks around discontinuities (or barriers). In this article, I shall talk about 'Overhedging' which is a technique to handle effectively risks around barriers.

The following daigram shows the delta and the gamma for the digital option.



Overhedging - Barrier/Digital options hedged as option spreads
Almost always a barrier/digital options are booked and hedged as option spreads. What the trader achieves by doing so is a smoother set of greeks specially the delta. As an example let's consider a binary option in the figure below booked as a call spread.



It's important to note that the call spread is structured that it is more expensive than the original binary option. What this means is that when a buyer comes to a bank with a price request for a digital option, the bank actually quotes price for a call spread. To summarise a digital option is hedged as a call spread with a long position on a call with "strike = strike of the digital - overhedge amount" and a short position on a call with "strike = strike of the digital" with each with a quantity = "the digital payoff/overhedge". The overhedge amount is normally fixed at a level 3-8% of the digital payoff level.
It's easy to see that the maximum delta for this call spread will be "Digital payoff/Overhedge amount".
To extend the discussion to the barrier trades, a barrier trade can be viewed as a combination of an option spread and an option. For example an up and in call option can be booked and hedged as a combination of a call spread (with strikes being barrier and barrier - overdhedge) and a call option with strike equal to the barrier level.

Pasted from <http://deltaquants.com/managing-risks-of-digital-payoffs-overhedging>

Ok. We'll be try to list payoffs for some of the most commonly traded products in the market today. But remember these structures are traded OTC and you should always expect deviations from these payoffs for these structure. With new structures thought of and researched everyday, this article will always be a work in progress. If you too have a structure in mind and think is worthwhile to put it here, give it to us the payoff and we'll include it in this page. Contact us at feedback@deltaquants.com.
Autocallables

An autocallable trade could be on a single index/stock or basket of indices/stocks. It is normally a multi period product and terminates early if at any observation date all the the underyings are above their autocall levels (often the initial level). Autocallables are one of the most commonly traded structured products. The buyer earns high yield (coupon) contingent on the underlier (or worst-of for basket trades) performance being greater than a threshold level (coupon trigger level). Also, the trade is capital protected as long as none of the underlying is below a given barrier level (knock in often the coupon barrier) at which the payoff (the final settlement) is normally linked to the performance of the underliers (worst performing stock/index in the basket trades).

$$Coupon = \begin{cases} predecided\ coupon\ paid\ for\ each\ observation \\ where\ the\ performance\ of\ the\ worst\ performer\ is \\ greater\ than\ the\ coupon\ barrier \end{cases}$$

$$Expiry = \begin{array}{l}\text{the stated maturity or the early redemption (autocall)} \\ \text{date whichever is earlier}\end{array}$$

$$Early\ redemption = \begin{array}{l}\text{If on any observation date all the underliers} \\ \text{are above the autocall barrier level} \\ \text{then the trade terminates.}\end{array}$$

$$Final\ settlement = \begin{cases} \text{If none of the underlyings are below a} \\ \text{predefined barrier level the investor gets} \\ \text{back the notional} \\ \text{Else,} \\ \frac{S(t)_i}{S(0)_i} \text{ where } S(t)_i \text{ is the stock/index level of the} \\ \text{worst performer at the final observation date.} \end{cases}$$

Altiplano

Altiplano is again a multi asset derivative product. In one of the commonly traded Altiplano structures, the buyer receives a large coupon at maturity if none of the underlyings fall below their barrier level till expiry(normally 40-60% of the initial level). If one or more underlyings do fall below the barrier level, the buyer becomes long an Asian call on the baskets.

$$Payoff = \begin{cases} \text{Coupon C,} \\ \text{if none of the underliyings ever fall below their} \\ \text{barrier level (B) during the life of the trade} \\ \text{Else,} \\ \max[0, \text{Asian Perf on Basket} - \text{K}] \end{cases}$$

$$Early\ redemption = \begin{array}{l}\text{Can be called at par by the issuer prior} \\ \text{to maturity.}\end{array}$$

$$Final\ settlement = \begin{cases} \text{Notional, if none of the underliers fall below} \\ \text{a certain knock in barrier (say 70\% of initial} \\ \text{level).} \\ \text{Else,} \\ \frac{S(t)_i}{S(0)_i} \text{*Notional where } S(t)_i \text{ is the level of the} \\ \text{worst performer at the final observation date.} \end{cases}$$

Rainbow options

Rainbow trades are options on the basket of underliers. The payoff at maturity is normally the weighted sum of the performances of the (all or some) individual underliers. The weights attached to the individual asset performances are decided in hindsight. e.g 60% for the best performing asset, 30% for the second best performer and 10% for the worst performer.

$$Final\ Payoff\ = \text{Notional} * (1+0.6*\text{Perf}_1+0.3*\text{Perf}_2+0.1*\text{Perf}_3).$$

$$Perf_1 = \text{Performance of the best performer.}$$

$$Perf_2 = \text{Performance of the second best performer.}$$

$$Perf_3 = \text{Performance of the worst performer.}$$

Cliquet options

Cliquets trades are almost a fashion today. Normally a multiple period trade on a single underliers. At the end of each observation period the performance of that period gets locked in (often subject to a floor of 0). The overall return of the trade may be subject to a global (or local) Cap or a Floor.

$$Payoff\ = \text{N}*\max\left[\text{Floor}_g,\min\left[\sum_{i=1}^{n}\min\left[\text{Cap}_l,\max\left[\text{Floor}_l,\frac{S_i-S_{i-1}}{S_{i-1}}\right]\right],\text{Cap}_g\right]\right]$$

Looks complicated (as indeed all generalisations do), but if you observe closely the payoff is simply the sum of periodic returns subject to local and global caps and floors.

Cliquets can also viewed as a series of ATM forward starting options and gives the buyer an exposure to forward skew.

Reverse Cliquets

These are an interesting variants of the standard cliquet trades. The payoff at maturity is a Coupon (MaxCoupon) plus the sum of negative negative periodic returns till the expiry.

$$Payoff\ = \text{Notional}*\max\left[0,\text{MaxCoupon} + \sum_{i=1}^{n}\min\left[0,\frac{S_i-S_{i-1}}{S_{i-1}}\right]\right]$$

The buyer is betting to receive an above market return(equal or close to MaxCoupon) which would happen if the underlier has positive periodic performances throughout till maturity. The trade has a local cap at 0 and global floor at 0.

Napoleon options

Napoleon options pays to the buyer a fixed coupon(C) and the worst returns of the index/stock over specified periods.

$$Final\ Payoff\ = \text{Notional} * \max\left[0,\text{C}+\text{Min}\left(\frac{S_i}{S_{i-1}}-1\right)\ (i=1,2,.....12)\right]$$

Above is a payoff for a 1Y trade, that pays fixed coupon C and the worst monthly performance over the one year duration till expiry.

Outperformance options

Also referred to as spread options are typically European style, and has a payoff based on the excess return of one asset S1 over S2. At maturity, the outperformance option holder receives

$$\text{Payoff}_{\text{outperformance}} = \max\left[0,\frac{S_1(T)}{S_1(0)}-\frac{S_2(T)}{S_2(0)}\right]$$

Individually capped basket call (ICBC)

A basket call based on capped returns of the underliers

$$\text{Ret}_n(i)=\frac{S_f(i)}{S_0(i)}-1, \qquad i=1,2,3...N$$

$$Capped\ Ret(i)=min[Ret(i),Cap\%]$$

$$Payoff=max\left[0,\frac{1}{N}X\sum_{j=1}^{N}Capped\ Ret(i)\right]$$

Best-Of and Worst-Of trades

These are options on the Best and the Worst performing assets from the baskets of underliers.

$$BO\ Call\ =\ max\left[0,\ max\left(R_1(T),R_2(T)....R_n(T)\right)-\ K\right]$$

$$BO\ Put\ =\ max\left[0,\ K\ -\ max\left(R_1(T),R_2(T)....R_n(T)\right)\right]$$

$$WO\ Call\ =\ max\left[0,\ min\left(R_1(T),R_2(T)....R_n(T)\right)\ -\ K\right]$$

$$WO\ Put\ =\ max\left[0,\ K\ -\ min\left(R_1(T),R_2(T)....R_n(T)\right)\right]$$

$$where R_1(T),R_2(T)....R_n(T)\ are\ the\ returns\ of\ assets\ 1,2,3...N etc$$

Shark Notes

Shark notes are capital protected structured product. The final settlement is contingent on whether an high barrier (up and out) is breached on any of the observation dates. If high barrier is not breached (knock out), the buyer gets the Notional back along with the payoff of the call option. If the Knock out event does happen, the buyer gets the notional back along with a predecided Rebate.

$$Basket\ Perf(T)=\frac{1}{n}\sum_{i=1}^{n}\frac{S_j(t)}{S_j(0)}$$

$$Payoff=\begin{cases}\text{if KO event occurs, NA+Rebate}\\ \text{else,}\\ \text{NA+max[0,Basket Perf(T)−K]}\end{cases}$$

Single Asset Reverse Convertible

The buyer of a Reverse convertible is long a zero coupon bond and short a down and in put. The motivation of such a structure being yield enhancement. The buyer is betting that the knock in event will not happen and the premium received helps in enhancing the yield. Ideal for a moderately bullish environment. A lot of investors did suffer a lot during the 2008/2009 crash when the down and in puts got knocked in resulting in a lot of losses.

$$Payoff\ =\begin{cases}If\ KI\ event\ occurs,\ NA+C-Max\left[0,K-S(T)\right]\\ else\\ NA+C\end{cases}$$

NA is the notional amount, C is the above market coupon that the investor manages due being short on the doen and in put, K and S have their usual meanings.

Pasted from <http://deltaquants.com/payoff-various-equity-exotic-structures>

Background

- Originally marketed by Société Générale in 1998.
- Traded over-the-counter (OTC), typically by private banks and institutional investors such as hedge funds.
- These options have combined characteristics of Range and Basket options.
- The options are active for a specified time (characteristic of Range options) and the payoff is dependant on the performances of multiple underlying assets (characteristic of Basket options).
- The five most commonly traded Mountain range options are Altiplano, Annapurna, Atlas, Everest and Himalayan. (names of mountain ranges!)

Altiplano

- The buyer receives a large coupon at maturity if the low barrier is not hit for any of the underlying basket securities.
- If the barrier is hit, the buyer receives the payoff of a plain vanilla or sometimes an Asian call on the basket.

- The buyer in these exotic options will aim to let the option ride out by choosing underlying stocks that will consistently rise.

Annapurna

- Gives the option holder a payoff if none of the stocks from the underlying basket of securities fall below a predetermined fraction of the initial value till maturity.
- The buyer has a bullish view on the underlying stocks.
- The more correlated the stocks in the underlying basket are, the higher the product price will be keeping all other trade parameters constant.

Atlas

- A option here the some of the best and worst performing securities are removed from the basket of underliers on an observation date on or before the maturity.
- The payoff similar to a call option on the remaining securities basket at maturity.
- This product is somewhat similar in characteristics to an Asian call options. With outliers being removed from the basket – the payoff becomes even lesser volatile. The product should be cheaper to an Asian option with similar trade parameters.

Everest

- A long term option (10-15 years) with an underlying basket containing large number of stocks (10-25 stocks)
- Buyer receives a payoff on the worst-performing member of a large basket of stocks at maturity.

Himalayan

- Like an Asian option, the Himalaya is a call on the average performance of the best performing stocks within the basket.
- On each observation date, the return level of the best performing stock is locked in. The stock is then removed from the basket.
- On maturity when only one stock remains, the return level of the remaining security is locked in for payoff calculation.
- The option's total payout is the sum of all the interim locked in return levels.

Pasted from <http://deltaquants.com/mountain-range-options>

Estimation of a valid instantaneuos or forecasted correlation matrix is an important problem in the field of derivatives valuation and of risk management. In one among many plausible situations, a risk manager might want to study the impact of bumping or overriding the equity correlation matrix. He might not end up generating spurious results e.g. negative VaR numbers if he does not use a consistent correlation matrix. A valid correlation matrix not only has to be symmetric but also positive semidefinite. In another situation, a trader or a quant might have problems in valuing monte carlo based multi asset trades because Cholesky decomposition of a correlation matrix requires the matrix to be positive semidefinite.

The Positive Semidefinite requirement

A correlation matrix must be positive semidefinite. This can be tested easily. If all the eigenvalues of the correlation matrix are **non negative**, then the matrix is said to be positive definite.

Let's take a hypothetical case where we have three underliers A,B and C. The returns of underliers A and B are perfectly correlated i.e. $\rho_{AB}=1$ and the returns of the underliers B and C are also perfectly correlated i.e. $\rho_{BC}=1$. Now if the returns of the underliers A & B are directly proportional and at the same time if the returns of the underliers B & C are also directly proportional, we know that the returns of the underliers A & C cannot be inversely related e.g. ρ_{AC} cannot be -1 .

$$\text{So, } A = \begin{bmatrix} 1 & \rho_{ab} & \rho_{ac} \\ \rho_{ab} & 1 & \rho_{bc} \\ \rho_{ac} & \rho_{bc} & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 1 & 1 \\ -1 & 1 & 1 \end{bmatrix} \text{ is not a valid correlation matrix}$$

To find the eigenvalues of this matrix we need to calculate the solutions to the **characteristic equation, Det(A-λI)=0**, where I is the identity matrix and the roots λ of the characteristic equation are said to be the eigenvalues of the correlation matrix A.

$$\begin{vmatrix} 1-\lambda & 1 & -1 \\ 1 & 1-\lambda & 1 \\ -1 & 1 & 1-\lambda \end{vmatrix} = 0$$

We get the **eigen values of A = {2,2,-1}.**

We conclude that A is not positive semidefinite and hence an invalid correlation matrix as one of the eigen values is negative(λ = -1).

Cleaning the spurious correlation matrix

There are many methods used in practise but we are going to discuss the **Spectral decomposition** (also known as principal component analysis) of treating the correlation matrix. The method is described in steps below:

1. Take the correlation matrix

$\boldsymbol{A}$

(which is not positive semidefinite i.e. atleast one eigenvalue is negative) and calculate the eigen value diagonal

$\boldsymbol{\Lambda}$

matrix and matrix

$\boldsymbol{S}$

comprising of eigenvectors

$\boldsymbol{S}$

in the ith column of the Matrix.

We have,

$\boldsymbol{A} = \boldsymbol{S}\boldsymbol{\Lambda}\boldsymbol{S}^{-1}$

[EV Decomposition]

2. Set negative elements of the diagonal matrix

$\boldsymbol{\Lambda}$

to 0 i.e. set all negative eigenvalues

λ_k

of the correlation matrix

$\boldsymbol{\Lambda}'$

to Zero. Let the new matrix represented as

$\boldsymbol{\Lambda}$

made up with new set of eigenvalues

λ_k'

3. Calculate the diagonal scaling matrix

λ_k'

whose elements are defined by

$$\boldsymbol{T}: t_{ii} = \left[\sum_k s_{ik}^2 \lambda_k'\right]^{-1}$$

4. Calculate new matrix

$\boldsymbol{B} = \sqrt{\boldsymbol{T}}\boldsymbol{S}\sqrt{\boldsymbol{\Lambda}}'$

5. The new correlation matrix

$\boldsymbol{C} = \boldsymbol{B}\boldsymbol{B}^T$

Example

Let the correlation matrix from the example above

$$\boldsymbol{A} = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 1 & 1 \\ -1 & 1 & 1 \end{bmatrix}$$

We have,

$$\boldsymbol{A} = \begin{bmatrix} 0.57735 & 0.707107 & -0.40825 \\ -0.57735 & 0.707107 & 0.40825 \\ 0.57735 & 0 & 0.816497 \end{bmatrix} \begin{bmatrix} -1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix} \begin{bmatrix} 0.57735 & 0.707107 & -0.40825 \\ -0.57735 & 0.707107 & 0.40825 \\ 0.57735 & 0 & 0.816497 \end{bmatrix}^{-1}$$

such that,

$$\boldsymbol{\Lambda} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

Setting negative eigenvalues to 0 we have,

$$\boldsymbol{\Lambda}' = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

Calculate diagonal scaling matrix

$$\boldsymbol{T} = \begin{bmatrix} 0.75 & 0 & 0 \\ 0 & 0.75 & 0 \\ 0 & 0 & 0.75 \end{bmatrix}$$

It follows that,

$$\sqrt{\boldsymbol{T}} = \begin{bmatrix} 0.866025 & 0 & 0 \\ 0 & 0.866025 & 0 \\ 0 & 0 & 0.866025 \end{bmatrix}$$

[remember that square root of a diagonal matrix is simply a diagonal matrix whose elements are square root of elements from the original matrix]

Similarily,

$$\sqrt{\boldsymbol{\Lambda}}' = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1.414214 & 0 \\ 0 & 0 & 1.414214 \end{bmatrix}$$

Calculating

$$\boldsymbol{B} = \sqrt{\boldsymbol{T}}\boldsymbol{S}\sqrt{\boldsymbol{\Lambda}}'$$

$$\boldsymbol{B} = \begin{bmatrix} 0 & 0.866025 & -0.5 \\ 0 & 0.866025 & 0.5 \\ 0 & 0 & 1 \end{bmatrix}$$

Our new correlation matrix

$$\boldsymbol{C} = \boldsymbol{B}\boldsymbol{B}^T = \begin{bmatrix} 1 & 0.5 & -0.5 \\ 0.5 & 1 & 0.5 \\ -0.5 & 0.5 & 1 \end{bmatrix}$$

Download excel spreadsheet example

The example has a dependancy on on Matrix functions library which is attached within the zip file. Other quantobjects libraries and their documentation are available here - Quant Libraries.

For comments and feedback, feel free to write to us at feedback@deltaquants.com

Pasted from <http://deltaquants.com/manipulating-correlation-matrices>

Often in the field of quantitative finance, it is required to apply numerical integration to arrive at the risk or valuation numbers which would otherwise not be possible as closed form solutions to these integrations dont exist. There are a few choices of numerical methods available to achieve this. Examples include Trapezoidal, Boole's and Gaussian quadratures. Gaussian quadrature is probably the most popular method in practice today. This article focuses on Gauss Legendre integration which is applied to calculate definite integrals numerically.

Let us first first briefly talk about Legendre polynomials:

Legendre polynomials

Consider the recursive equations 1 and 2 below.

$$P_0(x) = 1\,,P_1(x) = x$$

$$(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$$

Applying equation 2 for n = 1, we get 2P2(x) = 3xP_1(x) - P^0(x) (3)

Solving (3) we have ,

$$P_2(x) = \frac{1}{2}[3x^2 - 1]$$

Similarily, for n = 2, we get $3P_3(x)=5xP_2(x)-2P_1(x)$ or, $3P_3(x)=15/2x^2-5/2x-2x$
which leads to,

$$P_3(x) = \frac{1}{2}[5x^3 - 3x]$$

The first five legendre poynomials are tabulated below

n	$P_n(x)$
1	x
2	$\frac{1}{2}[3x^2 - 1]$
3	$\frac{1}{2}[5x^3 - 3x]$
4	$\frac{1}{8}[35x^4 - 30x^2 + 3]$
5	$\frac{1}{8}[63x^5 - 70x^3 + 15x]$

Table 1: The first five legendre polynomials

Roots of Legendre functions

There are quite a few solver algorithms that can be used to find the root of a polynomial. These include methods like Bisection, Newton, Brent etc. Here we, however, need a scheme to calculate all roots to these Legendre polynomials. Following is a suggestive scheme:

Assume we have a legendre polynomial P(x), we need all roots such than P(x) = 0.

1. Find the first root (R^1) of P(x) using a solver (Bisection, Newton etc.)
2. Find the polynomial f(x) such that $f(x) * (x-R_1) = P(x)$.
3. Use the solver to find the next root (R_2).
4. Find f'(x) such that $f'(x) * (x-R_2) = f(x)$ or, $(x-R_1) * (x-R_2) * f'(x) = P(x)$

So on an so forth..

*Tip: While using Newton's method some authors suggest using x = Cos(Pi * (4 * i + 3) / (4 * n + 2)) where i is the root number, and n is the polynomial degree. This initial guess converges efficiently.*

Evaluating f(x) such that $f(x) * (x - R_1) = P(x)$

Say we have

$$f(x) = a_0 + a_1x + a_2x^2 ... + a_{n-1}x^{n-1}$$

(1),

$$P(x) = b_0 + b_1x + b_2x^2 ... + b_nx^n$$

(2)

$$f(x) * (x - R_1) = P(x)$$

(3)

and we need to find out the coefficients a_0, a_1, a_2, a_3...etc.

solving (3) we get,

$$-a_0R_1 + (a_0 - a_1R_1)x + \ ... + (a_{n-2} - a_{n-1}R_1)x^{n-1} + a_{n-1}x^n = b_0 + b_1x + b_2x^2 ... + b_nx^n$$

which simplifies to

$$a_0 = -\frac{b_0}{R_1}$$

, (4)

$$a_i = -\frac{a_{i-1} - b_i}{R_1} \quad \forall\, i = 1\ to\ n-2$$

and, (5)

$$a_{n-1} = b_n$$

(6)

2 point Gauss Legendre Integration rule

The two point Gauss Legendre Integration rule is shown in the equation (7) below:

$$\int_{-1}^{1} f(x)dx \approx w_1 f(x_1) + w_2 f(x_2)$$

(7)

where x_1 and x_2 are the abscissas and w_1 and w_2 are the weights for the 2 point Gauss Legendre Integration rule. The abscissas for a n point rule are the roots of the Legendre function of degree n. As an example, for a 2 point rule we have the Legendre function

$$P_2(x) = \frac{1}{2}[3x^2 - 1]$$

. The roots of the equation $P_2(x) = 0$ are hence the abscissas for the 2 point Gauss Legendre rule. Going further, the roots of the Legendre function of degree 2 (see table 1 above) are as shown below.

$$x_1 = \frac{1}{\sqrt{3}}\ and\ x_2 = -\frac{1}{\sqrt{3}}$$

(8)

To find the weights w_1 and w_2 , we need two relationship equations. So we use our knowledge of definite integration of 1 and x which gives us the following two relationships.

$$\int_{-1}^{1} dx = 2 = w_1 + w_1$$

(9)

$$\int_{-1}^{1} x dx = 0 = w_1 f\left(\frac{1}{\sqrt{3}}\right) + w_2 f\left(-\frac{1}{\sqrt{3}}\right)$$

or,

$$0 = w_1 \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{3}} w_2$$

(10)

or, $w_1 = w_2 = 1$

(11)

Substituting (11) in (7) we get

$$\int_{-1}^{1} f(x)dx \approx f\left(\frac{1}{\sqrt{3}}\right) + f\left(-\frac{1}{\sqrt{3}}\right)$$

(12)

Application of 2 point Gauss Legendre rule

Example 1:

Let's take

$$f(x) = \frac{1}{2} e^{-\left(\frac{1+x}{2}\right)^2}$$

so that the two point Gauss Legendre approximation is as follows:

$$\int_{-1}^{1} f(x)dx = \frac{1}{2}[e^{-\left(\frac{1+\frac{1}{\sqrt{3}}}{2}\right)^2} + e^{-\left(\frac{1-\frac{1}{\sqrt{3}}}{2}\right)^2}]$$

or,

$\int_{-1}^{1} f(x)dx$ =0.74659468828286

where the exact solution is **0.74682413281243**

Example 2: Evaluate

$$\int_{-1}^{1} \frac{1}{2+x} dx$$

The two point rule leads to

$$\frac{1}{2+\frac{1}{\sqrt{3}}} + \frac{1}{2-\frac{1}{\sqrt{3}}}$$

so that the approximate solution using two point rule is

$$\int_{-1}^{1} \frac{1}{2+x} dx \approx 1.09090909090909$$

where the exact solution is ln(3) - ln(1) = **1.09861228866811.**

4 point Gauss Legendre Integration rule

Abscissas and weights for the 4 point rule are as follows:

x1 = -0.339981043584856, x2=-0.861136311594053, x3=0.339981043584856 and x4= 0.861136311594053.

w1 = 0.652145154862546, w2 = 0.347854845137454, w3 = 0.652145154862546 and w4 = 0.347854845137454.

Example 3: Let us revisit the second example so that we need to evaluate

$$\int_{-1}^{1} \frac{1}{2+x} dx$$

using the 4 point Gauss Legendre rule.

Applying the four point rule we have

$$\int_{-1}^{1} \frac{1}{2+x} dx \approx \frac{w_1}{2+x_1} + \frac{w_2}{2+x_2} + \frac{w_3}{2+x_3} + \frac{w_4}{2+x_4}$$

Substituting the values of weights and abscissas specified above we get

$$\int_{-1}^{1} \frac{1}{2+x} dx \approx 1.09857035364936$$

. We notice that the 4 point rule yields a closer result than the 2 point rule.

N point Gauss Legendre Integration rule

So far we have seen the application of 2 and 4 point Gauss Legendre integration rules. A generalisation for a higher order integration rule is as follows:

$$\int_{-1}^{1} f(x)dx \approx w_1 f(x_1) + w_2 f(x_2) + \cdots w_n f(x_n)$$

(13)

where x_is and w_is are the abscissas and the weights applicable for the N point rule. A table for higher order Gauss Legendre rule is available in the link below.

View Gauss Legendre abscissas and weights of higher order Gauss Legendre quadratures.

A higher order rule generally gives a better approximation to the required integration. Table 2 below shows how the results improve for the calculation of

$$\int_{-1}^{1} \frac{1}{2+x} dx$$

as we move to higher order Gauss Legendre rules. A 32 or 64 point rule is sufficient for most real life cases.

Order (n)	**Gauss Legendre approximation**	**Error (%)**
2	1.09090909090909	0.70118%
4	1.09857035364936	0.00382%
8	1.09861228751918	0.000000105%
16	1.09861228866810	0.0000000000011%

Table 2: A comparison between different orders Gauss Legendre quadrature.

Change of intervals for definite integrals

Any definite integral over [a,b] can be changed to an integral over interval [-1,1] using the following formula:

$$\int_{a}^{b} f(x)dx = \frac{b-a}{2}\int_{-1}^{1} f(\frac{b-a}{2}x + \frac{b+a}{2})dx$$

Hence to calculate the definite integral over any arbitrary bounded range [a,b] use the following formula:

$$\int_{a}^{b} f(x)dx \approx \frac{b-a}{2}\sum_{i=1}^{n} w_i f\left(\frac{b-a}{2}x_i + \frac{b+a}{2}\right)$$

where x_is and w_is are the abscissas and the weights applicable for the N point rule.

Singularities and Gauss Legendre Integration

If there are singularities in the bounds [a,b], the fixed point Gauss Legendre rule may lead to incorrect results and hence must be avoided. As an example

$$\int_{-1}^{1} \frac{1}{x^2} dx$$

, the exact solution is -2 whereas the two point rule leads to the answer 6.

Pasted from <http://deltaquants.com/gaussian-quadrature-gauss-legendre-Integration>

Also known as Day Count Fraction (DCF) convention describes how accrued interest is calculated on a variety of financial products like bonds, notes, FRAs, Interest rate swaps etc. While Interest rates are usually expressed on a per annum basis (reference period = 1 year), the periodic payments are generally due over shorter intervals (monthly, quaterly etc.). The Day Count Fraction (DCF), expressed as a number of days in the accrual period divided by the total number of days in the reference (often 360 or 365) period, determines the accrual payment for the period. Different conventions (or rules) determine how number of days are calculated for the accrual and the reference period. The followed convention generally depends on the market type, location and (or) the curriency in which the instrument of interest is denominated. Some of the most commonly followed conventions have been described here. Accrued interest is calculated using the following formula:

Accrued Interest (AI) = Principal amount * Rate (per annum basis) * DCF (1)

A single convention may be referred by different names depending on the market(Money/Bond/Swaps), currency denomination (USD or EUR etc.) and the partes involved. Table 1 lists the most common day count conventions along with some of the alternate names they may be referred to as.

Table 1: Alternate names for day conventions

Convention	**Alternate Name(s)**
Act/Act	Actual/Actual, Actual/Actual (ISDA)

Act/365F	Actual/365 Fixed, English
Act/360	Actual/360 , French
Act/365A	Actual/365 Actual
Act/365L	Actual/365 Leap year
NL/365	Actual/365 No leap year , NL365
30/360 ISDA	30/360 U.S. Municipal, Bond basis
30E/360	30/360 ISMA, 30/360 European, 30S/360 Special German, Eurobond Basis
30E+/360	30E+/360
30/360 German	30E/360 ISDA
30/360 US	30U/360,30US/360

Quantobjects' Schedules and business calendar library

QO's schedules and business calendar library can be downloaded from here. Other libraries and their respective documentation are available here.

Calculating DCFs

Let the dates D1.M1.Y1 (Period start date) and D2.M2.Y2 (Period end date) define the accrual period for interest rate calculations. Table 2 below describes how day count fraction is calculated for various day count conventions. These day conventions are amongst the most commonly used in the financial world today.

Table 2: DCF calculations

Day count method	DCF calculation
Act/Act	DCF = Days1 /366 + Days2 / 365 Days1 = Actual number of days in period that fall in a leap year. Days2 = Actual number of days in period that fall in a normal year.
Act/365F	DCF = Num/Den Num = Actual number of days within the accrual period Den = 365
Act/360	DCF = Num/Den Num = Actual number of days within the accrual period Den = 360
Act/365A	DCF = Num/Den Num = Actual number of days within the accrual period Den = 366 if the Leap day (29th Feb) falls within the accrual period else 365
Act/365L	DCF = Num/Den Num = Actual number of days within the accrual period Den = 366 if the accrual period end date (D2.M2.Y2) falls in a leap year else 365
NL/365	DCF = Num/Den Num: If the Leap day (29th Feb) does not fall within the accrual period then, Actual number of days within the accrual period Otherwise, Actual number of days within the accrual period -1 Den=365
30/360 ISDA	DCF = Num/Den Num: 1. If D1 = 31, Set D1 = 30 2. If D1 = 30 after applying 1 and D2 = 31, Set D2 = 30

	3. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1) Den = 360
30E/360	DCF = Num/Den Num: 1. If D1 = 31, Set D1 = 30 2. If D2 = 31, Set D2 = 30 3. Last day of February not treated specially 4. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1) Den = 360
30E+/360	DCF = Num/Den Num: 1. If D1 = 31, Set D1 = 30 2. If D2 = 31, Set D2.M2.Y2 to the 1st day of the next month - (D2 = 1, Y2 = Y2 + Integer part of (M2+1)/12, M2= M2 + 1 Mod 12) 3. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1) Den = 360
30/360 German	DCF = Num/Den Num: 1. If D1 (and/or D2) = 31, Set D1 (and/or D2) = 30 2. If D1.M1.Y1 (and/or D2.M2.Y2) falls on the last day of the February set use D1 = 30 (and/or D2 = 30) 3. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1) Den = 360
30/360 US	DCF = Num/Den Num: 1. If D2.M2.Y2 is the last day of February (28 in a non leap year; 29 in a leap year) and D1.M1.Y1 is the last day of February, Set D2 = 30 2. If D1 is the last day of February, Set D1 = 30 3. If D2 = 31 and D1 = 30 or 31, Set D2 = 30 4. If D1 = 31, Set D1 = 30 Den = 360

Below are few of the examples chosen to highlight the differences between the stated conventions

Example 1

Let us assume D1.M1.Y1 = 28/12/2007 and D2.M2.Y2 = 28/2/2008 (Remember Y2 is Leap).

Table 3: DCF calculations (1/4)

Convention	Calculation	DCF
Act/Act	4/365+58/366	0.16942884946478
Act/365F	62/365	0.16986301369863
Act/360	62/360	0.172222222222222
Act/365A	62/365	0.16986301369863
Act/365L	62/366	0.169398907103825
NL/365	62/365	0.16986301369863
30/360 ISDA	60/360	0.166666666666667
30E/360	60/360	0.166666666666667
30E+/360	60/360	0.166666666666667
30/360 German	60/360	0.166666666666667
30/360 US	60/360	0.166666666666667

Example 2

Now let us suppose D1.M1.Y1 = 28/12/2007 and D2.M2.Y2 = 29/2/2008 (Remember Y2 is Leap).

Table 4: DCF calculations (2/4)

Convention	Calculation	DCF
Act/Act	4/365+59/366	0.172161089901939
Act/365F	63/365	0.172602739726027
Act/360	63/360	0.175
Act/365A	63/366	0.172131147540984
Act/365L	63/366	0.172131147540984
NL/365	62/365	0.16986301369863
30/360 ISDA	61/360	0.169444444444444
30E/360	61/360	0.169444444444444
30E+/360	61/360	0.169444444444444
30/360 German	62/360	0.172222222222222
30/360 US	61/360	0.169444444444444

Example 3

Now let us suppose D1.M1.Y1 = 31/10/2007 and D2.M2.Y2 = 30/11/2008 (Remember Y2 is Leap).

Table 5: DCF calculations (3/4)

Convention	Calculation	DCF
Act/Act	62/365+334/366	1.08243131970956
Act/365F	396/365	1.08493150684932
Act/360	396/360	1.1000000000000
Act/365A	396/366	1.08196721311475
Act/365L	396/366	1.08196721311475
NL/365	395/365	1.08219178082192
30/360 ISDA	390/360	1.08333333333333
30E/360	390/360	1.08333333333333
30E+/360	390/360	1.08333333333333
30/360 German	390/360	1.08333333333333
30/360 US	390/360	1.08333333333333

Example 4

Let's take one last example. D1.M1.Y1 = 2/1/2008 and D2.M2.Y2 = 5/31/2009

Table 6: DCF calculations (4/4)

Convention	Calculation	DCF
Act/Act	335/366+150/365	1.32625945055768
Act/365F	485/365	1.32876712328767
Act/360	485/360	1.34722222222222
Act/365A	485/366	1.32513661202186
Act/365L	485/365	1.32876712328767
NL/365	484/365	1.32602739726027
30/360 ISDA	480/360	1.33333333333333
30E/360	479/360	1.33055555555556

30E+/360	480/360	1.33333333333333
30/360 German	479/360	1.33055555555556
30/360 US	480/360	1.33333333333333

Pasted from <http://deltaquants.com/day-count-conventions>

Greeks for some common option strategies have been plotted below.

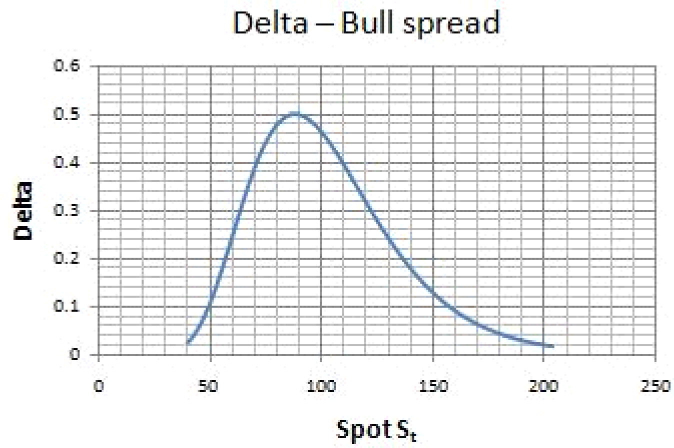
Bull spread:

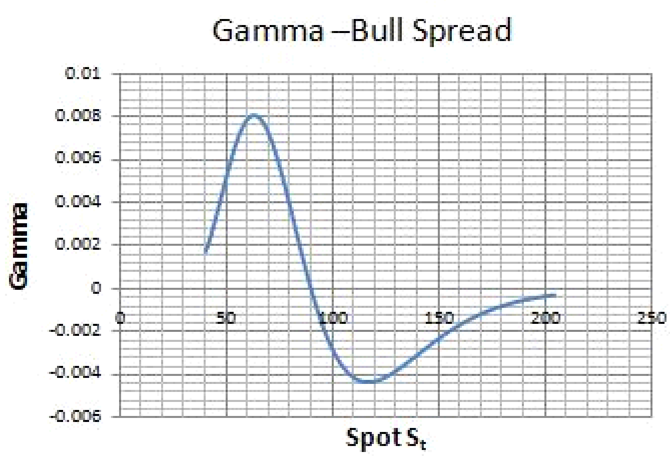
The strategy may be implemented in either of the following two ways:

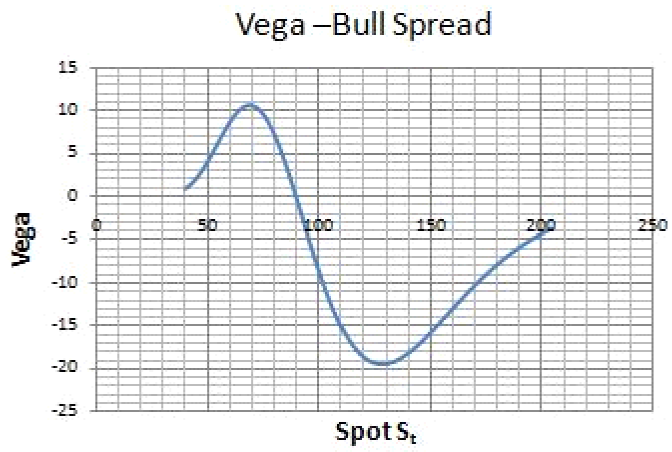
A bull call spread: Constructed by buying a call option with a low exercise price, and selling another call option with a higher exercise price.

A bull put spread: Constructed by buying a put option with a low exercise price, and selling another put option with a higher exercise price.

Stock/Index view: Moderately bullish.







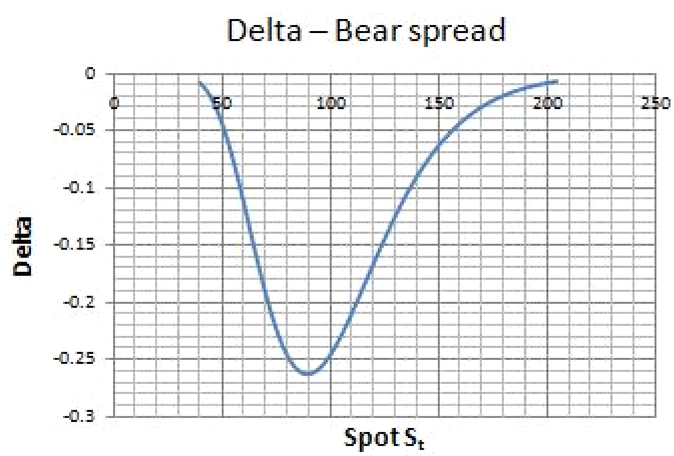
Bear spread:

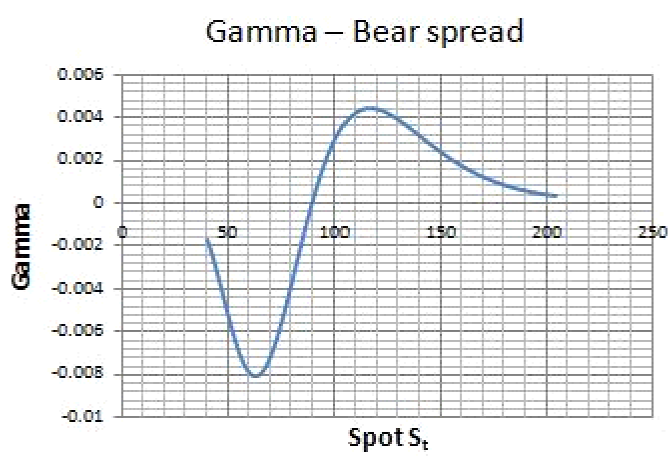
The strategy may be implemented in either of the following two ways:

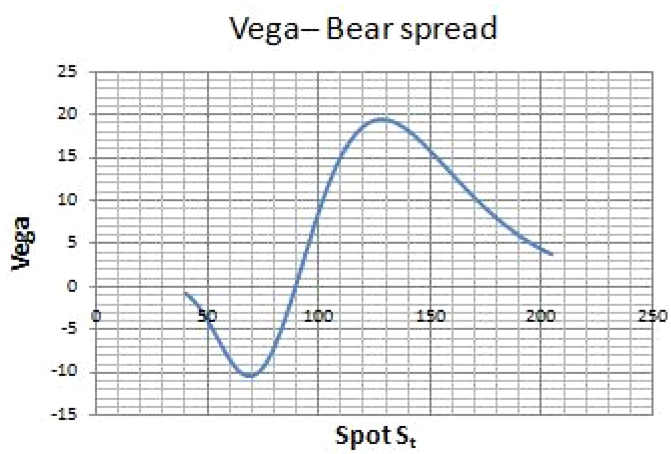
A bear call spread: Constructed by selling a call option with a low exercise price, and buying another call option with a higher exercise price.

A bear put spread: Constructed by selling a put option with a low exercise price, and buying another put option with a higher exercise price.

Stock/Index view: Moderately bearish.



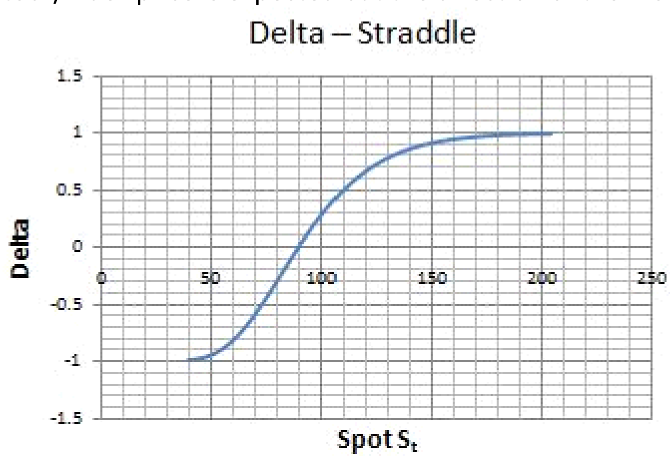


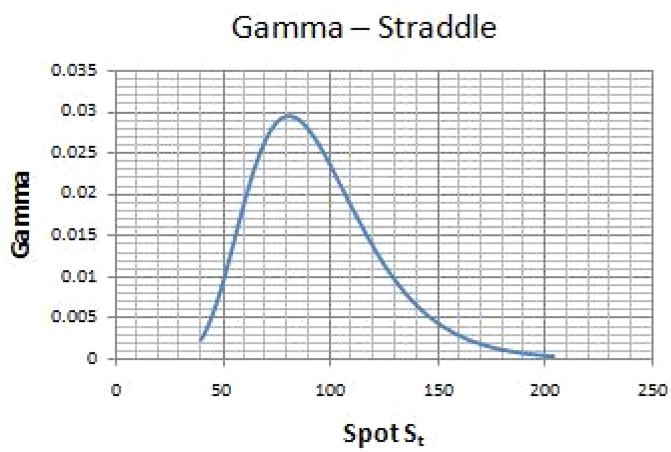


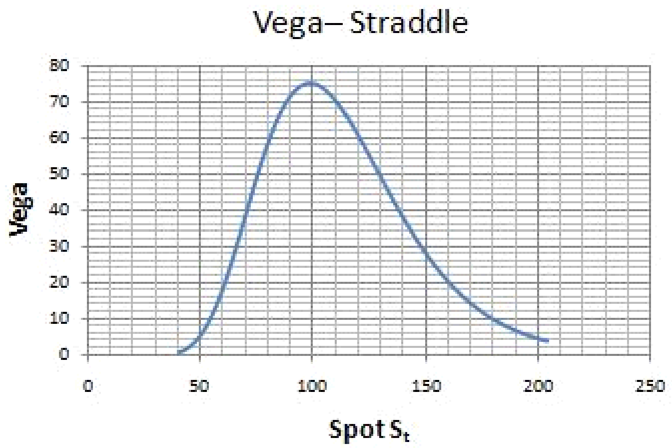
Straddle:

A long straddle may be constructed by buying a call and a put option on the same underlying with same strike and maturity.

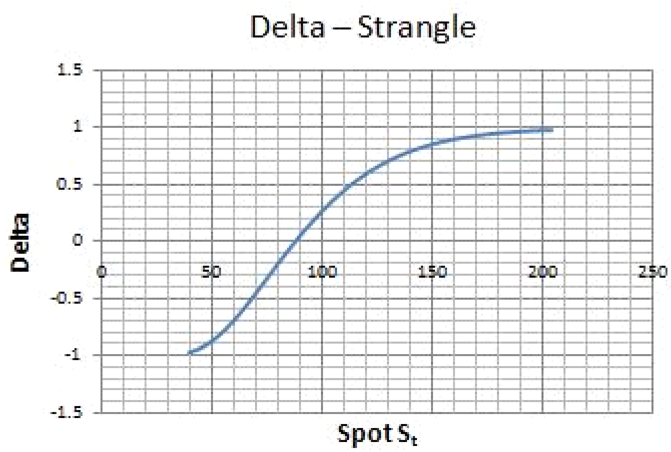
Stock/Index view: Non directional. May be appropriate in a volatile market when a large change in the stock/index price is expected but the direction of the movement is unclear.

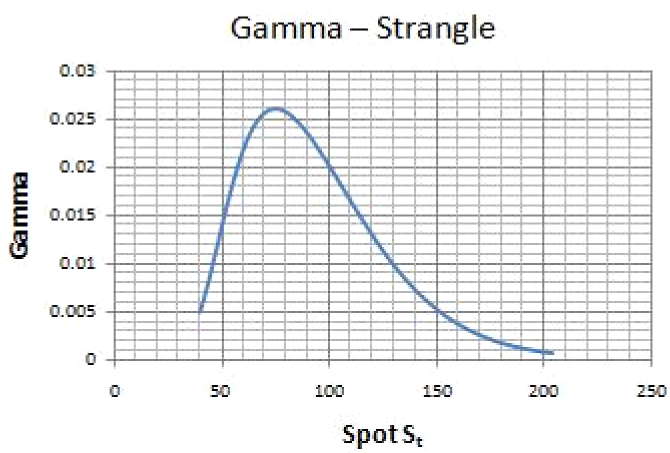


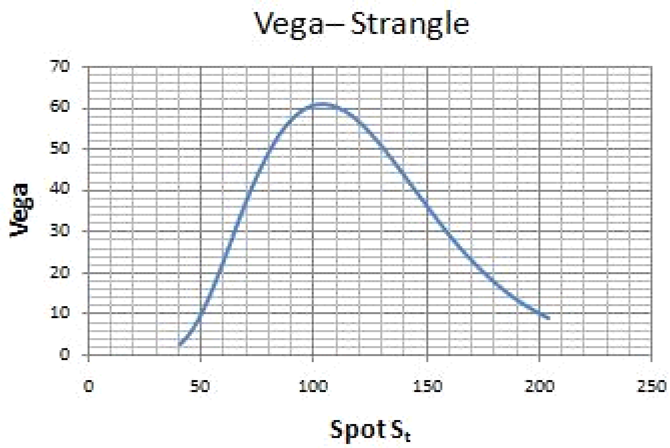




Strangle:
A long strangle may be constructed by buying a call option with higher strike and a put option with lower strike on the same underlying with same maturity.
Stock/Index view: Similar to a straddle. Non directional. May be appropriate in a volatile market when a large change in the stock/index price is expected but the direction of the movement is unclear. The strategy is cheaper to implement than a straddle but requires larger stock/index movement to provide a positive payoff.







Butterfly spread

Can be implemented in either of two following ways using call or put options

Using call options:

Long 1 call at (X − a) strike

Short 2 calls at X strike

Long 1 call at (X + a) strike

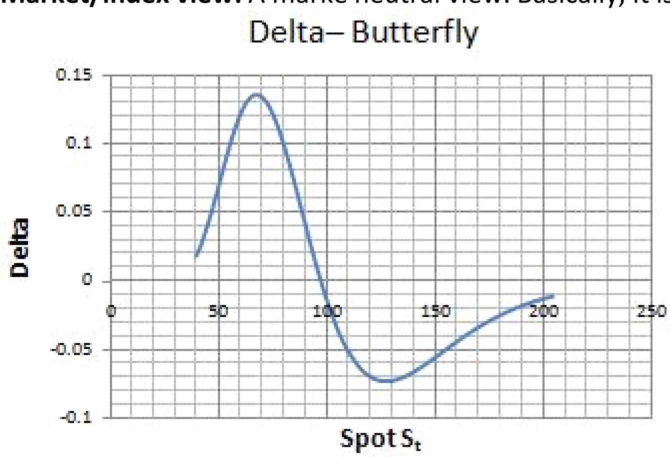
Using put options:

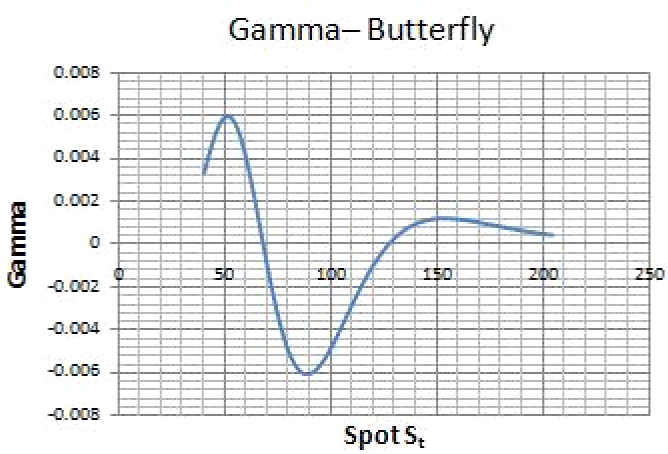
Long 1 put at (X − a) strike

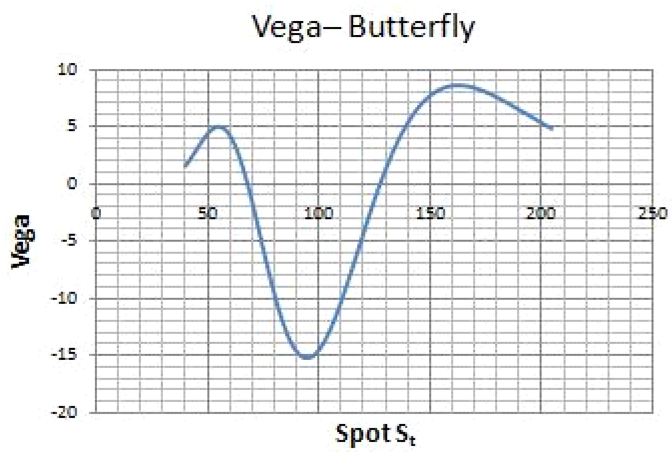
Short 2 puts at X strike

Long 1 put at (X + a) strike

Market/index view: A marke neutral view. Basically, It is a limited profit, limited risk options strategy.







Pasted from <http://deltaquants.com/greeks-for-common-option-strategies>

The Forward Price
The forward price $F=Se^{(r-q)t}$, where S = stock price; r = continuosly compounded interest rate; q = continuos dividend rate ; t = time to expiration.
Black Scholes Option Pricing Formula
European Call Price $C = Se^{-qt}N(d_1) - Ke^{-rt}N(d_2)$
European Put Price $P = -Se^{-qt}N(-d_1) + Ke^{-rt}N(-d_2)$ where

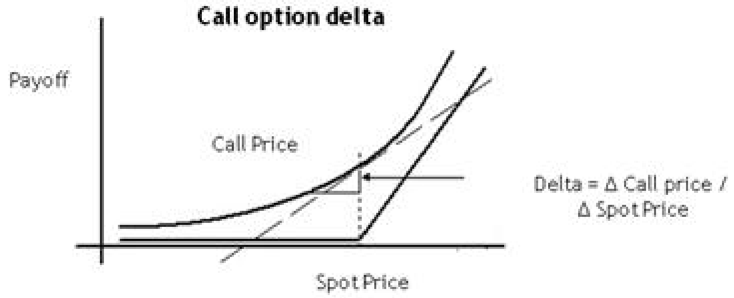
$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r - q + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

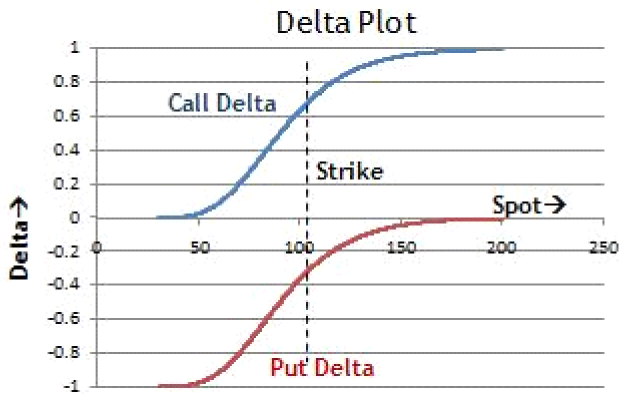
S = Spot price; K = Strike price; t = time to expiry; q = continuos dividend yield; r = risk free interest rate; σ = annual return volatility
Put-Call Parity
Put price + Spot price (minus PV of future dividends) = Call price + PV of Strike price
$P + Se^{-qt} = C + Ke^{-rt}$
Volatility Skew
In Black Scholes, implied volatility is assumed to be the same for all strikes for a given security. In reality however, for a given time to maturity, implied volatility is generally higher for lower strike prices and lower for higher strike prices.
Volatility Term Structure
Implied volatility varies as a function of time-to-maturity. Typically implied volatility is found to be mean reverting - Short dated implied volatility is more variable than long dated implied volatility.

- During crisis: short dated volatility >> long dated volatility
- In quiet times: short date volatility < long date volatility

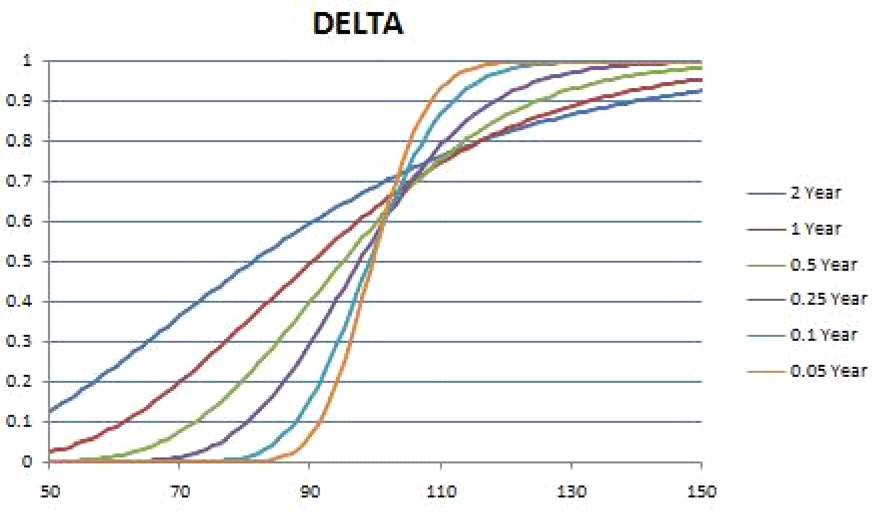
Calendar Spreads
Long a Calendar spread: Buy long dated and sell short dated options (same strike and underlying). Investor in a Long calendar spreads expects long dated option price to increase more than the short dated option price. In other words they expect long dated volatility to increase more than short dated volatility.
Short a Calendar spread: Sell long dated and buy short dated options (same strike and underlying).
The Greeks
Delta: Rate of change of option price with respect to the underlying stock. Delta for a call = e-qtN(d1) ; put = $-e^{-qt}N(-d_1)$



The option delta vs Spot price graph for a European call and put has plotted below.



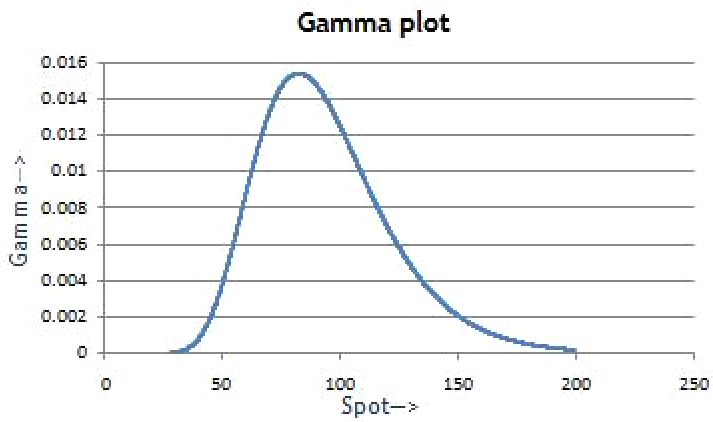
Variation in delta vs Spot profile for a call option with time to maturity is plotted below: (K = 100).



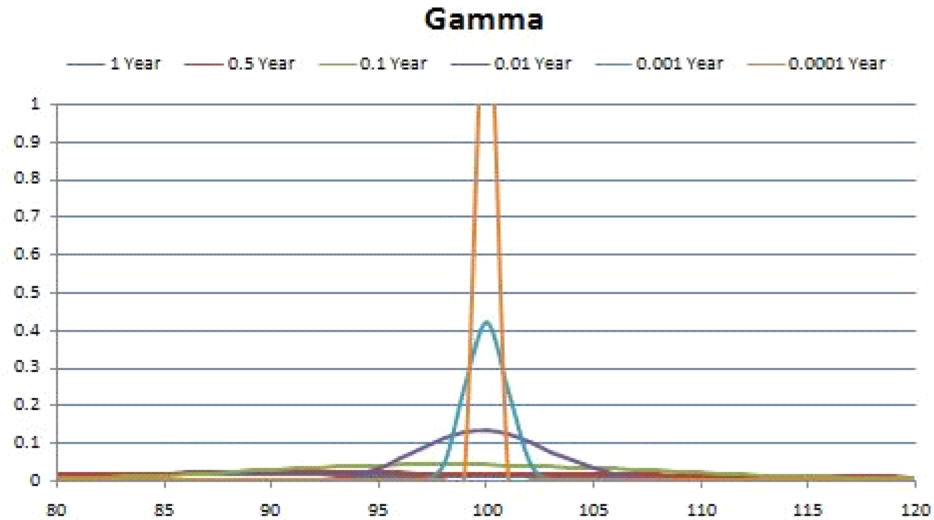
Gamma: Rate of change of option delta with respect to the underlying stock price. Gamma for a call (and put) =

$$\frac{N'(d_1)e^{-qt}}{S\sigma\sqrt{t}}$$

Below is plot of option gamma variation with Spot price.



Variation in gamma vs spot profile with time to maturity is as follows:

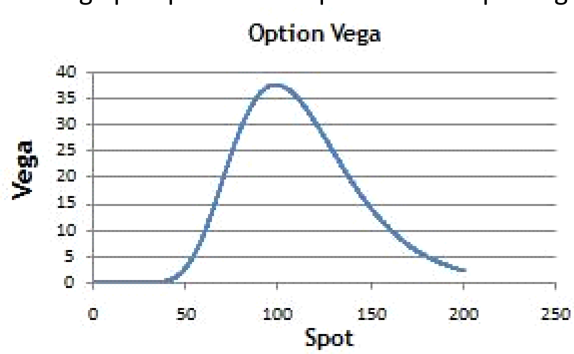


Unlike delta which is bounded between 0 and 1 for a call option and -1 and 0 for a put option, Gamma for a long position in an option can assume any value from 0 to infinity. Gamma is maximum for ATM optiona at expiry.

Vega: Rate of change of option price with respect to underlying stock volatility. Vega for an option (call and put) =

$S\sigma\sqrt{t}N'(d_1)e^{-qt}$

The vega plot plot for European call and put is given below.



Theta: Sensitivety of option price with respect to time to expiry.

Option Traders Jargon

Selling/Buying gamma: selling/buying short-dated options. (Gamma closer to expiry is higher)

Selling/Buying vega: selling/buying long-dated options. (Vega closer to expiry is lower)

Buying/Going long a skew: Buying low strike and selling high strike options.

Variance Swaps

A variance swap is a forwar contract on realized variance. **A Long var swap payoff = notional * (realized vol^2 - strike vol^2)**

Pasted from <http://deltaquants.com/revision-sheet-for-equity-derivatives>

A number of major investment banks, hedge funds and Investment research firms use Sobol as their primary Random number generator for pricing OTC products especially for low dimension problems. There are several technical papers already available online on Sobol sequence generation algorithm. Few such links have been provided towards the end of the article. This article however, does not intend to be too technical but rather aims at providing a simplified 'Dummies' guide to implementing Sobol sequence generation.

Before getting into the heart of the algorithm, let us briefly describe the following concepts.

Bitwise XOR operator

Represented by a

$\oplus$

sign. BitXor is used to perform a logical exclusion on two expressions. For example,

Primitive polynomials over GS(2)

[GS(2) simply means that the coeffecients $a_k(s)$ in the polynomial below can either be 0 or 1]

To generate sobol quasi random sequence, we'll have to source in primitive polynomials over GS(2) as input to the algorithm. Various researchers have already generated and published these polynomials and can be used directly (and we recommend) while implementing the algorithm. One such primitive polynomial table is published at A011260.

So what if we have these primitive polynomials already available with us, it is nevertheless good to understand what these are. At this stage you could read on for further information or skip this section if you are in a hurry.

So what is a primitive polynomial?

Consider an irreducible polynomial over GS(2) of degree s_j

$x^{sj} + a_1x^{sj-1} + a2x^{sj-2+}.....+ a_{sj-1}\, x + 1$

This polynomial is said to be primitive if it has the order $2^{sj} - 1$.

[Order of a polynomial??? The order of a polynomial P(x) with P(0) <> 0 is the smallest integer e for which P(x) completely divides $x^e + 1$. For example, consider $1 + x + x^2$ completely divides $x^3 - 1$ and hence its order is 3 ($3 = 2^2 - 1, S_j = 2$).]

Given below is a list of a few primitive polynomials over GS(2).

s_j	**Primitive polynomials**
1	$1 + x$
2	$1 + x + x^2$
3	$1 + x + x^3$, $1 + x^2 + x^3$
4	$1 + x + x^4$, $1 + x^3 + x^4$
5	$1 + x^2 + x^5$, $1 + x + x^2 + x^3 + x^5$, $1 + x^3 + x^5$, $1 + x + x^3 + x^4 + x^5$, $1 + x^2 + x^3 + x^4 + x^5$, $1 + x + x^2 + x^4 + x^5$

Direction numbers vi(s) and initialisation number mi(s).

So now we understand what primitive polynomials are, what do we need next?

Direction numbers!!!!

To generate sobol low discrepancy quasi random sequence, we will now have to assume an initial set of initialisation numbers $m^i(s)$ - $m_1, m_2, m_3, . . . m_{sj}$. (Remember s_j is also the degree of primitive polynomial we discussed previously). Each assumed m_i (i^{th} initialisation number), however, must satisfy two criterias - it should be an odd integer and it should be less than 2^i. That is, $m_1 < 2$, $m_2 < 2^2$, $m_3 < 2^3$ and so on.

However, this does not mean that any integer that satisfies these two criterias would generate a good quality low discrepancy sequence. In fact, the quality of the random number depends quite a bit on the assumed set of initialisation numbers. There are a few authors who have researched and arrived at a set of initial numbers which produce quality random numbers. See [3] for example.

The values for msj+1 and beyond are determined using the following recursive equation:

Higher dimension problems

We showed you how to generate sobol sequence for one dimension. So how do we generate this

sequence for more dimensions?
The answer is simple. For each dimension use one primitive polynomial, assume a set of initialisation numbers based on the criteria above, generate rest of the initialisation numbers using the recursive equation described before, calculate direction numbers vi(s) and finally use the equation stated in the previous section to generate the sequence.

Using Sobol low discrepancy sequence for Monte Carlo simulations

A lot of Monte Carlo based pricers use sobol for spot path generations. It would thus be justified to make a final comment, before closing this article, on how to use sobol within the monte carlo closed pricer.
Lets suppose we need to simulate spot paths for 'm' underlyings with 'n' time steps. Simply generate the sobol sequences for mxn dimensions and use random numbers from a unique dimension for each time step and underlying.

Random Number Generator (xll) Excel addin

DeltaQuants' Random Number Generator library can be downloaded from here. The library has been implemented in C++. The library documentation as well as other excel libraries can be downloaded from here.

Pasted from <http://deltaquants.com/sobol-sequence-simplified>

Altiplano

An Altiplano is a type of mountain range structure, which offers the buyer a predetermined fixed large coupon at expiry on the condition that none of the underlying assets have decreased below a given level. If the level is breached, the option holder receives the payout of a plain vanilla, or sometimes Asian call on the basket.

American option

An option that can be exercised on any day until its expiration date. In most cases, an American option is more valuable to the buyer and hence costlier than a European option.

Annapurna

An Annapurna is a type of mountain range structure, which offers a combination of a fixed coupon rate and participation in the equity gains of an underlying basket of securities. The coupon rate is dependent on when the worst-performing stock of the group falls below a prespecified level. The longer it takes for the worst-performing stock to reach the predetermined low point, the higher the coupon payment the investor will receive.

Asian option

An option whose payoff depends upon the average price of the underlying asset. As a result of this averaging feature, Asian options have a lower volatility and hence cheaper relative to their European counterparts.

Asset-or-Nothing option

A digital option that pays the value of the underlying security if the option expires in the money.

Autocallable notes

An autocallable is a strucured product that automatically gets exercised before the scheduled maturity date, if certain predetermined market conditions are realized. For example, a triggering event may be the underlying index breaching a predetermined level. Autocallable is one of the most widely traded OTC structured products.

Barrier option

An option that whose payoff depends on whether the price of the underlying asset crosses a predetermined barrier. There are two kinds of barrier options - Knock in and Knock out. Knock in options get activated only when the barrier is breached wheras knock out options get deactivated when the barrier is breached.

Basket option

An option whose payoff is dependent on multiple underlying assets.

Bermudan option

Holder of a Bermudan option has a right to exercise the option on multiple prespecified observation dates.

Best-of option

Best-of option is a basket option whose payoff at maturity is based on the best performer among all the underlying assets.

Beta

The price volatility of a financial instrument relative to the price volatility of a market or index as a whole. A high-beta instrument is riskier than a low-beta instrument.

Binary option

An option which pays a fixed amount/asset if the option expires in the money and nothing otherwise. Note the discontinuos nature of the payoff.

Binomial model

A method which assumes that the probability over time of price or interest rate follows a binomial distribution. At any time step, the price or rate can move to two possible values (one higher and one lower).

Black-Derman-Toy (BDT) model

A one-factor log-normal interest rate model where the single source of randomness is the short-term rate. The inputs into the model are the observed term structure of spot interest rates and their volatility term structure.

Black-Scholes model

A closed form solution developed assuming constant volatility for European style options.

Bond

A debt instrument through which corporates and government raise money.

Bond option

The right to sell a bond back to the issuer (put) or to redeem a bond from its current owner (call) at a specific price and on a specific date.

Calendar spread

A strategy that involves buying and selling options or futures with the same (strike) price but different maturities.

Call option

An option that gives its holder the right to buy a certain quantity of a stock or commodity for a specified price at a specified time.

Call swaption

An option that gives its holder the right to enter into an interest rate swap in which the buyer of the option pays the fixed rate and receives the floating rate.

Callable bond

A bond that gives the issuer the right to buy back the bond at a predetermined price at specified future dates. The embedded call option reduces the price of the bond.

Cap

Interest-rate option that guarantees that the rate on a floating-rate loan will not exceed a certain predetermined level. Normally a Cap is a multi period agreement where the floating rate in any period is determined by the equation Rate = Max(CAP, floating rate loan).

Caplet

An interim cap component in a multiperiod interest-rate cap agreement.

Cash-or-Nothing option

A digital option that pays some fixed amount of cash at expiry if the option expires in the money and zero otherwise.

Cliquet option

A path dependent option that can be perceived as a prepurchased series of 'At the money' future start options. The strike prices for these options being set on predetermined observation dates. Consider a three year cliquet with reset dates each year. The first would payoff at the end of the first year and has the same payoff as a normal ATM option. The second year's payoff has the same payoff as a two year option, but with strike equal to the stock price at the end of the first year and similarily for the third year.

Compound option

An option that gives its buyer the right to buy or sell an option at a prespecified price at a prespecified date.

Constant Maturity Swap

Interest rate swap where one of payment leg is a constant maturity rate. This constant maturity rate is the yield on an instrument with a longer life than the length of the reset period, so the parties to a constant maturity swap have exposure to changes in a longer-term market rate.

Credit default swap

A swap where one party (buying protection) pays a fixed periodic fee, generally a percentage of the notional amount in return of a contingent payment by the counterparty (selling protection) if a prespecified credit event occurs.

Delta

The rate of change of the price of a derivative security relative to the price of the underlying asset.

Derivative

A financial instrument whose payout is based or derived from some underlying asset. For example, an option is a derivative instrument based on the underlying asset.

Deterministic model

A model in which the model variable for a time step is dependent solely on the model varaible calculated in the previous step.

Digital option

An option whose payout is either a fixed amount or nothing depending on whether the option expires in the money or not.

Discount factor

A coefficient which is multiplied to the future cash flow to account for the time value of money. A cash flow to be received in future is equivalent to receiving its present value today.

Double barrier options

An option with two barriers - one specifying the upper limit for the price of the underlying asset and the other specifying the lower limit for the underlying asset.

Down-and-In option

An option which gets activated only when when the price of the underlying asset hits the low barrier.

Down-and-Out option

An option which gets deactivated if the price of the underlying asset hits the low barrier.

Equity collar

A option strategy involving going long on an OTM call and an OTM put option.

European option

An option that can be exercised only on its expiration date.

Everest structure

A capital guaranteed structure generally offering the investor the sum invested at maturity and potential upside linked to the performance of the worst-performing asset of the basket of underlying assets. It is one of the Mountain range structured products.

Ex-dividend date

Date when the effect of the announced corporate action on the price is assumed to have taken place.

Exercise price

The price set for buying an asset (call) or selling an asset (put). The strike price.

Exotic option

Any nonstandard option.

Fat tails

A distribution where the probability of extreme events is higher than the proposed distribution.

Fixed lookback option

Strike price is fixed at purchase. The underlying is priced at its highest or lowest level, depending whether it is a call or put, during the life of the option rather than expiring at market.

Floating lookback option

Strike price is fixed at maturity. For a call, the price is fixed at the lowest price during the life of the option; for a put it is fixed at the highest price.

Floor

Interest-rate option that guarantees that the rate on a floating-rate loan will not fall below a certain level. Normally a multiperiod agreement.

Floorlet

One of the interim period floors in a multiple period floor agreement.

Forward rate

Future rates of a bond calculated from the available yield curve of traded zero coupon bonds.

Forward start option

An option that becomes activated after a future date.

Gamma

The rate of change of delta for a derivative security relative to the price of the underlying asset.

Gap option

An option in which the strike price determines the size of the payoff, but a different constant determines whether or not the payoff is made.

Payoff call = S-X2 if S>X1 else 0

Payoff put = X2-S if S1 else 0

X1 is called Gap and X2 is called Strike.

Heath-Jarrow-Morton (HJM) model

A multifactor interest rate model that requires two inputs: the initial yield curve and a volatility structure for the forward.

Hedge

A financial transaction that reduces or offsets the risk on an existing open fiancial position.

High Low option

An option that pays the difference between the high and the low of the underlying asset during the life of the option.

Ho Lee model

A single factor interest rate model that makes a simplying assumption of constant volatility of term structure.

Implied volatility

Value of the volatility embedded in the option price.

Instrument set

A collection of financial assets. A portfolio.

Knock-in option

A barrier option that gets activated when a predetermined barrier is hit. Two kinds of Knock-in option are Up-and-In and Down-and-In.

Knock-out

A barrier option that gets deactivated when a predetermined barrier is hit. Two kinds of Knock-in option are Up-and-Out and Down-and-Out.

Ladder option

A path-dependent option whose payout increases stepwise as the underlying trades hits prespecified barrier levels (the ‘rungs’ of the ladder). Each time the underlying asset hits the new barrier, the option payout is locked-in at the higher level.

Least squares method

A mathematical method of determining the best fit of a curve to a series of observations by choosing the curve that minimizes the sum of the squares of all deviations from the curve.

Lite option

An European style option whose payout depends on the performance of the underlying assets that remain after a certain number of worst and/or best performers are removed from the basket on a prespecified date before maturity.

Lookback option

A path dependent option whose payoff depends on either the high or the low of the underlying asset during the life of the option. Two kinds of Lookback options are Fixed Lookback option and Floating Lookback option.

Mean reversion

The tendency of a variable to return to its mean value in the long run.

Monte Carlo Simulations

A derivatives valuation technique in which a number of underlying spot paths are generated. A discounted average of the payoffs for these scenarios is the approximate price of the option.

Naked Option

A unhedged open position in the option.

Open ended product

A structured product with no expiry.

Option

An option gives the right but not the obligation to buy or sell the underlying at a prespecified strike price on or before the agreed maturity.

Palladium

Palladium is range structured product that takes long positions on the best performing stocks and a short positions on the worst performing stocks of a basket.

Parisian barrier option

A kind of a barrier option in which the barrier is trigger only if the underlying spot meets the barrier condition for a specified time period.

Podium

A full capital guarenteed structured product where the annual coupon payments are linked to the number of assets in the basket meeting a prespecified performance criteria.

Power option

An option where the payoff is linked to underlying price at expiry raised to some power.

Portfolio

A collection of financial assets. Also called an instrument set.

Portfolio option

An basket option where the payoff is linked to difference between the performance of the portfolio and the a prespecified strike.

Put

An option that gives its holder the right to sell an asset for a prespecified price on or before a prespecified date.

Put swaption

An option that gives its holder the right to enter into an interest rate swap to receives fixed rate and pays floating rate.

Puttable bond

A bond that allows the holder to redeem the bond at a predetermined price at specified future dates. The bond contains an embedded put option; that makes the bond costlier than bonds without the put option.

Quanto product

A quanto is a type of derivative in which the underlying is denominated in one currency, but the instrument itself is settled in another currency at some fixed rate.

Rainbow option

A single option linked to two or more underlying assets. In order for the option to pay off, all the underlying assets must move in the intended direction.

Range note

A range note is a structured note, which pays a coupon for each day that the underlying spot stays within a prespecified range (sometimes called the accrual corridor).

Self-financing hedge

A trading strategy whereby the value of a portfolio after rebalancing is equal to its value at any previous time.

Shout option

A path-dependent option that allows the investor to lock in profits if he thinks the market has reached a high (for a call) or low (for a put). The strike is set at the price at which the investor shouts.

Spot rate

The current interest rate appropriate for discounting a cash flow of some given maturity.

Stochastic model

A model that contains a random variable the outcome of which is based on probability.

Stochastic volatility

Volatility of an underlying assumed to be driven by a stochastic process.

Straddle

An option strategy in which the buyer takes a long position on a call and a put on the same underlying asset with same strike and maturity. Straddle is a good investment strategy if the investor expects a large movement in the price of the underlying asset but is not sure about the direction of the movement.

Strangle

An option strategy similar to Straddle. The buyer goes long on an out of the money call and an out of the money put with same strike and maturity.

Strike

Exercise price for a put or call option.

Supershare option

A digital option that pays out a proportion of the assets underlying a portfolio if the asset lies between a prespecified range at the expiry of the option.

Swap

A contract between two parties to exchange cash flows in the future based on agreed predetermined formulas.

Swaption

A contract that gives its holder the option to enter into a swap on a later date.

Theta

Change is option price on decrease of one day from time to maturity.

Trinomial model

A model in which the basic assumption is that prices or rates can move to one of three possible values over any short time period. At any time step the price or rate direction can be upward, neutral, or downward.

Up-and-In option

A barrier option which gets activated only when the underlying asset price rises above the prespecified barier level.

Up-and-Out option

A barrier option which gets deactivated when the underlying asset price rises above rge prespecified barrier level.

Vanilla option

A common option, such as a European put or call.

Vanna

Rate of change of option vega with respect to the change in the underlying asset.

Vanilla swap

A simple swap agreement where one party pays fixed and the counter party pays floating rate.

Vega

The rate of change in the price of a derivative security relative to the volatility of the underlying security.

Volatility smile
Implied volatility versus strike graph is typically smile shaped and hence called a 'volatility smile'. The underlying distribution is found to be leptokurtic and hence the observed option prices of out of the money options are found to be higher.
Yield
The interest rate that will make the present value of the future cashflows from an investment equal to the price of thr investment.
Yield curve
Term structure of yield rates.
Zero curve
A term structure of yields for zero-coupon bonds - zero rates versus maturity dates.
Zero-coupon bond, or zero
A bond without intermin coupon payments. It is sold at at a discount to the notional and on maturity the notional is returned.

Pasted from <http://www.deltaquants.com/glossary>

3.20 Trade Idea

Monday, March 20, 2017
12:52 PM

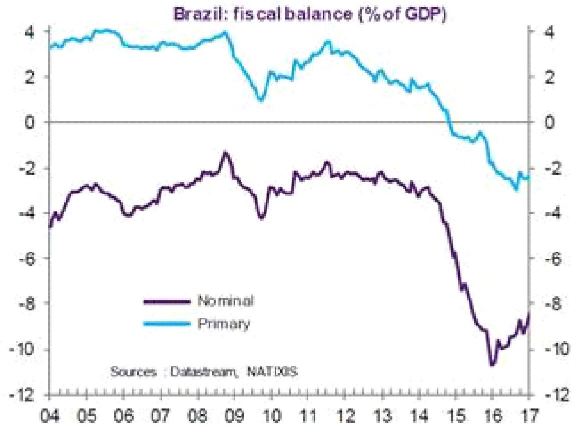
Natixis Economic Research's LatAm Country Risk Model shows that credit quality in LatAm will improve in 2017. The region is facing an inflection point after five consecutive years of decline. Brazil and Argentina are poised to be the top performers in the region in terms of credit worthiness.

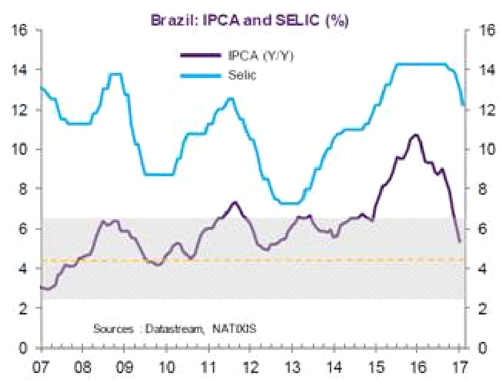
- Argentina and Brazil are showing impressive comebacks and should register a stellar performance in terms of credit quality. Both countries **share similar catalysts, namely better political, economic, external, and monetary scores.**

- The IMF expects Brazil to grow by 0.2% in 2017. This has come along with **falling inflation and an improvement of external accounts due to higher commodities prices and import contraction.**

- **Monetary easing** will encourage capital appreciation in local bonds. Copom (Brazilian Central Bank) is opting for front-loaded rate cuts. The Selic is down 200bps to 12.25% since October. A more aggressive pace of easing is very likely in the short-term.

- The BRL is 11% higher vs. USD since December. The **high carry and capital appreciation** resulting from rate cuts provides an **interesting cushion against FX volatility.**





Source: Natixis Economic Research Report: The Great Return of LatAm's Credit Quality

Multiple angle to analyze the country risk. And bet one some country(Kerea and india, brail)

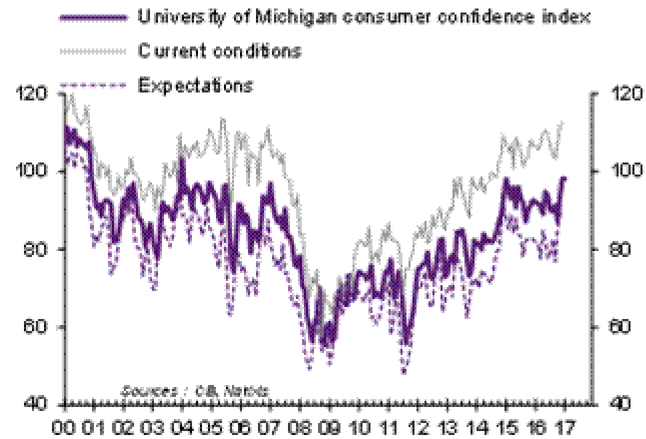
##

Consumer confidence has risen substantially over the past 5 years, reaching a post-crisis high at the beginning of 2017. The consumer discretionary sector could rise off of strong momentum in the labor market and wage growth.

- The **US labor market** improved significantly in 2016 and appears to be heading to full employment with the unemployment rate stable below 5.0% and initial jobless claims at the lowest level since the '70s
- Due to the labor market improvement, growth in wages will accelerate and thus increase disposable income for consumers
- Consumption should be positively affected as well with the **consumer discretionary sector poised to benefit;** historically the sector's performance has been correlated to labor market conditions and consumer confidence

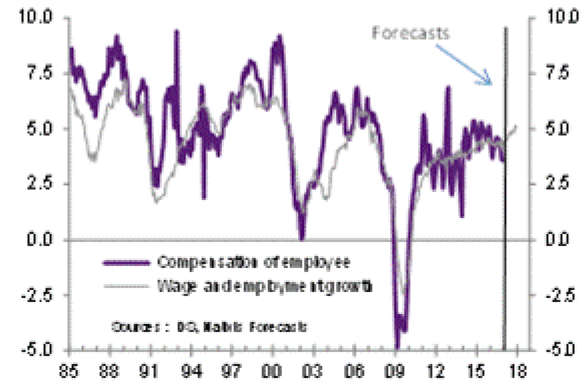
Consumer Confidence and the Labor Market

Consumer confidence has shifted higher, boosted by strong labor market growth in the post-crisis environment



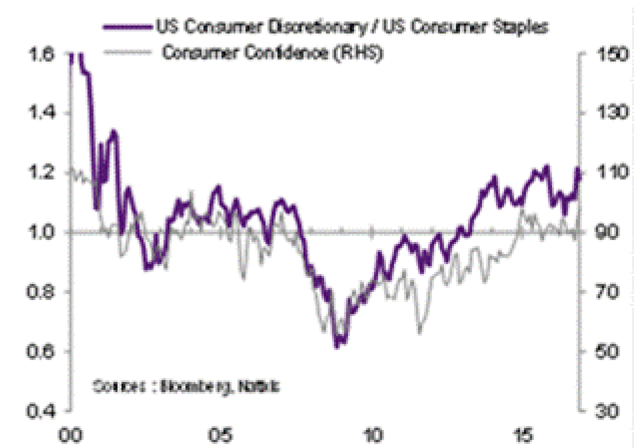
As we reach full employment, job growth should move to a more consistent level, while wages are expected to accelerate

US: Compensation of employees wage and employment growth (YoY in %)



Higher compensation for employees has generally coincided with higher consumer confidence and outperformance of the consumer discretionary sector over the consumer staples sector

US: Consumer Confidence vs. Relative Performance



Obvious events drive and find the sector

Over the last 85 years, economic research has shown that low volatility stocks have outperformed high volatility stocks in the medium term[1]. The S&P 500 Low Volatility Target Beta Index (SPXLTBUP) aims to provide exposure to the "low volatility anomaly", by selecting the 100 stocks with the lowest volatility in the S&P 500 (SPX) and weighting them in inverse proportion to their volatility. The index is then beta-adjusted in order to match the beta of the S&P 500 Index.

Rationale

- Natixis proposes a strategy to monetize the US Equity Low Volatility risk premium (the outperformance of the S&P 500 Low Volatility Target Beta Index versus the S&P 500 Index) in the medium term at a cheap cost
- The strategy allows the client to receive leveraged exposure on the US Equity Low Volatility risk premium with the risk limited to the initial premium paid

##

2017 appears to be the beginning of a cycle for global infrastructural development

Rationale

- Global infrastructural development appears to be poised for growth in 2017. This is due to the fact that there is little global growth at the moment, central banks have reduced interest rates close to zero, and governments are concerned with improving productivity and boosting the economy to create jobs.
- Since the amount of **public debt** could be a limitation for renewed infrastructure investment, future public investment in civil infrastructure will go hand in hand with **private sector investment** in energy and telecoms.
- Infrastructure projects are large and capital intensive with significant upfront costs, but with benefits that tend to accrue over the long term.
- The IMF has found that an increase in infrastructure investment spending equivalent to 1% of national income will lead to an **increase** in the level of output by **0.4% in the same year and 1.5% four years later.**
- For the first time in many years we could see a global coordinated effort for major economies to increase investment in infrastructure.

In the USA

President-elect Trump has announced a major fiscal stimulus package and promised big infrastructure upgrades to create millions of jobs and lift GDP growth to 4%. He will take advantage of **negative interest rates to push through $1tn infrastructure plan**. The aim is to increase **productivity growth, more domestic investment, and faster real GDP growth**.

In the UK

Brexit is leading UK politicians to boost infrastructure spending as a way to avoid the pernicious economic impacts of the exit. The new Chancellor has just announced a National Productivity Investment Fund focused on infrastructure and innovation to improve Britain's productivity. In addition, the UK **housing market remains undersupplied**. Demographics are driving demand for new households of around 250,000 against new build rates currently running about 170,000 units per year.

In Europe

Brussels is calling for more spending by some EU governments to boost demand. Although the **fiscal situation** of many countries does not allow for massive infrastructure investment, the EU Commission is taking the initiative through an Infrastructure Investment Plan to **mobilize investment of at last €315 bln** in 3 year.

In Asia

Japan is currently spending around 4% of its GDP on infrastructure, which is much needed due to an **ageing population**, decades of economic stagnation, and an oppressive debt burden. Even China could possibly increase its infrastructure investments, which could have an impact on global growth.

Make a idea globalized. In order to add diversification

###

2017 could shape up to be a solid year for real estate markets in the US. The sector may have taken 7 years to recover from the subprime mortgage crisis, but the trend reversal since 2013 is consolidating.

In the US

• The Fed raised the mortgage interest rates for only the second time since 2006 in December and the rates are expected to increase, but no greater than 4.3% (on the 30-year fixed rate). When compared to historical averages, it's still considerably low. Historically REITS have performed well among modest increases in interest rate and economic growth. Overall market sentiment is optimistic due to the proposal to increase infrastructure spending and tax cuts by the newly elected president Trump.
• Mortgage credit will likely to be more widely available due to looser lending standards and fees charges for first-time homebuyers is likely to remain low. Starting in 2017, government-owned mortgage companies will begin to back larger mortgages for the first time in over a decade, making it easier for homebuyers to finance their purchase in high-

priced markets. The availability of low down payment (1-3%) mortgages are likely to increase to draw more young buyers into the housing market.

• The average annual rate of new groundbreakings in 2016 reached 1.163 million (up 5% from 2015). The rate is expected to continue to rise in 2017 as home builders are encouraged by the improvement in the job market, higher wages, looser credit and increased demand from buyers. The residential real estate prices were up 4.6% in 2016 and will increase by 3.6% in 2017 and 2018.

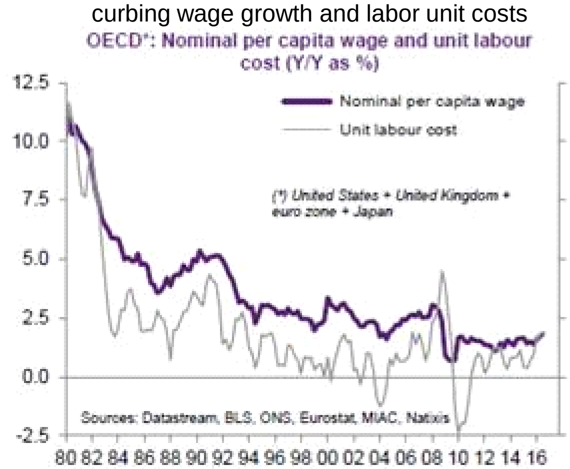
Classical Sector analysis. It is something in the pipe. Something underperformance

###333

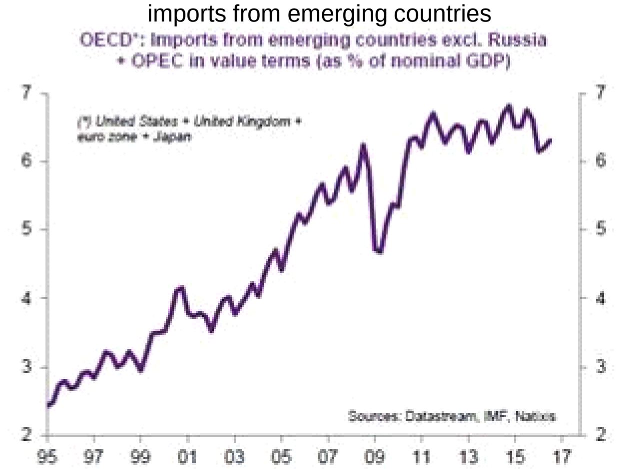
With inflation in the Eurozone and the United States rising to 1.1% and 1.7%, respectively, in November 2016, two products have been designed to provide a positive exposure to the inflation thematic. The first product is a portfolio of 3 equally-weighted funds that provides geographical diversification, low correlation and low volatility whereas the second product offered is a hybrid

Four aspects to contribute to the expected inflation trend

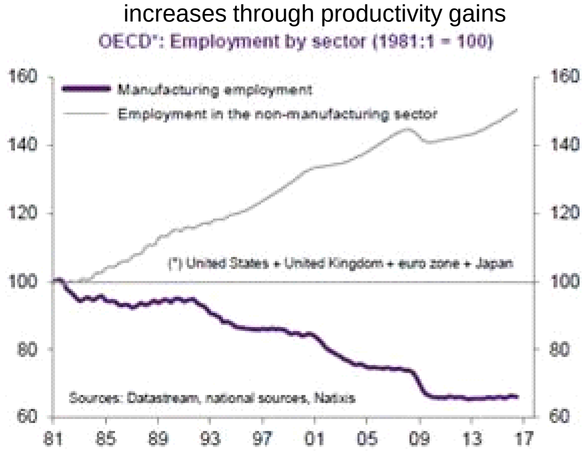
Ending Labor market deregulation could lead to increases in minimum wage which were previously curbing wage growth and labor unit costs



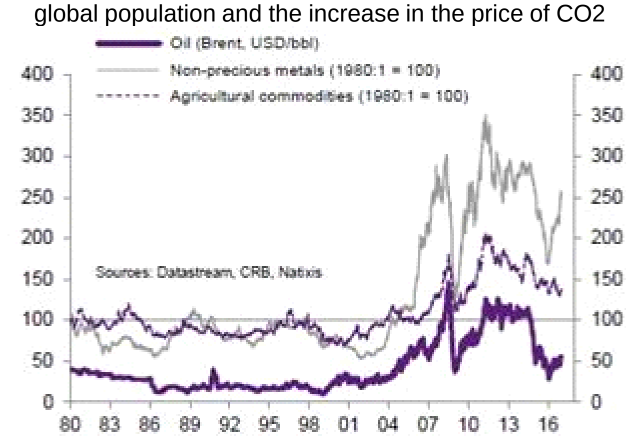
Production costs and prices will continue to rise in emerging countries and contribute to imported inflation via imports from emerging countries



Weakness of productivity gains is inflationary as a result of companies being unable to absorb wage increases through productivity gains



Expected rising commodity prices due increasing global population and the increase in the price of CO2



Market inflation goes up -> will give us a inflation idea <- come from analysis of graph.
And when you are reading some article, you could gather some view from other as well.
You need to know that the inflation is going up. But the idea should be your own.
You just need to get a idea every body believe.

Extract the stats

Wednesday, November 02, 2016
11:34 AM

```
Sub insert_performance()
    Path = InputBox("path", "Strate List File", 0, 10000, 5000)
    Current_worksheet = ActiveWorkbook.Name
    current_sheet_number = ActiveSheet.Index
    Dim objFSO As Object
    Dim objFolder As Object
    Dim objFile As Object
    Dim sourceColumn As Range, targetColumn As Range
    Set objFSO = CreateObject("Scripting.FileSystemObject")
    Set objFolder = objFSO.GetFolder(Path)
    i = 1
    For Each objFile In objFolder.Files
        Strat_name = objFile.Name
        file = Path + "/" + Strat_name
        Workbooks.Open file
        ret = Workbooks(Strat_name).Worksheets(1).Cells(3, 8).Value
        Vol = Workbooks(Strat_name).Worksheets(1).Cells(4, 8)
        Sharpe = Workbooks(Strat_name).Worksheets(1).Cells(5, 8)
        Sortino = Workbooks(Strat_name).Worksheets(1).Cells(6, 8)
        MDD = Workbooks(Strat_name).Worksheets(1).Cells(7, 8)
        Workbooks(Strat_name).Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 3), Cells(rownum + 1,
3))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_works
heet).Worksheets(current_sheet_number).Cells(8, i + 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, i + 1))
        sourceColumn.Copy Destination:=targetColumn
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 1), Cells(rownum + 1,
1))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_works
heet).Worksheets(current_sheet_number).Cells(8, 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, 1))
        sourceColumn.Copy Destination:=targetColumn
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, i + 1) = Strat_name
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, i + 1) = ret
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, i + 1) = Vol
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, i + 1) = Sharpe
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, i + 1) = Sortino
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, i + 1) = MDD
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, i + 1) = Strat_name
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, 1) = "Strat_name"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, 1) = "ret"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, 1) = "Vol"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, 1) = "Sharpe"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, 1) = "Sortino"
```

```
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, 1) = "MDD"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, 1) = "Strat_name"
        Workbooks(Strat_name).Close SaveChanges:=False
        i = i + 1
    Next objFile
End Sub

Sub getRow()

    On Error Resume Next
    For i = 43 To 366
        file = "C:\Users\Training Room\Downloads\log2004" &
Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i, 1) & ".csv"
        Workbooks.Open file

        Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        If (ActiveWorkbook.Name <> "data_num.xlsm") Then
            ActiveWorkbook.Close
            Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i, 2) = rownum
        End If

    Next i

End Sub

Sub Example1()
Dim objFSO As Object
Dim objFolder As Object
Dim objFile As Object
Dim i As Integer

'Create an instance of the FileSystemObject
Set objFSO = CreateObject("Scripting.FileSystemObject")
'Get the folder object
Set objFolder = objFSO.GetFolder("D:StuffFreelancesWebsiteBlogArraysPics")
i = 1
'loops through each file in the directory and prints their names and path
For Each objFile In objFolder.Files
    'print file name
    Cells(i + 1, 1) = objFile.Name
    'print file path
    Cells(i + 1, 2) = objFile.Path
    i = i + 1
Next objFile
End Sub
Function MaxDrawDown(returns As Variant) As Variant
   Dim TS As Variant
   Dim n As Integer
   Dim Min As Double
   TS = returns
   n = UBound(TS)
   Min = 0
```

```
  For i = 1 To n
    For j = i To n
      temp = TS(j, 1) / TS(i, 1) - 1
      If temp < Min Then
        Min = temp
      End If
    Next
  Next
  MaxDrawDown = Min
End Function
```

Extract the stats (don't contain .csv, and will clear the contents when we start)

Thursday, November 03, 2016
6:08 PM

```
Sub insert_performance()
    ActiveSheet.Cells.ClearContents
    Path = InputBox("path", "Strate List File", 0, 10000, 5000)
    Current_worksheet = ActiveWorkbook.Name
    current_sheet_number = ActiveSheet.Index
    Dim objFSO As Object
    Dim objFolder As Object
    Dim objFile As Object
    Dim sourceColumn As Range, targetColumn As Range
    Set objFSO = CreateObject("Scripting.FileSystemObject")
    Set objFolder = objFSO.GetFolder(Path)
    i = 1
    For Each objFile In objFolder.Files
        Strat_name = objFile.Name
        position_point = InStr(Strat_name, ".csv") - 1
        file = Path + "/" + Strat_name
        Workbooks.Open file
        ret = Workbooks(Strat_name).Worksheets(1).Cells(3, 8).Value
        Vol = Workbooks(Strat_name).Worksheets(1).Cells(4, 8)
        Sharpe = Workbooks(Strat_name).Worksheets(1).Cells(5, 8)
        Sortino = Workbooks(Strat_name).Worksheets(1).Cells(6, 8)
        MDD = Workbooks(Strat_name).Worksheets(1).Cells(7, 8)
        Workbooks(Strat_name).Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 3), Cells(rownum + 1, 3))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_worksheet).Workshee
ts(current_sheet_number).Cells(8, i + 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, i + 1))
        sourceColumn.Copy Destination:=targetColumn
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 1), Cells(rownum + 1, 1))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_worksheet).Workshee
ts(current_sheet_number).Cells(8, 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, 1))
        sourceColumn.Copy Destination:=targetColumn
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, i + 1) = Left(Strat_name,
position_point)
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, i + 1) = ret
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, i + 1) = Vol
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, i + 1) = Sharpe
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, i + 1) = Sortino
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, i + 1) = MDD
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, i + 1) = Left(Strat_name,
position_point)
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, 1) = "Strat_name"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, 1) = "IRR"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, 1) = "Vol"
```

```
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, 1) = "Sharpe"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, 1) = "Sortino"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, 1) = "MDD"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, 1) = "Strat_name"
        Workbooks(Strat_name).Close SaveChanges:=False
        i = i + 1
    Next objFile
End Sub

Sub getRow()

    On Error Resume Next
    For i = 43 To 366
        file = "C:\Users\Training Room\Downloads\log2004" & Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i,
1) & ".csv"
        Workbooks.Open file

        Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        If (ActiveWorkbook.Name <> "data_num.xlsm") Then
            ActiveWorkbook.Close
            Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i, 2) = rownum
        End If

    Next i

End Sub

Sub Example1()
Dim objFSO As Object
Dim objFolder As Object
Dim objFile As Object
Dim i As Integer

'Create an instance of the FileSystemObject
Set objFSO = CreateObject("Scripting.FileSystemObject")
'Get the folder object
Set objFolder = objFSO.GetFolder("D:StuffFreelancesWebsiteBlogArraysPics")
i = 1
'loops through each file in the directory and prints their names and path
For Each objFile In objFolder.Files
    'print file name
    Cells(i + 1, 1) = objFile.Name
    'print file path
    Cells(i + 1, 2) = objFile.Path
    i = i + 1
Next objFile
End Sub
Function MaxDrawDown(returns As Variant) As Variant
   Dim TS As Variant
   Dim n As Integer
   Dim Min As Double
   TS = returns
   n = UBound(TS)
```

```
  Min = 0
  For i = 1 To n
    For j = i To n
      temp = TS(j, 1) / TS(i, 1) - 1
      If temp < Min Then
        Min = temp
      End If
    Next
  Next
  MaxDrawDown = Min
End Function
```

Stats

Wednesday, November 16, 2016
3:18 PM

```
Function MaxDrawDown(returns As Variant) As Variant
  Dim TS As Variant
  Dim n As Integer
  Dim Min As Double
  TS = returns
  n = UBound(TS)
  Min = 0
  For i = 1 To n
    For j = i To n
      temp = TS(j, 1) / TS(i, 1) - 1
      If temp < Min Then
        Min = temp
      End If
    Next
  Next
  MaxDrawDown = Min
End Function


Function myIRR(prices, date_series)
   n = prices.Count
   myIRR = (prices(n) / prices(1)) ^ (365 / DateDiff("d", date_series(1), date_series(n))) - 1
End Function


Function myvol(prices, date_series)
   n = prices.Count
   Dim arr()
   ReDim arr(1 To (n - 1))
   For i = 1 To (n - 1)
      arr(i) = Log(prices(i + 1) / prices(i))
   Next i
   myvol = WorksheetFunction.StDev(arr) * Sqr(252)
End Function

Function mySharpe(prices, date_series)
   mySharpe = myIRR(prices, date_series) / myvol(prices, date_series)

End Function

Function myvol_down(prices, date_series)
   n = prices.Count
   Dim arr()
   ReDim arr(1 To (n - 1))
   For i = 1 To (n - 1)
      temp = (Log(prices(i + 1) / prices(i)))
      If temp > 0 Then
         arr(i) = 0
```

```
        Else
            arr(i) = temp
        End If
    Next i
    myvol_down = WorksheetFunction.StDev(arr) * Sqr(252)
End Function

Function Sortino(prices, date_series)
    Sortino = myIRR(prices, date_series) / myvol_down(prices, date_series)
End Function
```

Thursday, November 17, 2016
11:52 AM

```
Sub insert_performance()
    ActiveSheet.Cells.ClearContents
    Path = InputBox("path", "Strate List File", 0, 10000, 5000)
    Current_worksheet = ActiveWorkbook.Name
    current_sheet_number = ActiveSheet.Index
    Dim objFSO As Object
    Dim objFolder As Object
    Dim objFile As Object
    Dim sourceColumn As Range, targetColumn As Range
    Set objFSO = CreateObject("Scripting.FileSystemObject")
    Set objFolder = objFSO.GetFolder(Path)
    i = 1
    For Each objFile In objFolder.Files
        Strat_name = objFile.Name
        position_point = InStr(Strat_name, ".csv") - 1
        file = Path + "/" + Strat_name
        Workbooks.Open file
        ret = Workbooks(Strat_name).Worksheets(1).Cells(3, 8).Value
        Vol = Workbooks(Strat_name).Worksheets(1).Cells(4, 8)
        Sharpe = Workbooks(Strat_name).Worksheets(1).Cells(5, 8)
        Sortino = Workbooks(Strat_name).Worksheets(1).Cells(6, 8)
        MDD = Workbooks(Strat_name).Worksheets(1).Cells(7, 8)
        Workbooks(Strat_name).Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 3), Cells(rownum + 1,
3))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_works
heet).Worksheets(current_sheet_number).Cells(8, i + 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, i + 1))
        sourceColumn.Copy Destination:=targetColumn
        Set sourceColumn = Workbooks(Strat_name).Worksheets(1).Range(Cells(2, 1), Cells(rownum + 1,
1))
        Set targetColumn =
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Range(Workbooks(Current_works
heet).Worksheets(current_sheet_number).Cells(8, 1),
Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(rownum + 7, 1))
        sourceColumn.Copy Destination:=targetColumn
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, i + 1) =
Left(Strat_name, position_point)
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, i + 1) = ret
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, i + 1) = Vol
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, i + 1) = Sharpe
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, i + 1) = Sortino
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, i + 1) = MDD
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, i + 1) =
Left(Strat_name, position_point)
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(1, 1) = "Strat_name"
```

```
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(2, 1) = "IRR"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(3, 1) = "Vol"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(4, 1) = "Sharpe"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(5, 1) = "Sortino"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(6, 1) = "MDD"
        Workbooks(Current_worksheet).Worksheets(current_sheet_number).Cells(7, 1) = "Strat_name"
        Workbooks(Strat_name).Close SaveChanges:=False
        i = i + 1
    Next objFile
End Sub

Sub getRow()

    On Error Resume Next
    For i = 43 To 366
        file = "C:\Users\Training Room\Downloads\log2004" &
Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i, 1) & ".csv"
        Workbooks.Open file

        Worksheets(1).Cells(1, 1).Select
        rownum = ActiveCell.CurrentRegion.Rows.Count
        If (ActiveWorkbook.Name <> "data_num.xlsm") Then
            ActiveWorkbook.Close
            Workbooks("data_num.xlsm").Worksheets("Sheet1").Cells(i, 2) = rownum
        End If

    Next i

End Sub

Sub Example1()
Dim objFSO As Object
Dim objFolder As Object
Dim objFile As Object
Dim i As Integer

'Create an instance of the FileSystemObject
Set objFSO = CreateObject("Scripting.FileSystemObject")
'Get the folder object
Set objFolder = objFSO.GetFolder("D:StuffFreelancesWebsiteBlogArraysPics")
i = 1
'loops through each file in the directory and prints their names and path
For Each objFile In objFolder.Files
    'print file name
    Cells(i + 1, 1) = objFile.Name
    'print file path
    Cells(i + 1, 2) = objFile.Path
    i = i + 1
Next objFile
End Sub
Function MaxDrawDown(returns As Variant) As Variant
   Dim TS As Variant
   Dim n As Integer
```

```
  Dim Min As Double
  TS = returns
  n = UBound(TS)
  Min = 0
  For i = 1 To n
    For j = i To n
      temp = TS(j, 1) / TS(i, 1) - 1
      If temp < Min Then
        Min = temp
      End If
    Next
  Next
  MaxDrawDown = Min
End Function


Function myIRR(prices, date_series)
   n = prices.Count
   myIRR = (prices(n) / prices(1)) ^ (365 / DateDiff("d", date_series(1), date_series(n))) - 1
End Function


Function myvol(prices, date_series)
   n = prices.Count
   Dim arr()
   ReDim arr(1 To (n - 1))
   For i = 1 To (n - 1)
      arr(i) = Log(prices(i + 1) / prices(i))
   Next i
   myvol = WorksheetFunction.StDev(arr) * Sqr(252)
End Function

Function mySharpe(prices, date_series)
   mySharpe = myIRR(prices, date_series) / myvol(prices, date_series)

End Function

Function myvol_down(prices, date_series)
   n = prices.Count
   Dim arr()
   ReDim arr(1 To (n - 1))
   For i = 1 To (n - 1)
      temp = (Log(prices(i + 1) / prices(i)))
      If temp > 0 Then
         arr(i) = 0
      Else
         arr(i) = temp
      End If
   Next i
   myvol_down = WorksheetFunction.StDev(arr) * Sqr(252)
End Function

Function Sortino(prices, date_series)
```

```
    Sortino = myIRR(prices, date_series) / myvol_down(prices, date_series)
End Function

Sub dataCatch()
    Worksheets(2).Cells.Clear
    Worksheets(1).Select
    Worksheets(1).Cells(2, 1).Select
    underlying_num = ActiveCell.CurrentRegion.Columns.Count / 2
    Min = Cells(2, 2).EntireColumn.Cells.SpecialCells(xlCellTypeConstants).Count
    min_index = 1
    For i = 2 To underlying_num
        temp = Cells(1, 2 * i - 1).EntireColumn.Cells.SpecialCells(xlCellTypeConstants).Count
        If temp < Min Then
            Min = temp
            min_index = 2 * i - 1
        End If
    Next i
    Worksheets(1).Columns(min_index).Copy Destination:=Worksheets(2).Columns(1)
    Worksheets(2).Rows(1).EntireRow.Delete

    For i = 1 To underlying_num
        Worksheets(2).Cells(1, i + 1) = Worksheets(1).Cells(1, 2 * i - 1)
        Worksheets(2).Range(Worksheets(2).Cells(2, i + 1), Worksheets(2).Cells(Min - 1, i + 1)).FormulaR1C1
= "=vlookup(rc[-" & CStr(i) & "]," & Worksheets(1).Name & "!C" & CStr(2 * i - 1) & ":C" & CStr(2 * i) &
",2)"
    Next i
Worksheets(2).cells(1,1)="Dates"

End Sub
```

Function Collection

Thursday, November 17, 2016
12:37 PM

```
sheetname = ActiveSheet.Name

Columns(1).EntireColumn.Delete

Dim X As Integer
For X = 1400 To 1429
    Range("R" & X).Formula = "=(ROUND(""AC"" "&X", 0))+0.0625"
Next X


Range("D4").FormulaR1C1 = "=R[-1]C[-2]*10"


Worksheets("Sheet1").Range("A1").Formula = "=$A$4+$A$10"

Worksheets("Sheet1").Activate
ActiveSheet.Cells.SpecialCells(xlCellTypeLastCell).Activat

range(cells(1,n).entirecolumn,cells(1,n+4).entirecolumn).Select

n = Worksheets("Sheet1").Range("A:A").Cells.SpecialCells(xlCellTypeConstants).Count

Sheets("Sheet1").Columns(1).Copy Destination:=Sheets("Sheet2").Columns(2)
```

Tuesday, November 22, 2016
8:20 AM

```
Private Sub cmbDay_Change()

End Sub

Private Sub cmbMonth_Change()
   If cmbMonth.Value = 1 Or cmbMonth.Value = 3 Or cmbMonth.Value = 5 Or cmbMonth.Value = 7 Or
cmbMonth.Value = 8 Or cmbMonth.Value = 10 Or cmbMonth.Value = 12 Then
      cmbDay.RowSource = "Days_31"
   ElseIf cmbMonth.Value = 2 Then
      cmbDay.RowSource = "Days_28"
   Else
      cmbDay.RowSource = "Days_30"
   End If
End Sub

Private Sub cmdCancelPortDetail_Click()
   Unload Me
End Sub

Private Sub cmdEvaluateBotton_Click()
   If txtNotional.Value = "" Or (Not IsNumeric(txtNotional.Value)) Or txtNotional.Value < 0 Then
      txtNotional.BackColor = vbRed
      lblNotional.ForeColor = vbRed
      Exit Sub
   End If

   Sheet1.Range("I2") = DateSerial(cmbYear.Value, cmbMonth.Value, cmbDay.Value)
   Sheet1.Range("I3") = txtNotional.Value
   Application.ScreenUpdating = False
   product_num = Sheet1.Range("A2").End(xlDown).Row - 2

   Sheet3.Activate
   For j = 1 To product_num
      If Sheet1.Cells(j + 2, 3).Value = "Point-to-Point Index Strategy" Then
         Sheet3.Cells(1, j * 2) = "SPX Index"
         Cells(2, j * 2 - 1).FormulaR1C1 = "=BDH(""SPX Index"", ""PX_LAST""," & DateSerial(cmbYear.Value,
cmbMonth.Value, cmbDay.Value) & "," & Date & ",dts=""o"")"
         Cells(2, j * 2 - 1).Select
         date_num = ActiveCell.End(xlDown).Row - 1
         For m = 1 To date_num
            Call fill_formula_ptp(m + 1, j * 2)
         Next m
      ElseIf Sheet1.Cells(j + 2, 3).Value = "Point-to-Point Index Strategy" Then
         Sheet3.Cells(1, j * 2) = "SPX Index"
         Cells(2, j * 2 - 1).FormulaR1C1 = "=BDH(""SPX Index"", ""PX_LAST""," & DateSerial(cmbYear.Value,
cmbMonth.Value, cmbDay.Value) & "," & Date & ",dts=""o"")"
         Cells(2, j * 2 - 1).Select
         date_num = ActiveCell.End(xlDown).Row - 1
```

```
            For m = 1 To date_num
                Call fill_formula_ptp(m + 1, j * 2)
            Next m
        End If
    Next j
    Application.ScreenUpdating = True

    Unload Me


End Sub

Private Sub txtNotional_Change()
    txtNotional.BackColor = vbWhite
    lblNotional.ForeColor = vbBlack

End Sub
```

11.22 Excel Macro

Tuesday, November 22, 2016
7:29 PM

Recursive Function
You need to use if condition to get the trigger date
You need to use multiple vlookup to use the value you have before.
It is kind of recursive function. But it will make the formula in excel much easier.

Remember to use specific date to do this first. Then you can try to make it fit to different date.

Wednesday, November 23, 2016

IBLDV7E
(blackrock)
BXIIAG7E (barclays)

```
Columns("AY:AZ").Select
Selection.Copy
Range("BO1").Select
ActiveSheet.Paste
Range("BO1").Select
ActiveWorkbook.Worksheets("Sheet4").Sort.SortFields.Clear
ActiveWorkbook.Worksheets("Sheet4").Sort.SortFields.Add Key:=Range("BO1"), _
    SortOn:=xlSortOnValues, Order:=xlDescending, DataOption:=xlSortNormal
With ActiveWorkbook.Worksheets("Sheet4").Sort
    .SetRange Range("BO1:BP2493")
    .Header = xlNo
    .MatchCase = False
    .Orientation = xlTopToBottom
    .SortMethod = xlPinYin
    .Apply
End With
Range("BP4").Select
```

12.01 Excel Code

Thursday, December 01, 2016
4:32 PM

The reason why filling formula is very slow is that, excel run the calculation every time it fill the cells. But for autofill, it will not calculate over and over again. The reason it refresh everything, because we fill one formula which may have effect on other cells. So everything get updated.

```
    ActiveWorkbook.Worksheets("Sheet4").Sort.SortFields.Clear
    ActiveWorkbook.Worksheets("Sheet4").Sort.SortFields.Add Key:=Range("af1"), _
        SortOn:=xlSortOnValues, Order:=xlDescending, DataOption:=xlSortNormal
    With ActiveWorkbook.Worksheets("Sheet4").Sort
        .SetRange Range("af1:ag" & CStr(date_num + 1))
        .Header = xlNo
        .MatchCase = False
        .Orientation = xlTopToBottom
        .SortMethod = xlPinYin
        .Apply

    End With


    Set SourceRange = Range("m3:p3")
    Set fillRange = Range("m3:p" & CStr(date_num + 1))
    SourceRange.AutoFill Destination:=fillRange

    Sheet1.ChartObjects("Chart 6").Activate


ActiveChart.SetSourceData Source:=Sheet4.Range(Sheet4.Cells(2, 64), Sheet4.Cells(1 + date_num, 65))

Sub CopyCol()
Sheets("Sheet1").Columns(1).Copy
Sheets("Sheet2").Columns(2).PasteSpecial xlPasteValues
End Sub
```

Pasted from <http://stackoverflow.com/questions/23937262/excel-vba-copy-paste-values-only-xlpastevalues>

```
Sheets("Sheet1").Columns("A").Copy
```

Pasted from <http://stackoverflow.com/questions/23937262/excel-vba-copy-paste-values-only-xlpastevalues>

R3C5 is an absolute reference! A relative one is r[-2]c[6]

Pasted from <http://stackoverflow.com/questions/21977365/how-to-i-make-an-absolute-reference-using-r1c1-format-in-vba-for-excel>

```
With Worksheets(1).Range("a1:a500")
    Set c = .Find(2, lookin:=xlValues)
    If Not c Is Nothing Then
```

```
        firstAddress = c.Address
        Do
            c.Value = 5
            Set c = .FindNext(c)
        Loop While Not c Is Nothing And c.Address <> firstAddress
    End If
End With
```

Pasted from <https://msdn.microsoft.com/en-us/library/office/ff839746.aspx>

```
Sheets("My Hidden Sheet").Visible = True
```

Pasted from <http://excel.tips.net/T002548_Running_Macros_on_Hidden_Worksheets.html>

- In the **Go To** dialog box, click **Special**.
- Under **Select**, click **Visible cells only**, and then click **O**

Pasted from <https://support.office.com/en-us/article/Copy-visible-cells-only-6e3a1f01-2884-4332-b262-8b814412847e>

```
Application.run "RefreshAllWorkbooks"
Application.run "RefreshAllStaticData"
```

Pasted from <http://stackoverflow.com/questions/12856979/how-to-refresh-load-rtd-bloomberg-function-bdh-in-excel-in-vba>

=DateValue(A1)
Result: 41153

Pasted from <https://www.techonthenet.com/excel/formulas/datevalue.php>

```
LDate = DateValue("May 15, 2012")
```

Pasted from <https://www.techonthenet.com/excel/formulas/datevalue.php>

```
Dim MyDate As Date
MyDate = #3/15/1997#
DateNumber = MyDate - #1/1/1900# + 2
MsgBox DateNumber 'Will show 35504
```

Pasted from <http://ccm.net/forum/affich-20178-date-to-number-format-using-macro>

```
    With rng.Borders
        .LineStyle = xlContinuous
        .Color = vbRed
        .Weight = xlThin
    End With
```

Pasted from <http://stackoverflow.com/questions/13121425/border-around-each-cell-in-a-range>

```
Selection.Borders.LineStyle = xlNone
```

Pasted from <http://www.mrexcel.com/forum/excel-questions/25599-clear-all-borders-using-visual-basic-applications.html>

MYSTRING=FORMAT(NOW(),"yyyymmdd")

Pasted from <http://www.mrexcel.com/forum/excel-questions/70772-convert-date-string.html>

```
Function AcceptOneCell(rng As Range)
If (rng.Cells.Count > 1) Then
   AcceptOneCell = "Only allow 1 cell"
   Exit Function
End If
' your code here
End Function
```

Pasted from <http://stackoverflow.com/questions/14479627/excel-vba-passing-a-single-cell-as-argument>

```
Sub MySortMacro()
Dim LastRow As Long
   LastRow = Cells(Rows.Count, 1).End(xlUp).Row
   Range("A2:H" & LastRow).Sort Key1:=Range("C3:C" & LastRow), _
     Order1:=xlAscending, Header:=xlNo
End Sub
```

Pasted from <http://www.microsofttraining.net/b/blog/vba-training/sort-excel-vba/>

have found a 2nd solution.

1. Press "Debug" button in the popup.
2. Press Ctrl+Pause|Break twice.
3. Hit the play button to continue.
4. Save the file after completion.

Hope this helps someone.

Pasted from <http://stackoverflow.com/questions/2154699/excel-vba-app-stops-spontaneously-with-message-code-execution-has-been-halted>

```
Set sourceRange = Worksheets("Sheet1").Range("A1:A2")
Set fillRange = Worksheets("Sheet1").Range("A1:A20")
sourceRange.AutoFill Destination:=fillRange
```

Pasted from <https://msdn.microsoft.com/en-us/library/office/ff195345.aspx>

```
Union(Columns(14), Columns(13), Columns(11), _
Columns(10), Columns(8), Columns(7), _
Columns(5), Columns(4)).Delete Shift:=xlToLeft
```

Pasted from <http://www.mrexcel.com/forum/excel-questions/114025-visual-basic-applications-select-multiple-columns-using-column-number.html>

```
Range("M3:M" & LastRow).Formula = "=G3&"",""&L3"
```

Pasted from <http://stackoverflow.com/questions/25788750/vba-to-fill-formula-down-till-last-row-in-column>

```
Range("M3") = "=G3&"",""&L3": Range("M3:M" & LastRow).FillDown
```

Pasted from <http://stackoverflow.com/questions/25788750/vba-to-fill-formula-down-till-last-row-in-column>

You can stop a macro by pressing the keys: ctrl + alt + break

Pasted from <http://stackoverflow.com/questions/3018286/how-to-abort-a-macro>

```
Application.EnableCancelKey = xlDisabled
```

Pasted from <http://www.maheshsubramaniya.com/article/fix-for-code-execution-has-been-interrupted-in-excel-vba-macros.html>

```
DateSerial( year, month, day )
```

Pasted from <https://www.techonthenet.com/excel/formulas/dateserial.php>

```
exampleDate = DateValue("Jun 19, 2010")
```

Pasted from <http://www.excel-easy.com/vba/date-time.html>

```
secondDate = DateAdd("d", 3, firstDate)
```

Pasted from <http://www.excel-easy.com/vba/date-time.html>

```
lNum = 38543
MsgBox CDate(lNum)
strText = "February 14, 1995"
MsgBox CDate(strText)
```

Pasted from <http://www.ozgrid.com/VBA/convert-to-date.htm>

```
=DATEDIF (start_date, end_date, unit)
```

Pasted from <https://exceljet.net/excel-functions/excel-datedif-function>

```
   For i As Integer = firstDate.Year To lastDate.Year
Dim current = New Date(i, toFind.Month, toFind.Day)
If firstDate < current AndAlso current < lastDate Then
          count += 1
      End If
Next
```

Pasted from <http://stackoverflow.com/questions/8834376/how-to-compare-only-day-part-and-month-part-in-vb-net>

```
DateDiff( interval, date1, date2, [firstdayofweek], [firstweekofyear] )
```

Pasted from <https://www.techonthenet.com/excel/formulas/datediff.php>

Spreadsheet problem

Friday, January 20, 2017
7:46 AM

You have to save it in one of the Excel 2007 formats:
Excel workbook (*.xlsx) if the workbook does not contain macros.
Excel macro-enabled workbook (*.xlsm) if the workbook contains macros.
Excel binary workbook (.xlsb) if the above formats are too slow.
Your worksheets will then have 1,048,576 rows by 16,384 columns.

Pasted from <https://answers.microsoft.com/en-us/msoffice/forum/msoffice_excel-mso_other/my-excel-sheet-only-gos-from-a-to-iv-columns-i/db197ba7-c575-e011-8dfc-68b599b31bf5>

Save file

Friday, January 20, 2017
12:36 PM

```
Sub save_as_automating()
   Path = ActiveWorkbook.Path

   ActiveWorkbook.SaveAs Filename:=Path & "\" & "File" & Hour(Timer) & Minute(Timer), FileFormat:
=xlWorkbookNormal
   Call test
End Sub

Sub test()
   Application.OnTime Now + TimeValue("00:00:05"), "save_as_automating"
End Sub
```

Thursday, March 16, 2017
12:09 PM

1. Clear, straightforward Platform
2. User Friendly input setting window(no need to worry about parameter)
3. Inception Date Validation(Consider the Calendar holiday)
4. Flexible Strategy update (user can change the strategy and parameter each year) -> easy to compare different strategy for certain market scenarios.
5. Auto updated graph(change with the different parameter, time horizon)
6. Show the credit for each contract year to measure the impact from parameter
7. Show the graph of non-reinvest Intrinsic Value to have overall view about the strategy

Example
3 strategies with different Parameter

Friday, April 21, 2017
6:22 PM

```
Sub CompanyChange()
    Dim ContactsFolder As Folder
    Set ContactsFolder = Session.GetDefaultFolder(olFolderInbox)
    Dim myOlSel As Outlook.Selection
    oMail = myOlSel.Item(x)




End Sub


Sub GetSelectedItems()
    Dim myOlExp As Outlook.Explorer
    Dim myOlSel As Outlook.Selection
    Dim mySender As Outlook.AddressEntry
    Dim oMail As Outlook.MailItem
    Dim oAppt As Outlook.AppointmentItem
    Dim oPA As Outlook.PropertyAccessor
    Dim strSenderID As String
    Const PR_SENT_REPRESENTING_ENTRYID As String = _
        "http://schemas.microsoft.com/mapi/proptag/0x00410102"
    Dim MsgTxt As String
    Dim x As Long
    Dim fso As Object
    Set fso = CreateObject("Scripting.FileSystemObject")
    MsgTxt = "Senders of selected items:"
    Set myOlExp = Application.ActiveExplorer
    Set myOlSel = myOlExp.Selection
    For x = 1 To myOlSel.Count
        If myOlSel.Item(x).Class = OlObjectClass.olMail Then
            ' For mail item, use the SenderName property.
            Set oMail = myOlSel.Item(x)
            MsgTxt = oMail.Body & ";"
            Dim Fileout As Object
            Set Fileout = fso.CreateTextFile("H:\Desktop\20170421\vba" + Str(x) +
".txt", True, True)
            Fileout.Write MsgTxt
            Fileout.Close
        ElseIf myOlSel.Item(x).Class = OlObjectClass.olAppointment Then
            ' For appointment item, use the Organizer property.
            'Set oAppt = myOlSel.Item(x)

        Else
            ' For other items, use the property accessor to get sender ID,
```

```
            ' then get the address entry to display the sender name.
            'Set oPA = myOlSel.Item(x).PropertyAccessor
            'strSenderID = oPA.GetProperty(PR_SENT_REPRESENTING_ENTRYID)
            'Set mySender = Application.Session.GetAddressEntryFromID(strSenderID)

        End If
    Next x

End Sub
```

```
Sub CompanyChange()
    Dim ContactsFolder As Folder
    Set ContactsFolder = Session.GetDefaultFolder(olFolderInbox)
    Dim myOlSel As Outlook.Selection
    oMail = myOlSel.Item(x)




End Sub
```

```
Sub GetSelectedItems()
    Dim myOlExp As Outlook.Explorer
    Dim myOlSel As Outlook.Selection
    Dim mySender As Outlook.AddressEntry
    Dim oMail As Outlook.MailItem
    Dim oAppt As Outlook.AppointmentItem
    Dim oPA As Outlook.PropertyAccessor
    Dim strSenderID As String
    Const PR_SENT_REPRESENTING_ENTRYID As String = _
        "http://schemas.microsoft.com/mapi/proptag/0x00410102"
    Dim MsgTxt As String
    Dim x As Long
    Dim fso As Object
    Set fso = CreateObject("Scripting.FileSystemObject")
    MsgTxt = "Senders of selected items:"
    Set myOlExp = Application.ActiveExplorer
    Set myOlSel = myOlExp.Selection
    For x = 1 To myOlSel.Count
        If myOlSel.Item(x).Class = OlObjectClass.olMail Then
            ' For mail item, use the SenderName property.
            Set oMail = myOlSel.Item(x)
            oMail.Display

            MsgTxt = oMail.Body & ";"
            Dim Fileout As Object
            Set Fileout = fso.CreateTextFile("H:\Desktop\20170421\vba" + Str(x) + ".txt", True, True)
            Fileout.Write MsgTxt
```

```
            Fileout.Close
        ElseIf myOlSel.Item(x).Class = OlObjectClass.olAppointment Then
            ' For appointment item, use the Organizer property.
            'Set oAppt = myOlSel.Item(x)

        Else
            ' For other items, use the property accessor to get sender ID,
            ' then get the address entry to display the sender name.
            'Set oPA = myOlSel.Item(x).PropertyAccessor
            'strSenderID = oPA.GetProperty(PR_SENT_REPRESENTING_ENTRYID)
            'Set mySender = Application.Session.GetAddressEntryFromID(strSenderID)

        End If
    Next x

End Sub
```

Monday, April 24, 2017
8:42 AM

Outlook Developer Reference

MailItem Object Members

Show All

Represents a mail message.

Methods

	Name	Description
	AddBusinessCard	Appends contact information based on the Electronic Business Card (EBC) associated with the specified **ContactItem** object to the **MailItem** object.
	ClearConversationIndex	Clears the index of the conversation thread for the mail message.
	ClearTaskFlag	Clears the **MailItem** object as a task.
	Close	Closes and optionally saves changes to the Outlook item.
	Copy	Creates another instance of an object.
	Delete	Deletes an object from the collection.
	Display	Displays a new **Inspector** object for the item.
	Forward	Executes the **Forward** action for an item and returns the resulting copy as a **MailItem** object.
	GetConversation	Obtains a **Conversation** object that represents the conversation to which this item belongs.
	MarkAsTask	Marks a **MailItem** object as a task and assigns a task interval for the object.
	Move	Moves a Microsoft Outlook item to a new folder.
	PrintOut	Prints the Outlook item using all default settings.The **PrintOut** method is the only Outlook method that can be used for printing.
	Reply	Creates a reply, pre-addressed to the original sender, from the original message.
	ReplyAll	Creates a reply to all original recipients from the original message.
	Save	Saves the Microsoft Outlook item to the current folder or, if this is a new item, to the Outlook default folder for the item type.
	SaveAs	Saves the Microsoft Outlook item to the specified path and in the format of the specified file type. If the file type is not specified, the MSG format (.msg) is used.
	Send	Sends the e-mail message.
	ShowCategoriesDialog	Displays the **Show Categories** dialog box, which allows you to select categories that correspond to the subject of the item.

Properties

	Name	Description
	Actions	Returns an **Actions** collection that represents all the available actions for the item. Read-only.
	AlternateRecipientAllowed	Returns True if the mail message can be forwarded. Read/write.
	Application	Returns an **Application** object that represents the parent Outlook application for the object. Read-only.
	Attachments	Returns an **Attachments** object that represents all the attachments for the specified item. Read-only.
	AutoForwarded	A **Boolean** value that returns **True** if the item was automatically forwarded. Read/write.

	AutoResolvedWinner	Returns a **Boolean** that determines if the item is a winner of an automatic conflict resolution. Read-only.
	BCC	Returns a **String** representing the display list of blind carbon copy (BCC) names for a **MailItem**. Read/write.
	BillingInformation	Returns or sets a **String** representing the billing information associated with the Outlook item. Read/write.
	Body	Returns or sets a **String** representing the clear-text body of the Outlook item. Read/write.
	BodyFormat	Returns or sets an **OlBodyFormat** constant indicating the format of the body text. Read/write.
	Categories	Returns or sets a **String** representing the categories assigned to the Outlook item. Read/write.
	CC	Returns a **String** representing the display list of carbon copy (CC) names for a **MailItem** . Read/write.
	Class	Returns an **OlObjectClass** constant indicating the object's class. Read-only.
	Companies	Returns or sets a **String** representing the names of the companies associated with the Outlook item. Read/write.
	Conflicts	Return the **Conflicts** object that represents the items that are in conflict for any Outlook item object. Read-only.
	ConversationID	Returns a **String** that uniquely identifies a **Conversation** object that the **MailItem** object belongs to. Read-only.
	ConversationIndex	Returns a **String** that indicates the relative position of the item within the conversation thread. Read-only.
	ConversationTopic	Returns a **String** representing the topic of the conversation thread of the Outlook item. Read-only.
	CreationTime	Returns a **Date** indicating the creation time for the Outlook item. Read-only.
	DeferredDeliveryTime	Returns or sets a **Date** indicating the date and time the mail message is to be delivered. Read/write.
	DeleteAfterSubmit	Returns or sets a **Boolean** value that is **True** if a copy of the mail message is not saved upon being sent, and **False** if a copy is saved. Read/write.
	DownloadState	Returns a constant that belongs to the **OlDownloadState** enumeration indicating the download state of the item. Read-only.
	EntryID	Returns a **String** representing the unique Entry ID of the object. Read-only.
	ExpiryTime	Returns or sets a **Date** indicating the date and time at which the item becomes invalid and can be deleted. Read/write.
	FlagRequest	Returns or sets a **String** that indicates the requested action for a mail item. Read/write.
	FormDescription	Returns the **FormDescription** object that represents the form description for the specified Outlook item. Read-only.
	GetInspector	Returns an **Inspector** object that represents an inspector initialized to contain the specified item. Read-only.
	HTMLBody	Returns or sets a **String** representing the HTML body of the specified item. Read/write.
	Importance	Returns or sets an **OlImportance** constant indicating the relative importance level for the Outlook item. Read/write.
	InternetCodepage	Returns or sets a **Long** that determines the Internet code page used by the item. Read/write.
	IsConflict	Returns a **Boolean** that determines if the item is in conflict. Read-only.
	IsMarkedAsTask	Returns a **Boolean** value that indicates whether the **MailItem** is marked as a task. Read-only.
	ItemProperties	Returns an **ItemProperties** collection that represents all standard and user-defined properties associated with the Outlook item. Read-only.
	LastModificationTime	Returns a **Date** specifying the date and time that the Outlook item was last modified. Read-only.
	Links	Returns a **Links** collection that represents the contacts to which the item is linked. Read-only.

	MarkForDownload	Returns or sets an **OlRemoteStatus** constant that determines the status of an item once it is received by a remote user. Read/write.
	MessageClass	Returns or sets a **String** representing the message class for the Outlook item. Read/write.
	Mileage	Returns or sets a **String** representing the mileage for an item. Read/write.
	NoAging	Returns or sets a **Boolean** value that is **True** to not age the Outlook item. Read/write.
	OriginatorDeliveryReportRequested	Returns or sets a **Boolean** value that determines whether the originator of the meeting item or mail message will receive a delivery report. Read/write.
	OutlookInternalVersion	Returns a **Long** representing the build number of the Outlook application for an Outlook item. Read-only.
	OutlookVersion	Returns a **String** indicating the major and minor version number of the Outlook application for an Outlook item. Read-only.
	Parent	Returns the parent **Object** of the specified object. Read-only.
	Permission	Sets or returns an **OlPermission** constant that determines what permissions to grant to the recipients of the e-mail item. Read/write.
	PermissionService	Sets or returns an **OlPermissionService** constant that determines the permission service that will be used when sending a message protected by Information Rights Management (IRM). Read/write.
	PermissionTemplateGuid	Returns or sets the GUID of the template file to apply to the **MailItem** in order to specify Information Rights Management (IRM) permissions. Read/write.
	PropertyAccessor	Returns a **PropertyAccessor** object that supports creating, getting, setting, and deleting properties of the parent **MailItem** object. Read-only.
	ReadReceiptRequested	Returns a **Boolean** value that indicates **True** if a read receipt has been requested by the sender.
	ReceivedByEntryID	Returns a **String** representing the **EntryID** for the true recipient as set by the transport provider delivering the mail message. Read-only.
	ReceivedByName	Returns a **String** representing the display name of the true recipient for the mail message. Read-only.
	ReceivedOnBehalfOfEntryID	Returns a **String** representing the **EntryID** of the user delegated to represent the recipient for the mail message. Read-only.
	ReceivedOnBehalfOfName	Returns a **String** representing the display name of the user delegated to represent the recipient for the mail message. Read-only.
	ReceivedTime	Returns a **Date** indicating the date and time at which the item was received. Read-only.
	RecipientReassignmentProhibited	Returns a Boolean that indicates **True** if the recipient cannot forward the mail message. Read/write.
	Recipients	Returns a **Recipients** collection that represents all the recipients for the Outlook item. Read-only.
	ReminderOverrideDefault	Returns or sets a **Boolean** value that is **True** if the reminder overrides the default reminder behavior for the item. Read/write.
	ReminderPlaySound	Returns or sets a **Boolean** value that is **True** if the reminder should play a sound when it occurs for this item. Read/write.
	ReminderSet	Returns or sets a **Boolean** value that is **True** if a reminder has been set for this item. Read/write.
	ReminderSoundFile	Returns or sets a **String** indicating the path and file name of the sound file to play when the reminder occurs for the Outlook item. Read/write.
	ReminderTime	Returns or sets a **Date** indicating the date and time at which the reminder should occur for the specified item. Read/write.
	RemoteStatus	Returns or sets an **OlRemoteStatus** constant specifying the remote status of the mail message. Read/write.
	ReplyRecipientNames	Returns a semicolon-delimited **String** list of reply recipients for the mail message. Read-only.
	ReplyRecipients	Returns a **Recipients** collection that represents all the reply recipient objects for the Outlook item. Read-only.
	RetentionExpirationDate	Returns a **Date** that specifies the date when the **MailItem** object expires, after which the Messaging Records Management (MRM) Assistant will delete the item. Read-only.
	RetentionPolicyName	Returns a **String** that specifies the name of the retention policy. Read-only.

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	RTFBody	Returns or sets a **Byte** array that represents the body of the Microsoft Outlook item in Rich Text Format. Read/write.
	Saved	Returns a **Boolean** value that is **True** if the Outlook item has not been modified since the last save. Read-only.
	SaveSentMessageFolder	Returns or sets a **Folder** object that represents the folder in which a copy of the e-mail message will be saved after being sent. Read/write.
	Sender	Returns or sets an **AddressEntry** object that corresponds to the user of the account from which the **MailItem** is sent. Read/write.
	SenderEmailAddress	Returns a **String** that represents the e-mail address of the sender of the Outlook item. Read-only.
	SenderEmailType	Returns a **String** that represents the type of entry for the e-mail address of the sender of the Outlook item, such as 'SMTP' for Internet address, 'EX' for a Microsoft Exchange server address, etc. Read-only.
	SenderName	Returns a **String** indicating the display name of the sender for the Outlook item. Read-only.
	SendUsingAccount	Returns or sets an **Account** object that represents the account under which the **MailItem** is to be sent. Read/write.
	Sensitivity	Returns or sets a constant in the **OlSensitivity** enumeration indicating the sensitivity for the Outlook item. Read/write.
	Sent	Returns a **Boolean** value that indicates if a message has been sent. Read-only.
	SentOn	Returns a **Date** indicating the date and time on which the Outlook item was sent. Read-only.
	SentOnBehalfOfName	Returns a **String** indicating the display name for the intended sender of the mail message. Read/write.
	Session	Returns the **NameSpace** object for the current session. Read-only.
	Size	Returns a **Long** indicating the size (in bytes) of the Outlook item. Read-only.
	Subject	Returns or sets a **String** indicating the subject for the Outlook item. Read/write.
	Submitted	Returns a **Boolean** value that is **True** if the item has been submitted. Read-only.
	TaskCompletedDate	Returns or sets a **Date** value that represents the completion date of the task for this **MailItem**. Read/write.
	TaskDueDate	Returns or sets a **Date** value that represents the due date of the task for this **MailItem**. Read/write.
	TaskStartDate	Returns or sets a **Date** value that represents the start date of the task for this **MailItem** object. Read/write.
	TaskSubject	Returns or sets a **String** value that represents the subject of the task for the **MailItem** object. Read/write.
	To	Returns or sets a semicolon-delimited **String** list of display names for the **To** recipients for the Outlook item. Read/write.
	ToDoTaskOrdinal	Returns or sets a **Date** value that represents the ordinal value of the task for the **MailItem**. Read/write.
	UnRead	Returns or sets a **Boolean** value that is **True** if the Outlook item has not been opened (read). Read/write.
	UserProperties	Returns the **UserProperties** collection that represents all the user properties for the Outlook item. Read-only.
	VotingOptions	Returns or sets a **String** specifying a delimited string containing the voting options for the mail message. Read/write.
	VotingResponse	Returns or sets a **String** specifying the voting response for the mail message. Read/write.

Events

	Name	Description
	AfterWrite	Occurs after Microsoft Outlook has saved the item.
	AttachmentAdd	Occurs when an attachment has been added to an instance of the parent object.
	AttachmentRead	Occurs when an attachment in an instance of the parent object has been opened for reading

		reading.
	AttachmentRemove	Occurs when an attachment has been removed from an instance of the parent object.
	BeforeAttachmentAdd	Occurs before an attachment is added to an instance of the parent object.
	BeforeAttachmentPreview	Occurs before an attachment associated with an instance of the parent object is previewed.
	BeforeAttachmentRead	Occurs before an attachment associated with an instance of the parent object is read from the file system, an attachment stream, or an **Attachment** object.
	BeforeAttachmentSave	Occurs just before an attachment is saved.
	BeforeAttachmentWriteToTempFile	Occurs before an attachment associated with an instance of the parent object is written to a temporary file.
	BeforeAutoSave	Occurs before the item is automatically saved by Outlook.
	BeforeCheckNames	Occurs just before Microsoft Outlook starts resolving names in the recipient collection for an item (which is an instance of the parent object).
	BeforeDelete	Occurs before an item (which is an instance of the parent object) is deleted.
	BeforeRead	Occurs before Microsoft Outlook begins to read the properties for the item.
	Close	Occurs when the inspector associated with an item (which is an instance of the parent object) is being closed.
	CustomAction	Occurs when a custom action of an item (which is an instance of the parent object) executes.
	CustomPropertyChange	Occurs when a custom property of an item (which is an instance of the parent object) is changed.
	Forward	Occurs when the user selects the **Forward** action for an item, or when the **Forward** method is called for the item, which is an instance of the parent object.
	Open	Occurs when an instance of the parent object is being opened in an **Inspector**.
	PropertyChange	Occurs when an explicit built-in property (for example, **Subject**) of an instance of the parent object is changed.
	Read	Occurs when an instance of the parent object is opened for editing by the user.
	Reply	Occurs when the user selects the **Reply** action for an item, or when the **Reply** method is called for the item, which is an instance of the parent object.
	ReplyAll	Occurs when the user selects the **ReplyAll** action for an item, or when the **ReplyAll** method is called for the item, which is an instance of the parent object.
	Send	Occurs when the user selects the **Send** action for an item, or when the **Send** method is called for the item, which is an instance of the parent object.
	Unload	Occurs before an Outlook item is unloaded from memory, either programmatically or by user action.
	Write	Occurs when an instance of the parent object is saved, either explicitly (for example, using the **Save** or **SaveAs** methods) or implicitly (for example, in response to a prompt when closing the item's inspector).

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8:43 AM

Outlook 2010 Developer Reference > Outlook Object Model Reference > Inspector Object

Outlook Developer Reference

Inspector Object Members

Show All

Represents the window in which an Outlook item is displayed.

Methods

	Name	Description
	Activate	Activates an inspector window by bringing it to the foreground and setting keyboard focus.
	Close	Closes the **Inspector** and optionally saves changes to the displayed Outlook item.
	Display	Displays a new **Inspector** object for the item.
	HideFormPage	Hides a form page in the inspector.
	IsWordMail	Determines whether the mail message associated with an inspector is displayed in an Outlook **Inspector** or in Microsoft Word.
	NewFormRegion	Opens a new page in design mode in the inspector for a new form region.
	OpenFormRegion	Opens a page in design mode in the inspector for the specified form region.
	SaveFormRegion	Saves the specified page in design mode in the inspector to the specified file.
	SetControlItemProperty	Binds an Outlook object model property to a control in an inspector.
	SetCurrentFormPage	Displays the specified form page in the inspector.
	SetSchedulingStartTime	Sets the start time for a meeting item in the free/busy grid on the **Scheduling Assistant** tab of the inspector.
	ShowFormPage	Shows a form page in the inspector.

Properties

	Name	Description
	Application	Returns an **Application** object that represents the parent Outlook application for the object. Read-only.
	AttachmentSelection	Returns an **AttachmentSelection** object consisting of one or more attachments that are selected in the inspector. Read-only.
	Caption	Returns a **String** representing the title. Read-only.
	Class	Returns an **OlObjectClass** constant indicating the object's class. Read-only.
	CurrentItem	Returns an **Object** representing the current item being displayed in the inspector. Read-only.
	EditorType	Returns an **OlEditorType** constant indicating the type of editor. Read-only.
	Height	Returns or sets a **Long** specifying the height (in pixels) of the inspector window. Read/write.
	Left	Returns or sets a **Long** specifying the position (in pixels) of the left vertical edge of an inspector window from the edge of the screen. Read/write.
	ModifiedFormPages	Returns the **Pages** collection that represents all the pages for the item in the inspector. Read-only.
	Parent	Returns the parent **Object** of the specified object. Read-only.
	Session	Returns the **NameSpace** object for the current session. Read-only.
	Top	Returns or sets a **Long** indicating the position (in pixels) of the top horizontal edge of an inspector window from the edge of the screen. Read/write.

		inspector window from the edge of the screen. Read/write.
	Width	Returns or sets a **Long** indicating the width (in pixels) of the specified object. Read/write.
	WindowState	Returns or sets the property with a constant in the **OlWindowState** enumeration specifying the window state of an explorer or inspector window. Read/write.
	WordEditor	Returns the Microsoft Word Document Object Model of the message being displayed. Read-only.

Events

	Name	Description
	Activate	Occurs when an inspector becomes the active window, either as a result of user action or through program code.
	AttachmentSelectionChange	Occurs when the user selects a different or additional attachment of an item in the active inspector programmatically or by interacting with the user interface.
	BeforeMaximize	Occurs when an inspector is maximized by the user.
	BeforeMinimize	Occurs when the active inspector is minimized by the user.
	BeforeMove	Occurs when the **Inspector** is moved by the user.
	BeforeSize	Occurs when the user sizes the current **Inspector**.
	Close	Occurs when the inspector associated with a Microsoft Outlook item is being closed.
	Deactivate	Occurs when an inspector stops being the active window, either as a result of user action or through program code.
	PageChange	Occurs when the active form page changes, either programmatically or by user action, on an Inspector object.

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3:55 PM

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['Reoffer 95%Thanks a lot Best ']
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['Maturity:2yAutocall Quarterly o']
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['Reoffer: 95%Delivery: Physica']
['Issue price: 100%Reoffer: 95%Deli']
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['Tenor: 15 monthsAutocall tri']
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['Reoffer: 95%Delivery: Physica']
['Issue price: 100%Reoffer: 95%Deli']
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['Maturity: 2 years Currency: CHF']
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['Maturity: 2 years Currency: CHF']
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['Tenor: 15 months Low Strike ']
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['Issue price: 91.75% Please solve ']
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['Tenor: 12 months Low Strike:']
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['ReofferShould you have any qu']
['Issue price: 100%Delivery: Physic']
['Maturity: 15 monthsStrike type:']
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['Tenor: 6 yearsCurrency: USD1']
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['Maturity: 6 yearsCurrency: GBPS']
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['Maturity: 2 Years===== FEEDBACK']
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['Maturity: 18 months Currency: U']
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['Reoffer = 98.60%Best,RobRober']
['Issue price: 100%Delivery: CashPl']
['Maturity: 2 YearsStrike type: C']
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['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: C']
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['Maturity: 3 yearsStrike type: C']
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['ReofferCustodian Bank: UBS Ge']
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['Reoffer: 97%Best,RobRobert Ro', 'Reoffer===== COMMENTS ======C']
['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: O']
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['Issue price: 100%Delivery: CashPl']
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['Tenor: 6 monthsEuropean Barr']
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['Reoffer: 96%Many thanksBest r']
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['Tenor: 6 monthsEuropean Barr']
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['Tenor: 6 monthsEuropean Barr']
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['Reoffer 95%Guaranteed coupon ']
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['Reoffer 95%Thanks,CaméliaThis']
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['Maturity = 12 months Currency =']
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['Maturity Date: March 12, 2018Be', 'Maturity Date: March 12, 2018Be']
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['Reoffer: 98.40%Best,RobRobert']
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['Reoffer: 96%Best,RobRobert Ro', 'Reoffer = X%Issue Price = 100', 'Reoffer X%Should you have any']
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['Reoffer = X%Issue Price = 100', 'Reoffer X%Should you have any']
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['Maturity = 12 months Currency =']
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['Reoffer 95%Please solve for a']
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['Maturity: 1 year Currency: USDL']
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['Reoffer 95%Please solve for a']
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['Maturity: 1 year Currency: USDL']
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['Reoffer: 98.40%Best,RobRobert']
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['Maturity = 1 year Currency = US']
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['Maturity = 1 year Currency = US']
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32
['Reoffer 95%Thanks,CaméliaThis']
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['Maturity: 1 yearLow Strike: 75%']
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['Reoffer: 97.75%Please see sch']
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['Maturity = 12 months Currency =']
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['Reoffer: 96.30%Please see bel']
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['Maturity = 18 months Currency =']
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['Reoffer: 96.30%Please see bel']
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['Maturity = 18 months Currency =']
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['Reoffer: 97.75%Please see sch']
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['Maturity = 18 months Currency =']
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45
['Reoffer: 95.85%Best,RobRobert']
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['Maturity: 18 months Currency: U', 'Maturity date: 31/08/2018Should']
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['Reoffer: 95.85%Best,RobRobert']
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['Maturity: 18 months Currency: U', 'Maturity date: 31/08/2018Should']
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['Maturity: 18 months Currency: U', 'Maturity date: 31/08/2018Should']
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['Reoffer: 95%Please solve for ']
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['Maturity: 12 monthsCurrency: US']
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['Reoffer: 95.90%Best,RobRobert']
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['Maturity: 18 monthsEuropean Bar']
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['Reoffer: 96.50%Custodian bank']
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['Maturity: 18 months Currency: U']
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['Reoffer: 95.90%Best,RobRobert']
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['Maturity: 18 monthsEuropean Bar']
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['Maturity: 18 months Currency: U']
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send4
['Reoffer: 95%Delivery: Physica']
['Issue price: 100%Reoffer: 95%Deli']
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['Tenor: 15 monthsAutocall tri']
send5
['Reoffer: 95%Delivery: Physica']
['Issue price: 100%Reoffer: 95%Deli']
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['Tenor: 15 monthsAutocall tri']
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['Issue price: 91.75% Please solve ']
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['Tenor: 12 months Low Strike:']
send9
['Reoffer = 98.55%Best,RobRober', 'Reoffer = 98.60%Best,RobRober']
['Issue price: 100%Delivery: CashPl']
['Maturity: 2 YearsStrike type: C']
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['Reoffer = 98.60%Best,RobRober']
['Issue price: 100%Delivery: CashPl']
['Maturity: 2 YearsStrike type: C']
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['Maturity: 18 months Currency: U']
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['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: C']
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['Maturity = 1year Currency =USDA']
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['Maturity = 1year Currency =USDA']
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['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: C']
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['Reoffer===== COMMENTS ======C']
['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: C']
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send19
['Reoffer: 97%Best,RobRobert Ro', 'Reoffer===== COMMENTS ======C']
['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: O']
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send22
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send30
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send32
['Reoffer 95%Thanks,CaméliaThis']
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send33
['Reoffer: 97.75%Please see sch']
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send34
['Reoffer: 96.30%Please see bel']
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['Maturity = 18 months Currency =']
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send35
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send36
['Reoffer: 97.75%Please see sch']
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send49
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send50
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send51
['Reoffer: 96.50%Custodian bank']
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send52
['Reoffer: 95.90%Best,RobRobert']
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['Maturity: 18 monthsEuropean Bar']
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receive3
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receive8
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receive9
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receive16

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receive17
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receive22
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['Issue price: 100%Delivery: CashPl']
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['Maturity: 2 YearsStrike type: C']
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receive34
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receive35
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receive36
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['Maturity: 2 YearsStrike type: O']
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receive37
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['Issue price: 100%Delivery: CashPl']
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receive38
['Reoffer===== COMMENTS ======C']
['Issue price: 100%Delivery: Physic']
['Maturity: 2 YearsStrike type: O']

[]
receive39
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['Issue price: 100%Delivery: CashPl']
['Maturity: 2 YearsStrike type: C']
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receive40
[]
['Issue price: 100%Delivery: CashPl']
['Maturity: 2 YearsStrike type: C']
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receive41
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['Tenor: 6 monthsEuropean Barr']
receive42
['Reoffer: 96%Many thanksBest r']
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['Tenor: 6 monthsEuropean Barr']
receive43
['Reoffer: 96%Many thanksBest r']
[]
[]
['Tenor: 6 monthsEuropean Barr']
receive51
['Reoffer = X%Issue Price = 100', 'Reoffer X%Should you have any']
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['Maturity = 12 months Currency =']
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receive53
['Reoffer 95%Please solve for a']
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['Maturity: 1 year Currency: USDL']
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receive56
['Reoffer 95%Thanks,CaméliaThis']
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['Maturity: 1 yearLow Strike: 75%']
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receive65
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['Maturity Date: March 12, 2018Be']
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receive70
['Reoffer Price: 95.20% (Commis']

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receive71
['Reoffer: 95.40%Best,RobRobert']
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receive81
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receive84
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['Maturity: 18 months Quanto USDL']
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receive90
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receive97
['Reoffer 90%Issue Price: 100%C']
[]
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[]

3.23 Structuring

Wednesday, November 02, 2016
11:54 AM

- **Issuer:** Natixis Structured Issuance SA
- **Wrapper:** Natixis EMTN
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3Y
- **Currency:** USD
- **CDS:** Brazil – Investor is subject to Brazil sovereign credit risk (note is principal protected if there is no credit event on Brazil)
- **Underlying:** Worst-of Itau Unibanco (ITUB UN), Petrobras (PBR UN), Vale SA (VALE UN)
- **Annual Coupon:** Every year, if the worst-of is above 90% of its initial value, the client receives a coupon of 7.50%
- **Redemption at maturity:** 100% if no credit event occurred on Brazil Republic (as an issuer), Recovery otherwise
- **Reoffer:** 99.00%

Payoff Characteristics

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Maturity:** 2 Years
- **Currency:** EUR
- **Underlying:** LFIS Vision UCITS - Premia (LU1162198839 / LFVRPIS LX)
- **Investment objective:** Double the initial exposure to the Fund and provide enhanced return to Note holders
- **Initial LTV Ratio:** 50%
- **LTV Trigger:** 60% (over this level the Issuer early redeems the Note)
- **Liquidity:** Daily
- **Capital Protection:** None. Capital is at risk throughout the life of the product
- **Cost of leverage:** 1.30% p.a. over 3m EURIBOR

Payoff Characteristics

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 2Y
- **Currency:** USD
- **Underlying:** Worst-of GM UN, EXPE UW, WYNN UQ
- **Observation:** Quarterly
- **Quarterly Coupon:** 1.75% (7.00% p.a.), with memory, therefore the sum of all previously missed coupons are paid if the worst-of is greater than the coupon barrier on any quarterly observation date
- **Autocall Barrier:** 100%
- **Coupon Barrier:** 65%
- **European Knock-In Barrier**: 60%
- **European Star Effect Barrier:** 100% (if at least one of the stocks is above the initial level at maturity, the product is 100% capital guaranteed)
- **Capital Protection:** Capital is at risk at maturity
- **Reoffer:** 96.00%
- **Final Redemption Amount per $1,000 of Notes at Maturity:**
    - ➢ If the Final Level of the worst-performing stock is greater than the Knock-in Level (60% of its initial level): **$1,000**
    - ➢ If the Final level of the worst-performing stock is less than the Knock-in Level (60% of its initial

level), **but** at least one of the stocks is above the European Star Effect Barrier (100% of initial level at maturity): **$1,000**

➢ If the Final Level of the worst-performing stock is less than the Knock-in Level (60% of its initial level) **and** none of the stocks are above the European Star Effect Barrier (100% of initial level): **$1,000 + ($1,000 * Performance of worst-performing stock)**

- **Wrapper:** OTC
- **Maturity:** 1 year
- **Currency:** USD
- **Underlying:** S&P 500 Low Volatility Target Beta Index (SPXLTBUP), S&P 500 Index (SPX)
- **Payout:**
    - **Define Y_SPXLTBUP(1Y)** = Final Level of SPXLTBUP / Initial Level of SPXLTBUP
    - **Define Y_SPX(1Y)** = Final Level of SPX / Initial Level of SPX
    - If (SPX_1Y / SPX_initial) ≥ 100% → client receives: **Max [0 ; {Y_SPXLTBUP(1Y) - Y_SPX(1Y)} / Y_SPXLTBUP(1Y)]**
    - Otherwise, client receives nothing

➔ **Offer:** Premium = 1.45%

As a comparison, a standard outperformance call SPXLTBUP > SPX would cost ~3.45%

- **Wrapper:** EMTN
- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
  Maturity: 3y
- **Currency:** USD
- **Underlying:** iShares US Real Estate ETF (IYR UP)
- **Observation:** Annual
- **Coupon:** 20% p.a.
- **Put Strike:** 100%
- **Upside Gearing**: 200%
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer**: 98.00%
- **On each Annual Observation Day:**
    - The issuer has the right to exercise the call option on the product. If the issuer exercises the call option, the investor will receive: **a coupon of 20% for each year elapsed**.
- **Redemption at Maturity:**
    - If the underlying closes above its initial level, the investor will receive: **100% of their initial capital + 200% of the performance of the underlying.**

Otherwise, capital will be reduced by 1% for every 1% fall in the basket performance. **Capital loss may be partial or total.**

- **Format:** EMTN Natixis SA
- **Maturity:** 3 years
- **Currency:** USD
- **Underlying:** Equally weighted basket of :
    - CPR Focus Inflation (CPRFOIP FP)
    - AXA Global Inflation Short Duration Bonds (AGSDAHE LX)
    - Amundi Funds - Bond Euro Inflation (EUINFAC LX)

- **Volatility Cap:** 5.00%
- **Observation:** At maturity
- **Reoffer:** 96%
- **Payoff at Maturity:** 90% + Max [0, Final/Initial – 90%]

Indicative Pricing as of 02/06/2017

1) Hybrids: wrong title + same kind of cosmetic adjustments

PRODUCT CHARACTERISTICS: **~~90% CAPITAL PROTECTION AT MATURITY BASKET~~**

- **Format:** EMTN Natixis SA
- **Maturity:** 3 years
- **Currency:** USD
- **Underlying:**
  - United States Oil Fund LP (USO UP)
  - US CPI Urban Consumers NSA (US CPI)

- **European Knock-in:** 80.00% on USO
- **Coupon Frequency:** Annually
- **Conditional Coupon:** 175% of the performance of a yearly at-the-money call on CPURNSA floored at 2.50% per annum
- **Reoffer:** 96%

Indicative Pricing as of 02/06/2017

(1) INCOME PRODUCT – PHOENIX MEMORY WORST-OF

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** Quanto USD
- **Underlying:** Worst-of 9531 JT, CCI UN, EIX UN, DG FP
- **Autocall Barrier:** 100%
- **Coupon Barrier:** 70%
- **European Knock-in Barrier:** 60%
- **Observations:** Quarterly
- **Quarterly Coupon:** 2.35% (9.40% p.a.), with memory, therefore the sum of all previously missed coupons are paid if the worst-of is greater than the coupon barrier on any quarterly observation date
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97.50%
- **Final Redemption Amount per $1,000 of Notes at Maturity:**
  - If the Final Level of the worst-performing stock is greater than the Knock-in Level (60% of its initial level): **$1000**
  - If the Final Level of the worst-performing stock is less than the Knock-in Level (60% of its initial level): **$1,000 + ($1,000 * Performance of worst-performing stock)**

Indicative Pricing as of 1/30/2017

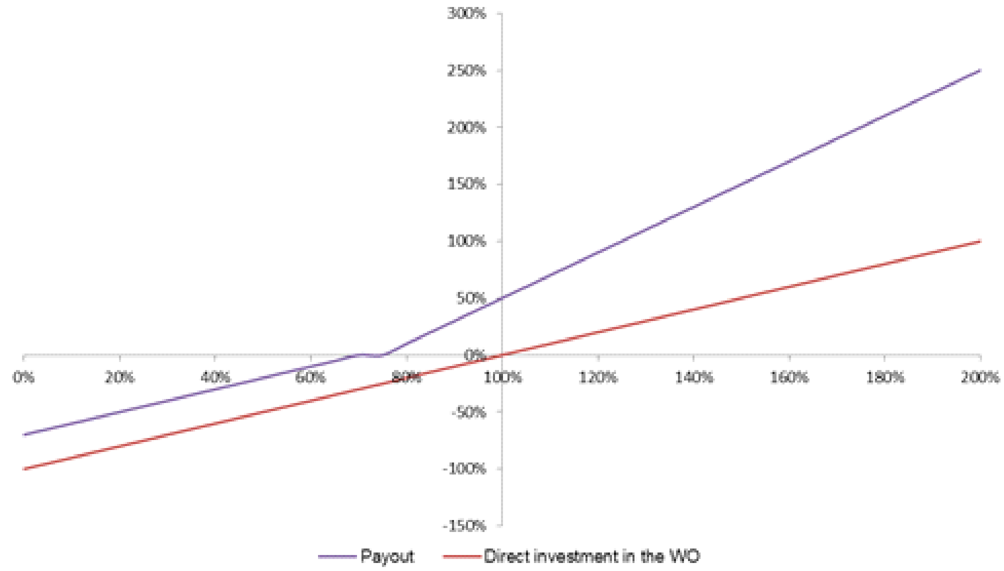
(2) GROWTH PRODUCT – SWITCHABLE ISSUER CALLABLE BUFFER NOTE WORST-OF

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** Quanto USD
- **Underlying:** Worst-of 9531 JT, CCI UN, EIX UN, DG FP
- **Buffer:** 30%

- **Call Strike:** 75%
- **Participation:** 200%
- **Observations:** Annual
- **Capital Protection:** Capital is at risk at maturity
- **Each year, the issuer has the right to call the note at 100% + 10% * N**
- **Re-offer:** 98.00%
- **Final Redemption Amount per $1,000 of Notes at Maturity if the product has not been called:**
    - If the Final Level of the worst-performing stock is greater than the Call Strike (75% of its initial level): **$1,000 + $1,000 * (2 * ([Final Level of Worst-of / Initial Level of Worst-of] – 75%))**
    - If the Final Level of the worst-performing stock is greater than the Buffer (70% of its initial level), but less than the Call Strike (75% of its initial level): **$1,000**
    - If the Final Level of the worst-performing stock is less than the Buffer Level (70% of its initial level): **$1,000 + [$1,000 * (Performance of worst performing stock + Buffer)]**

Indicative Pricing as of 1/30/2017

Hypothetical Payoff Graph – Switchable Issuer Callable Buffer Note Worst-of*



Graph pertains only if the product has not been called prior to Maturity. This graph presents the hypothetical return at maturity.

Source: Natixis Financial Engineering

INCOME PRODUCT CHARACTERISTICS (1) – PHOENIX AUTOCALL WORST-OF

Indicative Pricing as of 1/9/2017

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** USD
- **Underlying:** Worst-of Apple, Inc. (AAPL UQ), Microsoft, Corp. (MSFT UQ), Cisco Systems, Inc. (CSCO UQ)
- **Coupon Barrier:** 70%
- **European Knock-in Barrier:** 60%
- **Observations:** Quarterly
- **Contingent Quarterly Coupon:** 2.83% (11.32% p.a.)
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97.00%
- **Final Redemption Amount per $1,000 of Notes at Maturity:**
    - If the Final Level of the worst-performing stock is greater than the Knock-in Level (60% of its initial level), the investor receives par: **$1,000**

- If the Final Level of the worst-performing stock is less than the Knock-in Level (60% of its initial level): **$1,000 + ($1,000 * Performance of worst-performing stock)**

PARTICIPATION PRODUCT CHARACTERISTICS (2) – TURBO

Indicative Pricing as of 1/9/2017

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 3y
- **Currency:** USD
- **Underlying:** Equally-weighted Basket of Apple, Inc. (AAPL UQ), Microsoft, Corp. (MSFT UQ), Cisco Systems, Inc. (CSCO UQ)
- **Upside Leverage:** 200%
- **Call Spread:** 100% - 115%, therefore Maximum Return: 30%
- **Short Put Strike:** 90%
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 97.00%
- **Final Redemption Amount per $1,000 of Notes at Maturity:**
  - If the Final Level of the equal-weight basket is above the short call strike (115%), the investor receives a max of 30% return: $1,000 + ($1,000 * (200% * [115%-100%])) = **$1,300**
  - If the Final Level of the equal-weight basket is between 100% and 115%, for example 8% return from inception to maturity, the investor receives: $1,000 + ($1,000 * (200% * [108%-100%])) = **$1,160**
  - If the Final Level of the equal-weight basket is between 100% of the initial level and the 90% Short Put Strike, the investor receives the par amount: **$1,000**
  - If the Final Level of the equal-weight basket is below the 90% Short Put Strike, the investor is exposed to the downside of the equal-weight basket performance below 90% of its initial level, therefore if the final performance of equal-weight basket is -30%, investor receives: $1,000 + ($1,000 * (70% - 90%]) = **$800**

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Currency:** USD
- **Maturity:** 1y
- **Underlying:** EURO STOXX 50® Index (Bloomberg ticker: SX5E) & USD CMS10Y (Bloomberg ticker: USISDA10)
- **Observations:** at maturity
- **Coupon:** 7% at maturity
- **Leveraged Put:** 65% of initial level
- **Capital Protection:** Capital is at risk at maturity

Redemption at maturity (coupon payable at maturity regardless of underlying performance):

1. If the lowest performing underlying closes at or above 65% of its initial level, the investor will receive 100% of their initial capital.
2. If the lowest performing underlying is strictly less than 65% of its initial level, the investor will receive: lowest performing final/(65% x lowest performing initial). Capital loss may be partial or total.

Payoff Characteristics

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Maturity:** 1y
- **Currency:** USD (Quanto)
- **Underlying:** Basket of 4 international stocks (see below Selection of Underlying)
- **Observation:** Quarterly
- **Quarterly Conditional Coupon:** 2.50% (10% per annum)
- **Autocall Barrier:** 90% of initial level
- **Coupon Barrier:** 65% of initial level

- **Protection Barrier:** 60% of initial level
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer**: 98.50%

Payoff Descriptions

Early redemption mechanism

- If the price of each underlying is **equal to or greater than the Autocall Barrier** on any quarterly observation date, the product is redeemed early and the investor will receive 100% of their initial capital.
- Otherwise, the product continues to its next quarterly observation date.

Conditional quarterly coupon of 2.50% (10% p.a.) with memory effect mechanism

- If the price of each underlying is **equal to or greater than the Coupon Barrier** on any quarterly observation date, a coupon of 2.50% together with all previously unpaid coupons will be paid.
- Otherwise, no coupon will be paid and the product continues to its next quarterly observation date.

Redemption at maturity

- If the price of each underlying is **equal to or greater than the Coupon Barrier**, the investor will receive 100% of their initial capital plus a coupon of 2.50% (together with all previously unpaid coupons).
- If the price of each underlying is **below the Coupon Barrier but equal to or greater than the Protection Barrier**, the investor will receive 100% of their initial capital.
- Otherwise, the investor's capital will be reduced by 1% for every 1% fall in the price of the worst-performing underlying **(capital loss may be partial or total)**. For example, if the price of the worst-performing underlying is down by 55%, the investor will receive 45% of the nominal at maturity and bear a significant loss.

PRODUCT CHARACTERISTICS – WORST-OF BUFFERED NOTE

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Currency:** USD
- **Maturity:** 3y
- **Underlying:** Materials Select Sector SPDR (NYSEARCA: XLB) & Energy Select Sector SPDR (NYSEARCA: XLE)
- **Participation:** 125%
- **Call Strike:** 100% of initial level
- **Short Put Strike:** 85% of initial level
- **Capital Protection:** Capital is at risk at maturity
- **Reoffer:** 97%

PRODUCT CHARACTERISTICS – PHOENIX WORST-OF

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Currency:** USD
- **Maturity:** 3y
- **Underlying:** Materials Select Sector SPDR (NYSEARCA: XLB) & Energy Select Sector SPDR (NYSEARCA: XLE)
- **Observations:** Quarterly
- **Coupon:** 7.52% per annum (1.88% quarterly)
- **Autocall Barrier:** 100% of initial level
- **Coupon Barrier (European KI):** 75% of initial level
- **Capital Protection:** Capital is at risk at maturity

- **Reoffer:** 97%

The client, based on some research he follows, believes that the S&P will be down about 19% in 2017. He is looking for a bearish 12-15 month note that will get him short the S&P. I was thinking of something where he writes the ATM or slightly OTM call and buys the ATM/80% put spread, levered if possible. If it makes sense to get more granular (and I am not sure it does), the following is a list of specific sectors his research advocates underweighting. Can we look at a reoffer of 97?

Underweight
Equities
Japan, Eurozone, EM, China
Energy, Materials
Industrials, Tech
Financials
U.S. Multinationals
Cyclical Factors: (Equity Valuation, Leverage, High Tgt Dispersion)

Indications :

Maturity : 15 months
Underlying : SPX
Reoffer : 97%

1. **Bearish Turbo**
   - ⇨ Client is long 100% * Put Spread 95/75, short 100% Call Spread 100/200
   - ⇨ Max return 20%
   - ⇨ Mtb ~ 1.45%, cost of bumps ~ 40bps

1. **IssuerCallable Bearish Turbo**
   - ⇨ After 7 months, the issuer has the right to call the note at 107.50%
   - ⇨ At maturity, if the product has not been called : Client is long 150% * Put Spread 95/81.67, short 100% Call Spread 100/200
   - ⇨ Max return 20%
   - ⇨ Mtb ~ 1.45%, cost of bumps ~ 40bps

Rob,

These advisors are moderately bullish non-US equities (including Emerging Markets) and bearish on bonds. There are a bunch of ways to slice this, but one thing I was thinking was something like a 4 yr note where the client sells the worst of downside on the 10yr CMS and EEM beyond some buffer and receives a fixed coupon. I would like to start with a 6% p.a. coupon and solve for the hard buffer (no leverage). The reoffer would be 95.50%

Reverse convertible WO CMS/EEM
Reoffer : 95.50%
Guaranteed coupon : 6% p.a
At maturity, client is short the put strike XX on the worst of CMS 10y / EEM UP

1. Maturity 2y

⇨ Put Strike XX = 88.50%
⇨ 1.5% MU

1. Maturity 4y

⇨ Put Strike XX = 96%
⇨ 2% MU

- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2; S&P: A; Fitch Ratings: A)
- **Maturity:** 1y
- **Currency:** USD
- **Underlying:** worst of FB UW, MSFT UQ, QCOM UQ, NVDA UQ
- **Observation:** monthly
- **Monthly Conditional Coupon:** 1.11% (13.32% p.a) (with memory)
- **Autocall Barrier:** 100% of initial level for the first 3 months / 95% the next 3 months / 90% the next 3 months / 85% thereafter
- **Coupon Barrier:** 60% of initial level
- **Protection Barrier:** 60% of initial level
- **Capital Protection:** Capital is at risk at maturity
- **Re-offer:** 98.50%

Payoff Characteristics

- **Format:** EMTN
- **Issuer:** Natixis Structured Issuance SA
- **Guarantor:** Natixis SA (Moody's: A2 ; S&P: A ; Fitch Ratings: A)
- **Currency:** USD
- **Maturity:** 3Y
- **Underlying:** Intel Corp. (NASDAQ: INTC UQ), Qualcomm Inc. (NASDAQ: QCOM UQ), NXP Semiconductors NV (NASDAQ: NXPI UQ)
- **Observations:** Semi-annual
- **Coupon:** 5.25% (10.5% p.a.)
- **Autocall Barrier:** 95% of initial level
- **Coupon Barrier:** 65% of initial level
- **Protection Barrier:** 65% of initial level
- **Capital Protection:** Capital is at risk at maturity
- **Reoffer:** 97%

Payoff Description

Early redemption mechanism

- If the price of each underlying is **equal to or greater than the Autocall Barrier** on any quarterly observation date, the product is redeemed early and the investor will receive 100% of their initial capital.
- Otherwise, the product continues to its next quarterly observation date.

Conditional coupon of 5.25% (10.5% p.a.)

- If the price of each underlying is **equal to or greater than the Coupon Barrier** on any quarterly observation date, a coupon of 5.25% will be paid.

- Otherwise, no coupon will be paid and the product continues to its next quarterly observation date.

Redemption at maturity

- If the price of each underlying is **equal to or greater than the Coupon Barrier**, the investor will receive 100% of their initial capital plus a coupon of 5.25%.
- Otherwise, the investor's capital will be reduced by 1% for every 1% fall in the price of the worst-performing underlying **(capital loss may be partial or total)**. For example, if the price of the worst-performing underlying is down by 55%, the investor will receive 45% of the nominal at maturity and bear a significant loss.

12.22 Reading Note

Thursday, December 22, 2016
9:17 AM

Off balance sheet items are expressed as a credit equivalent amount.
Non Derivative has as conversion factor
OTC contract's rwa = max(V,0)+aL
Remember everything we are talking about here is the asset subjected to the default.
RWA = w L + w C
L is on balance sheet, C is off the balance sheet.
Tier 1 : equity, non cumulative perpetual prefered stock.
Netting : means that, if a company defaults on one transaction that is covered by the master agreement, it must default on all transactions covered by the master agreement.
NRR. This is the ratio of the current exposure with netting to the current exposure without netting

TABLE 12.3 Portfolio of Derivatives with a Particular Counterparty

Transaction	Principal, L_i	Current Value, V_i	Table 12.2 Add-On Amount, $a_i L_i$
3-year interest rate swap	1,000	−60	5
6-year foreign exchange forward	1,000	70	75
9-month option on a stock	500	55	30

The credit equivalent amount was modified to

$$\max\left(\sum_{i=1}^{N} V_i, 0\right) + (0.4 + 0.6 \times \text{NRR}) \sum_{i=1}^{N} a_i L_i$$

EXAMPLE 12.4

Consider the example in Table 12.3, which shows a portfolio of three derivatives that a bank has with a particular counterparty. The third column shows the current mark-to-market values of the transactions and the fourth column shows the add-on amount calculated from Table 12.2. The current exposure with netting is $-60 + 70 + 55 = 65$. The current exposure without netting is $0 + 70 + 55 = 125$. The net replacement ratio is given by

$$\text{NRR} = \frac{65}{125} = 0.52$$

The total of the add-on amounts, $\sum a_i L_i$, is $5 + 75 + 30 = 110$. The credit equivalent amount when netting agreements are in place is $65 + (0.4 + 0.6 \times 0.52) \times 110 = 143.32$. Without netting, agreements of the credit equivalent amount are $125 + 110 = 235$. Suppose that the counterparty is an OECD bank so that the risk weight is 0.2. This means that the risk-weighted assets with netting is $0.2 \times 143.32 = 28.66$. Without netting, it is $0.2 \times 235 = 47$.

Marking to market is the practice of revaluing assets and liabilities daily. It is also known as fair value accounting. Banks are required to use fair value accounting for all assets and liabilities that are held for trading purposes. This includes most derivatives, marketable equity securities, foreign currencies, and commodities. These items constitute what is referred to as the bank’s trading book. Banks are not required to use fair value accounting for assets that are expected to be held for the whole of their life for investment purposes. These assets, which include loans and some debt securities, constitute what is referred to as the banking book

Standardized approach : No account was taken of correlations between different types of instrument.
internal model-based approach: VaR -> diversify benefits
Max(VaR,mc*Var_avg)+SRC
market risk is captured by VaR, credit risk is capture by SRC

Basel I
require the same amount of capital. A loan to a corporation with a AAA credit rating is treated in the same way
as one to a corporation with a B credit rating.7 Also, in Basel I there was no model of default correlation.

1. Minimum Capital Requirements
2. Supervisory Review
3. Market Discipline
calculated in a new way that reflects the credit ratings of counterparties.
1. The Standardized Approach
2. The Foundation Internal Ratings Based (IRB) Approach
3. The Advanced IRB Approach

The capital required is therefore the value at risk minus the expected loss
WCDRi denotes the "worst case probability of default"

TABLE 12.5 Dependence of one-year 99.9% WCDR on PD and ρ

	PD = 0.1%	PD = 0.5%	PD = 1%	PD = 1.5%	PD = 2.0%
$\rho = 0.0$	0.1%	0.5%	1.0%	1.5%	2.0%
$\rho = 0.2$	2.8%	9.1%	14.6%	18.9%	22.6%
$\rho = 0.4$	7.1%	21.1%	31.6%	39.0%	44.9%
$\rho = 0.6$	13.5%	38.7%	54.2%	63.8%	70.5%
$\rho = 0.8$	23.3%	66.3%	83.6%	90.8%	94.4%

As PD increases, # decreases. The reason usually given for this inverse relationship is as follows. As a company becomes less creditworthy, its PD increases and its probability of default becomes more idiosyncratic and less affected by overall market conditions.

Mis the maturity of the exposure. The maturity adjustment is designed to allow for the fact that, if an instrument lasts longer than one year, there is a one-year credit exposure arising from a possible decline in the creditworthiness of the counterparty as well as from a possible default by the counterparty.

Under the advanced IRB approach, banks supply their own estimates of the PD, LGD, EAD, and M for corporate, sovereign, and bank exposures. The PD can be reduced by credit mitigants such as credit triggers. (As in the case of the Foundation IRB approach, it is subject to a floor of 0.03% for bank and corporate exposures.) The two main factors influencing the LGD are the seniority of the debt and the collateral. In calculating EAD, banks can with regulatory approval use their own estimates of credit conversion factors.

1. The Basic Indicator Approach

2. The Standardized Approach
3. The Advanced Measurement Approach
The Standardized Approach is similar to the basic indicator approach except that a different factor is applied to the gross income from different business lines. In the Advanced Measurement Approach, the bank uses its own internal models to calculate the operational risk loss that it is 99.9% certain will not be exceeded in one year. One advantage of the advanced measurement approach is that it allows banks to recognize the risk mitigating impact of insurance contracts subject to certain conditions

Liquidity risks arise because there is a tendency for banks to finance long-term needs with short-term funding such as commercial paper.
1. Liquidity Coverage Ratio (LCR); and
2. Net Stable Funding Ratio (NSFR)

LCR= High Quality Liquid Assets/Net Cash Outflows in a 30-Day Period
NSFR= Amount of Stable Funding/ Required Amount of Stable Funding

- Dependence on short-term wholesale funding or lack of liquidity.
- Growth versus risk culture (strategic errors).
- Low capital reserves.
- Investment banking activities (volatility in earnings).
- Management & governance.
- Remuneration (the total compensation that an employee receives in exchange for the service they perform for their employer)

Pasted from <http://www.math.vu.nl/~sbhulai/papers/thesis-puts.pdf>
Winsorizing or winsorization is the transformation of statistics by limiting extreme values in the statistical data to reduce the effect of possibly spurious outliers. It is named after the engineer-turned-biostatistician Charles P. Winsor (1895–1951). The effect is the same as clipping in signal processing.

The distribution of many statistics can be heavily influenced by outliers. A typical strategy is to set all outliers to a specified percentile of the data; for example, a 90% winsorization would see all data below the 5th percentile set to the 5th percentile, and data above the 95th percentile set to the 95th percentile. Winsorized estimators are usually more robust to outliers than their more standard forms,

3.2 Reading Note

Thursday, March 02, 2017
7:27 AM

this is an email i wrote to my sister when she asked me about it a month ago (i rotated on a structuring desk this past summer):
two kinds of structuring: equity/FX/rate/commodities structuring VS. credit structuring. former is just as quantitative as derivatives flow trading, the latter is really quantitative.
1st type:
i define structuring as: using derivatives as building blocks to build a custom tailored investment note to help clients express their view on anything. this requires good knowledge of derivatives. **for example, client is very uncertain of ECB and fed's decision on rates, but he's certain that euro - dollar exchange rate will fluctuate a lot due to uncertain of what ECb and fed want to do. and he is also certain that no matter what ECB and fed want to do the currency rate will not exceed a range**. lets say the rate is currently 1.5, and he believes it wont go higher than 1.7 and wont go lower than 1.3. So you create some structured notes that pays 0% coupon (but protects principal) if the currency rate is 1.5 a year later, but as the rate goes high or lower than 1.5 the pay off (coupon)begin to increase (on both sides), but if the rate goes out of the range then coupon is zero again. so it's like a bond that has coupons that depend on scenarios. lets say mutual fund wanna invest in commodities, but they cant buy futures coz they can only invest in fixed income and equities since it's low risk pension fund. so they tell structurers that they wanna invest in **commodities**, so we create a note, that protects principal, and pays you a coupon of 3*i%, i is the growth in that commodities in a year minus 5%. so basically for everything percent this commodity grows in the next year that surpasses 5%, you can 3 times that number as your coupon. even if commodities fall, you still get your principal back. so you create a zero coupon bond embeding an option. the zero conpon bond matures to the principal on expiration date to protect principal, the rest of the money goes to buy the option that has crazy payoff if something is triggered. so now the mutual fund has an fixed income securitiy that has exposure to commodities return and risk. you can do hybrids, interest rate AND commodity, you can do thousands of combinations, like a basket of 5 currencies, and only the best performing 3 will be counted in payoff calculation. or a fucking russian roulette, after every month, the worst performing currency in the group gets weeded out and the others remain. structuruing is all about originality and creativity, you think about trade ideas that clients may be interested in, you sell the idea to clients, if they wanna buy you structure this thing with the help of traders, and you sell it and charge a transaction fee, that's how you make $. lets say **you are willing to give up some extra upside of APPLE stock performance to eliminate downsid**e. sure i;ll make u something so you can receive apple's upside until itshi reaches 15% upside (then it goes flat on 15% even if apples rises 30%), but if apple goes down 20% your loss will be stopped out at 5%. its all about selling ideas, requires good quant skills to work and price these structured notes. For these interviews you just need to study option math, bulk up on what the greeks mean, delta gamma, vega, theta, rho, etc. know payoffs well. ITM, OTM, ATM concepts and etc. **undergrads can easily do it.**
2. credit structuring. this shit is hard. it's basically CDO. so the beautiful part about CDO is that: since companies default at different times, you can construct some weird probability distribution (that's why they hire phd) and find a way to structure a CDO with 100 single name companies with B rating and yet buy protection on this CDO at a low cost as if these companies are AAA rated. it's all about the correlation between these 100 names. if correl goes out of wack you are fucked and everything blows up. structured debt crisis happened because people didnt think correlation will go out of wack that much. it's unseen historically. thus these super senior traches aint worth shit, they would be safe if correlation holds. but it no longer holds after shit got fucked up. in correlation trading you basically quote spread to buy separate tranches. let's say you go to a correlation trader and say i wanna buy a CDO (virtual/synthetic) on 100 single names (you name whatever company you want), and you specifically want to buy the 15-25% tranch. the trader puts a bunch of shit in the model and model spits out some number. he tells you, this tranch cost this (xxx) much. This xxx number is hugely affected by correlation between the default probability of the 100 comapnies. quant stuff. it's all about managing

risk and think of fucked up scenarios of what can happen and hedge your risk. but i really dont know that much about CDO/CMO structuring, no experience besides talking to people.

Pasted from <http://www.wallstreetoasis.com/forums/structuring-how-quantitative-is-structuring>

Tuesday, March 07, 2017
11:06 AM

Cross-Border Risk

Cross-border risk is the risk that actions taken by a non-U.S. government may prevent the conversion of local currency into non-local currency and/or the transfer of funds outside of the country, thereby impacting the ability of the Company and its customers to transact business across borders. Examples of cross-border risk include actions taken by foreign governments such as exchange controls, debt moratoria, or restrictions on the remittance of funds. These actions might restrict the transfer of funds or the ability of the Company to obtain payment from customers on their contractual obligations.

Management oversight of cross-border risk is performed through a formal review process that includes annual setting of cross-border limits and/or exposures, monitoring of economic conditions globally, and the establishment of internal cross-border risk management policies.

Under Federal Financial Institutions Examination Council (FFIEC) regulatory guidelines, total reported cross-border outstandings include cross-border claims on third parties, as well as investments in and funding of local franchises. Cross-border claims on third parties (trade, short-term, and medium- and long-term claims) include cross-border loans, securities, deposits with banks, investments in affiliates, and other monetary assets, as well as net revaluation gains on foreign exchange and derivative products.

Cross-border outstandings are reported based on the country of the obligor or guarantor. Outstandings backed by cash collateral are assigned to the country in which the collateral is held. For securities received as collateral, cross-border outstandings are reported in the domicile of the issuer of the securities. Cross-border resale agreements are presented based on the domicile of the counterparty in accordance with FFIEC guidelines.

Investments in and funding of local franchises represent the excess of local country assets over local country liabilities. Local country assets are claims on local residents recorded by branches and majority-owned subsidiaries of Citigroup domiciled in the country, adjusted for externally guaranteed claims and certain collateral. Local country liabilities are obligations of non-U.S. branches and majority-owned subsidiaries of Citigroup for which no cross-border guarantee has been issued by another Citigroup office.
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The table below shows all countries where total FFIEC cross-border outstandings exceed 0.75% of total Citigroup assets:

	March 31, 2007								December 31, 2006	
	Cross-Border Claims on Third Parties									
	Banks	Public	Private	Total	Trading and Short-Term Claims(1)	Investments in and Funding of Local Franchises	Total Cross-Border Out-standings	Commit-ments(2)	Total Cross-Border Out-standings	Commit-ments
Germany	$ 19.3	$ 11.5	$ 8.8	$ 39.6	$ 35.8	$ 2.5	$ 42.1	$ 46.8	$ 38.6	$ 43.6
India	1.0	0.1	8.6	9.7	7.3	17.8	27.5	8.3	24.8	0.7
Netherlands	9.9	3.2	12.7	25.8	22.9	—	25.8	13.6	20.1	10.5
France	7.6	5.6	12.5	25.7	23.3	—	25.7	77.1	19.8	60.8
United Kingdom	6.2	0.1	14.1	20.4	13.9	—	20.4	219.9	18.4	192.8
Spain	3.4	6.5	6.6	16.5	15.1	3.8	20.3	6.6	19.7	6.8
South Korea	0.9	1.2	3.7	5.8	5.8	14.3	20.1	10.1	19.7	11.4
Italy	2.3	9.5	4.0	15.8	15.3	0.7	16.5	4.7	18.6	4.0

(1) Included in total cross-border claims on third parties.

(2) Commitments (not included in total cross-border outstandings) include legally binding cross-border letters of credit and other commitments and contingencies as defined by the FFIEC. Effective March 31, 2006 the FFIEC revised the definition of commitments to include commitments to local residents that will be funded with local currency local liabilities.

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Pasted from <http://www.wikinvest.com/stock/Citigroup_(C)/Cross-border_Risk>

Local Volatility vs Stocastic Vol

Thursday, March 16, 2017
8:26 AM

A general model (with continuous paths) can be written
$\frac{dS_t}{S_t}=r_t dt+\sigma_t dW^S_t$
where the short rate r_t and spot volatility σ_t
are stochastic processes.
In the Black-Scholes model both r
and σ are deterministic functions of time (even constant in the original model). This produces a flat smile for any expiry T. And we have the closed form formula for option prices
$C(t,S;T,K)=BS(S,T-t,K;\Sigma(T,K))$
where BS is the BS formula and $\Sigma(T,K)=\sqrt{\frac{1}{T-t}\int_t^T\sigma(s)^2 ds}$. This is not consistent with the smile observed on the market. In order to match market prices, one needs to use a different volatility for each expiry and strike. This is the implied volatility surface
$(T,K)\mapsto\Sigma(T,K)$
.
In the local volatility model, rates are deterministic, instant volatility is stochastic but there is only one source of randomness
$\frac{dS_t}{S_t}=r(t)dt+\sigma_{Dup}(t,S_t)dW^S_t$
this is a special case of the general model with
$d\sigma_t=\left(\partial_t\sigma_{Dup}(t,S_t)+r(t)S_t\partial_S\sigma_{Dup}(t,S_t)+\frac{1}{2}S_t^2\partial^2_S\sigma_{Dup}(t,S_t)\right)dt+\frac{1}{2}S_t\partial_S\sigma_{Dup}(t,S_t)^2 dW^S_t$
What is appealing with this model is that the function σ_{Dup}
can be **perfectly calibrated to match all market vanilla prices** (and quite easily too).
The problem is that while correlated to the spot, statistical study show that the volatility also has **its own source of randomness independent of that of the spot**. Mathematically, this means the instant correlation between the **spot and vol is not 1** contrary to what happens in the local volatility model.
This can be seen in several ways:

1. The **forward smile**. Forward implied volatility is implied from prices of forward start options: ignoring interest rates,
   $C(t,S;T\to T+\vartheta,K):=E^Q\left[\left(\frac{S_{T+\vartheta}}{S_T}-K\right)^+\right]=:C^{BS}(S=1,\vartheta,K;\Sigma(t,S;T\to T+\vartheta,K))$

Alternatively, it is sometimes defined as the **expectation of implied volatility at a forward date**. In a LV model, as the maturity T increases but ϑ

1. is kept constant, **the forward smile gets flatter and higher**. This is not what we observe in the markets where the forward smile tends to be similar to the current smile.

This is because the initial smile you calibrate the model too has decreasing skew:
$\partial_K\Sigma(0,S;T,K)\xrightarrow[T\to+\infty]{}0$

2. Smile rolling. In a LV model, smile tends to move in the **opposite direction of the spot and get higher independently of the direction of the spot**. This is not consistent with what is observed on markets. See Hagan and al. Managing Smile Risk for the derivation. **This means that $\partial_S\Sigma_{LV}(t,S;T,K)$ often has the wrong sign** so your Delta will be wrong which can lead to a higher hedging error than using BS.
2. Barrier options. In FX markets, barrier options like Double No Touch are liquid but a **LV model calibrated to vanilla prices does not reproduce these prices**. This is a consequence of the previous point.

The LV model is a static model. Its whole dynamic **comes from the volatility surface at time 0**. But the vol surface has a dynamic that is richer than that.

There are alternatives using multiple factors like SV models, LSV models (parametric local vol like SABR or fully non parametric local vol), models of the joint dynamic of the spot and vol surface etc... but the LV model remains the default model in many cases due to its **simplicity, its ability to calibrate the initial smile** perfectly and its numerical efficiency.

Pasted from <http://quant.stackexchange.com/questions/17859/why-dynamics-of-local-volatility-is-wrong>

Friday, March 31, 2017
10:04 AM

Corporate Treasury is responsible for providing world class management of the company's FX, interest rate, and liquidity risks using a state of the art framework for balancing the tradeoffs between risk and return. Treasury's primary responsibilities include funding the company's balance sheet, forecasting net interest income, managing relationships with rating agencies and fixed income investors, and analyzing interest rate and liquidity risks."

Within Corporate Treasury, the Debt & Capital Hedge Management (**DCHM**) group manages the risk of debt issuances and capital, both foreign and domestic, on a portfolio basis. The Middle Office team is responsible for reporting comprehensive P&L on all DCHM trading activity on a daily (T+0) basis.

Responsibilities:

Knowledge and experience with both dollar and non-dollar products preferred. Must have strong analytical skills with a demonstrated ability to work in a deadline-driven environment while managing competing priorities. Must have advanced excel skills as the environment is spreadsheet heavy. Also must have strong communication skills as the role will involve frequent contact with various business partners and the trading desk.

Enterprise Role Overview

Responsible for balance sheet, general ledger and/or product controls specific to a defined area or defined process. Understands the market and the market drivers of the product they are supporting. Understands more complex structured transactions and the operational risks around the end to end product lifecycle. Implements improvements to the system infrastructure and control environment. Provides general team guidance on complex transactions. May provide input to recruiting and hiring and performance management processes. BA preferred or substantially equivalent experience. Typically 5-7 years of applicable experience.

Required Skills & Experience

- Bachelor's Degree (economics, finance or business preferred) or equivalent experience
- Minimum 5 - 7 years of in depth knowledge of financial instruments - interest rate derivatives, FX s or fixed income securities experience (Middle Office or Product Control experience preferred)
- Strong quantitative and analytical skills
- Advanced Excel skills
- Communicates and partners well with others to accomplish goals
- Displays a high level of attention to detail
- Ability to quickly learn new applications and trade capture platforms

Desired Skills & Experience

- Knowledge and experience with both dollar and non-dollar products preferred.
- CFA
- Extensive work with data systems, databases and spreadsheets
- Long term and short term projects also desirable
- Solid understanding of fx, fixed income, and derivative instruments

- See more at: http://careers.bankofamerica.com/job-detail/17018705/united-states/emea/corporate-treasury-product-controller#sthash.P82mFEII.dpuf

Pasted from <http://careers.bankofamerica.com/job-detail/17018705/united-states/emea/corporate-treasury-product-controller>

Tuesday, January 31, 2017
11:30 AM

PRESIDENT DONALD J. TRUMP'S ADDRESS TO A JOINT SESSION OF CONGRESS
Remarks as prepared for delivery
TO THE CONGRESS OF THE UNITED STATES:
Mr. Speaker, Mr. Vice President, Members of Congress, the First Lady of the United States, and Citizens of America:
Tonight, as we mark the conclusion of our celebration of Black History Month, we are reminded of our Nation's path toward civil rights and the work that still remains. Recent threats targeting Jewish Community Centers and vandalism of Jewish cemeteries, as well as last week's shooting in Kansas City, remind us that while we may be a Nation divided on policies, we are a country that stands united in condemning hate and evil in all its forms.
Each American generation passes the torch of truth, liberty and justice --- in an unbroken chain all the way down to the present.
That torch is now in our hands. And we will use it to light up the world. I am here tonight to deliver a message of unity and strength, and it is a message deeply delivered from my heart.
A new chapter of American Greatness is now beginning.
A new national pride is sweeping across our Nation.
And a new surge of optimism is placing impossible dreams firmly within our grasp.
What we are witnessing today is the Renewal of the American Spirit.
Our allies will find that America is once again ready to lead.
All the nations of the world -- friend or foe -- will find that America is strong, America is proud, and America is free.
In 9 years, the United States will celebrate the 250th anniversary of our founding -- 250 years since the day we declared our Independence.
It will be one of the great milestones in the history of the world.
But what will America look like as we reach our 250th year? What kind of country will we leave for our children?
I will not allow the mistakes of recent decades past to define the course of our future.
For too long, we've watched our middle class shrink as we've exported our jobs and wealth to foreign countries.
We've financed and built one global project after another, but ignored the fates of our children in the inner cities of Chicago, Baltimore, Detroit -- and so many other places throughout our land.
We've defended the borders of other nations, while leaving our own borders wide open, for anyone to cross -- and for drugs to pour in at a now unprecedented rate.
And we've spent trillions of dollars overseas, while our infrastructure at home has so badly crumbled.
Then, in 2016, the earth shifted beneath our feet. The rebellion started as a quiet protest, spoken by families of all colors and creeds --- families who just wanted a fair shot for their children, and a fair hearing for their concerns.
But then the quiet voices became a loud chorus -- as thousands of citizens now spoke out together, from cities small and large, all across our country.
Finally, the chorus became an earthquake -- and the people turned out by the tens of millions, and they were all united by one very simple, but crucial demand, that America must put its own citizens first ... because only then, can we truly MAKE AMERICA GREAT AGAIN.
Dying industries will come roaring back to life. Heroic veterans will get the care they so desperately need.
Our military will be given the resources its brave warriors so richly deserve.
Crumbling infrastructure will be replaced with new roads, bridges, tunnels, airports and railways gleaming across our beautiful land.
Our terrible drug epidemic will slow down and ultimately, stop.

And our neglected inner cities will see a rebirth of hope, safety, and opportunity.
Above all else, we will keep our promises to the American people.
It's been a little over a month since my inauguration, and I want to take this moment to update the Nation on the progress I've made in keeping those promises.
Since my election, Ford, Fiat-Chrysler, General Motors, Sprint, Softbank, Lockheed, Intel, Walmart, and many others, have announced that they will invest billions of dollars in the United States and will create tens of thousands of new American jobs.
The stock market has gained almost three trillion dollars in value since the election on November 8th, a record. We've saved taxpayers hundreds of millions of dollars by bringing down the price of the fantastic new F-35 jet fighter, and will be saving billions more dollars on contracts all across our Government. We have placed a hiring freeze on non-military and non-essential Federal workers.
We have begun to drain the swamp of government corruption by imposing a 5 year ban on lobbying by executive branch officials --- and a lifetime ban on becoming lobbyists for a foreign government.
We have undertaken a historic effort to massively reduce job–crushing regulations, creating a deregulation task force inside of every Government agency; imposing a new rule which mandates that for every 1 new regulation, 2 old regulations must be eliminated; and stopping a regulation that threatens the future and livelihoods of our great coal miners.
We have cleared the way for the construction of the Keystone and Dakota Access Pipelines -- thereby creating tens of thousands of jobs -- and I've issued a new directive that new American pipelines be made with American steel.
We have withdrawn the United States from the job-killing Trans-Pacific Partnership.
With the help of Prime Minister Justin Trudeau, we have formed a Council with our neighbors in Canada to help ensure that women entrepreneurs have access to the networks, markets and capital they need to start a business and live out their financial dreams.
To protect our citizens, I have directed the Department of Justice to form a Task Force on Reducing Violent Crime.
I have further ordered the Departments of Homeland Security and Justice, along with the Department of State and the Director of National Intelligence, to coordinate an aggressive strategy to dismantle the criminal cartels that have spread across our Nation.
We will stop the drugs from pouring into our country and poisoning our youth -- and we will expand treatment for those who have become so badly addicted.
At the same time, my Administration has answered the pleas of the American people for immigration enforcement and border security. By finally enforcing our immigration laws, we will raise wages, help the unemployed, save billions of dollars, and make our communities safer for everyone. We want all Americans to succeed --- but that can't happen in an environment of lawless chaos. We must restore integrity and the rule of law to our borders.
For that reason, we will soon begin the construction of a great wall along our southern border. It will be started ahead of schedule and, when finished, it will be a very effective weapon against drugs and crime.
As we speak, we are removing gang members, drug dealers and criminals that threaten our communities and prey on our citizens. Bad ones are going out as I speak tonight and as I have promised.
To any in Congress who do not believe we should enforce our laws, I would ask you this question: what would you say to the American family that loses their jobs, their income, or a loved one, because America refused to uphold its laws and defend its borders?
Our obligation is to serve, protect, and defend the citizens of the United States. We are also taking strong measures to protect our Nation from Radical Islamic Terrorism.
According to data provided by the Department of Justice, the vast majority of individuals convicted for terrorism-related offenses since 9/11 came here from outside of our country. We have seen the attacks at home --- from Boston to San Bernardino to the Pentagon and yes, even the World Trade Center.
We have seen the attacks in France, in Belgium, in Germany and all over the world.
It is not compassionate, but reckless, to allow uncontrolled entry from places where proper vetting cannot occur. Those given the high honor of admission to the United States should support this country and love its people and its values.
We cannot allow a beachhead of terrorism to form inside America -- we cannot allow our Nation to

become a sanctuary for extremists.
That is why my Administration has been working on improved vetting procedures, and we will shortly take new steps to keep our Nation safe -- and to keep out those who would do us harm.
As promised, I directed the Department of Defense to develop a plan to demolish and destroy ISIS -- a network of lawless savages that have slaughtered Muslims and Christians, and men, women, and children of all faiths and beliefs. We will work with our allies, including our friends and allies in the Muslim world, to extinguish this vile enemy from our planet.
I have also imposed new sanctions on entities and individuals who support Iran's ballistic missile program, and reaffirmed our unbreakable alliance with the State of Israel.
Finally, I have kept my promise to appoint a Justice to the United States Supreme Court -- from my list of 20 judges -- who will defend our Constitution. I am honored to have Maureen Scalia with us in the gallery tonight. Her late, great husband, Antonin Scalia, will forever be a symbol of American justice. To fill his seat, we have chosen Judge Neil Gorsuch, a man of incredible skill, and deep devotion to the law. He was confirmed unanimously to the Court of Appeals, and I am asking the Senate to swiftly approve his nomination.
Tonight, as I outline the next steps we must take as a country, we must honestly acknowledge the circumstances we inherited.
Ninety-four million Americans are out of the labor force.
Over 43 million people are now living in poverty, and over 43 million Americans are on food stamps.
More than 1 in 5 people in their prime working years are not working.
We have the worst financial recovery in 65 years.
In the last 8 years, the past Administration has put on more new debt than nearly all other Presidents combined.
We've lost more than one-fourth of our manufacturing jobs since NAFTA was approved, and we've lost 60,000 factories since China joined the World Trade Organization in 2001.
Our trade deficit in goods with the world last year was nearly $800 billion dollars.
And overseas, we have inherited a series of tragic foreign policy disasters.
Solving these, and so many other pressing problems, will require us to work past the differences of party. It will require us to tap into the American spirit that has overcome every challenge throughout our long and storied history.
But to accomplish our goals at home and abroad, we must restart the engine of the American economy -- making it easier for companies to do business in the United States, and much harder for companies to leave.
Right now, American companies are taxed at one of the highest rates anywhere in the world.
My economic team is developing historic tax reform that will reduce the tax rate on our companies so they can compete and thrive anywhere and with anyone. At the same time, we will provide massive tax relief for the middle class.
We must create a level playing field for American companies and workers.
Currently, when we ship products out of America, many other countries make us pay very high tariffs and taxes -- but when foreign companies ship their products into America, we charge them almost nothing.
I just met with officials and workers from a great American company, Harley-Davidson. In fact, they proudly displayed five of their magnificent motorcycles, made in the USA, on the front lawn of the White House.
At our meeting, I asked them, how are you doing, how is business? They said that it's good. I asked them further how they are doing with other countries, mainly international sales. They told me -- without even complaining because they have been mistreated for so long that they have become used to it -- that it is very hard to do business with other countries because they tax our goods at such a high rate.
They said that in one case another country taxed their motorcycles at 100 percent.
They weren't even asking for change. But I am.
I believe strongly in free trade but it also has to be FAIR TRADE.
The first Republican President, Abraham Lincoln, warned that the "abandonment of the protective policy by the American Government [will] produce want and ruin among our people."

Lincoln was right -- and it is time we heeded his words. I am not going to let America and its great companies and workers, be taken advantage of anymore.
I am going to bring back millions of jobs. Protecting our workers also means reforming our system of legal immigration. The current, outdated system depresses wages for our poorest workers, and puts great pressure on taxpayers.
Nations around the world, like Canada, Australia and many others --- have a merit-based immigration system. It is a basic principle that those seeking to enter a country ought to be able to support themselves financially. Yet, in America, we do not enforce this rule, straining the very public resources that our poorest citizens rely upon. According to the National Academy of Sciences, our current immigration system costs America's taxpayers many billions of dollars a year.
Switching away from this current system of lower-skilled immigration, and instead adopting a merit-based system, will have many benefits: it will save countless dollars, raise workers' wages, and help struggling families --- including immigrant families --- enter the middle class.
I believe that real and positive immigration reform is possible, as long as we focus on the following goals: to improve jobs and wages for Americans, to strengthen our nation's security, and to restore respect for our laws.
If we are guided by the well-being of American citizens then I believe Republicans and Democrats can work together to achieve an outcome that has eluded our country for decades.
Another Republican President, Dwight D. Eisenhower, initiated the last truly great national infrastructure program --- the building of the interstate highway system. The time has come for a new program of national rebuilding.
America has spent approximately six trillion dollars in the Middle East, all this while our infrastructure at home is crumbling. With this six trillion dollars we could have rebuilt our country --- twice. And maybe even three times if we had people who had the ability to negotiate.
To launch our national rebuilding, I will be asking the Congress to approve legislation that produces a $1 trillion investment in the infrastructure of the United States -- financed through both public and private capital --- creating millions of new jobs.
This effort will be guided by two core principles: Buy American, and Hire American.
Tonight, I am also calling on this Congress to repeal and replace Obamacare with reforms that expand choice, increase access, lower costs, and at the same time, provide better Healthcare.
Mandating every American to buy government-approved health insurance was never the right solution for America. The way to make health insurance available to everyone is to lower the cost of health insurance, and that is what we will do.
Obamacare premiums nationwide have increased by double and triple digits. As an example, Arizona went up 116 percent last year alone. Governor Matt Bevin of Kentucky just said Obamacare is failing in his State -- it is unsustainable and collapsing.
One third of counties have only one insurer on the exchanges --- leaving many Americans with no choice at all.
Remember when you were told that you could keep your doctor, and keep your plan?
We now know that all of those promises have been broken.
Obamacare is collapsing --- and we must act decisively to protect all Americans. Action is not a choice --- it is a necessity.
So I am calling on all Democrats and Republicans in the Congress to work with us to save Americans from this imploding Obamacare disaster.
Here are the principles that should guide the Congress as we move to create a better healthcare system for all Americans:
First, we should ensure that Americans with pre-existing conditions have access to coverage, and that we have a stable transition for Americans currently enrolled in the healthcare exchanges.
Secondly, we should help Americans purchase their own coverage, through the use of tax credits and expanded Health Savings Accounts --- but it must be the plan they want, not the plan forced on them by the Government.
Thirdly, we should give our great State Governors the resources and flexibility they need with Medicaid to make sure no one is left out.

Fourthly, we should implement legal reforms that protect patients and doctors from unnecessary costs that drive up the price of insurance -- and work to bring down the artificially high price of drugs and bring them down immediately.
Finally, the time has come to give Americans the freedom to purchase health insurance across State lines --- creating a truly competitive national marketplace that will bring cost way down and provide far better care.
Everything that is broken in our country can be fixed. Every problem can be solved. And every hurting family can find healing, and hope.
Our citizens deserve this, and so much more --- so why not join forces to finally get it done? On this and so many other things, Democrats and Republicans should get together and unite for the good of our country, and for the good of the American people.
My administration wants to work with members in both parties to make childcare accessible and affordable, to help ensure new parents have paid family leave, to invest in women's health, and to promote clean air and clear water, and to rebuild our military and our infrastructure.
True love for our people requires us to find common ground, to advance the common good, and to cooperate on behalf of every American child who deserves a brighter future.
An incredible young woman is with us this evening who should serve as an inspiration to us all.
Today is Rare Disease day, and joining us in the gallery is a Rare Disease Survivor, Megan Crowley.
Megan was diagnosed with Pompe Disease, a rare and serious illness, when she was 15 months old. She was not expected to live past 5.
On receiving this news, Megan's dad, John, fought with everything he had to save the life of his precious child. He founded a company to look for a cure, and helped develop the drug that saved Megan's life.
Today she is 20 years old -- and a sophomore at Notre Dame.
Megan's story is about the unbounded power of a father's love for a daughter.
But our slow and burdensome approval process at the Food and Drug Administration keeps too many advances, like the one that saved Megan's life, from reaching those in need.
If we slash the restraints, not just at the FDA but across our Government, then we will be blessed with far more miracles like Megan.
In fact, our children will grow up in a Nation of miracles.
But to achieve this future, we must enrich the mind --- and the souls --- of every American child.
Education is the civil rights issue of our time.
I am calling upon Members of both parties to pass an education bill that funds school choice for disadvantaged youth, including millions of African-American and Latino children. These families should be free to choose the public, private, charter, magnet, religious or home school that is right for them.
Joining us tonight in the gallery is a remarkable woman, Denisha Merriweather. As a young girl, Denisha struggled in school and failed third grade twice. But then she was able to enroll in a private center for learning, with the help of a tax credit scholarship program. Today, she is the first in her family to graduate, not just from high school, but from college. Later this year she will get her masters degree in social work.
We want all children to be able to break the cycle of poverty just like Denisha.
But to break the cycle of poverty, we must also break the cycle of violence.
The murder rate in 2015 experienced its largest single-year increase in nearly half a century.
In Chicago, more than 4,000 people were shot last year alone --- and the murder rate so far this year has been even higher.
This is not acceptable in our society.
Every American child should be able to grow up in a safe community, to attend a great school, and to have access to a high-paying job.
But to create this future, we must work with --- not against --- the men and women of law enforcement.
We must build bridges of cooperation and trust --- not drive the wedge of disunity and division.
Police and sheriffs are members of our community. They are friends and neighbors, they are mothers and fathers, sons and daughters -- and they leave behind loved ones every day who worry whether or not they'll come home safe and sound.
We must support the incredible men and women of law enforcement.

And we must support the victims of crime.
I have ordered the Department of Homeland Security to create an office to serve American Victims. The office is called VOICE --- Victims Of Immigration Crime Engagement. We are providing a voice to those who have been ignored by our media, and silenced by special interests.
Joining us in the audience tonight are four very brave Americans whose government failed them.
Their names are Jamiel Shaw, Susan Oliver, Jenna Oliver, and Jessica Davis.
Jamiel's 17-year-old son was viciously murdered by an illegal immigrant gang member, who had just been released from prison. Jamiel Shaw Jr. was an incredible young man, with unlimited potential who was getting ready to go to college where he would have excelled as a great quarterback. But he never got the chance. His father, who is in the audience tonight, has become a good friend of mine.
Also with us are Susan Oliver and Jessica Davis. Their husbands --- Deputy Sheriff Danny Oliver and Detective Michael Davis --- were slain in the line of duty in California. They were pillars of their community. These brave men were viciously gunned down by an illegal immigrant with a criminal record and two prior deportations.
Sitting with Susan is her daughter, Jenna. Jenna: I want you to know that your father was a hero, and that tonight you have the love of an entire country supporting you and praying for you.
To Jamiel, Jenna, Susan and Jessica: I want you to know --- we will never stop fighting for justice. Your loved ones will never be forgotten, we will always honor their memory.
Finally, to keep America Safe we must provide the men and women of the United States military with the tools they need to prevent war and --- if they must --- to fight and to win.
I am sending the Congress a budget that rebuilds the military, eliminates the Defense sequester, and calls for one of the largest increases in national defense spending in American history.
My budget will also increase funding for our veterans.
Our veterans have delivered for this Nation --- and now we must deliver for them.
The challenges we face as a Nation are great. But our people are even greater.
And none are greater or braver than those who fight for America in uniform.
We are blessed to be joined tonight by Carryn Owens, the widow of a U.S. Navy Special Operator, Senior Chief William "Ryan" Owens. Ryan died as he lived: a warrior, and a hero --- battling against terrorism and securing our Nation.
I just spoke to General Mattis, who reconfirmed that, and I quote, "Ryan was a part of a highly successful raid that generated large amounts of vital intelligence that will lead to many more victories in the future against our enemies." Ryan's legacy is etched into eternity. For as the Bible teaches us, there is no greater act of love than to lay down one's life for one's friends. Ryan laid down his life for his friends, for his country, and for our freedom --- we will never forget him.
To those allies who wonder what kind of friend America will be, look no further than the heroes who wear our uniform.
Our foreign policy calls for a direct, robust and meaningful engagement with the world. It is American leadership based on vital security interests that we share with our allies across the globe.
We strongly support NATO, an alliance forged through the bonds of two World Wars that dethroned fascism, and a Cold War that defeated communism.
But our partners must meet their financial obligations.
And now, based on our very strong and frank discussions, they are beginning to do just that.
We expect our partners, whether in NATO, in the Middle East, or the Pacific --- to take a direct and meaningful role in both strategic and military operations, and pay their fair share of the cost.
We will respect historic institutions, but we will also respect the sovereign rights of nations.
Free nations are the best vehicle for expressing the will of the people --- and America respects the right of all nations to chart their own path. My job is not to represent the world. My job is to represent the United States of America. But we know that America is better off, when there is less conflict -- not more.
We must learn from the mistakes of the past --- we have seen the war and destruction that have raged across our world.
The only long-term solution for these humanitarian disasters is to create the conditions where displaced persons can safely return home and begin the long process of rebuilding.
America is willing to find new friends, and to forge new partnerships, where shared interests align. We

want harmony and stability, not war and conflict.
We want peace, wherever peace can be found. America is friends today with former enemies. Some of our closest allies, decades ago, fought on the opposite side of these World Wars. This history should give us all faith in the possibilities for a better world.
Hopefully, the 250th year for America will see a world that is more peaceful, more just and more free.
On our 100th anniversary, in 1876, citizens from across our Nation came to Philadelphia to celebrate America's centennial. At that celebration, the country's builders and artists and inventors showed off their creations.
Alexander Graham Bell displayed his telephone for the first time.
Remington unveiled the first typewriter. An early attempt was made at electric light.
Thomas Edison showed an automatic telegraph and an electric pen.
Imagine the wonders our country could know in America's 250th year.
Think of the marvels we can achieve if we simply set free the dreams of our people.
Cures to illnesses that have always plagued us are not too much to hope.
American footprints on distant worlds are not too big a dream.
Millions lifted from welfare to work is not too much to expect.
And streets where mothers are safe from fear -- schools where children learn in peace -- and jobs where Americans prosper and grow -- are not too much to ask.
When we have all of this, we will have made America greater than ever before. For all Americans.
This is our vision. This is our mission.
But we can only get there together.
We are one people, with one destiny.
We all bleed the same blood.
We all salute the same flag.
And we are all made by the same God.
And when we fulfill this vision; when we celebrate our 250 years of glorious freedom, we will look back on tonight as when this new chapter of American Greatness began.
The time for small thinking is over. The time for trivial fights is behind us.
We just need the courage to share the dreams that fill our hearts.
The bravery to express the hopes that stir our souls.
And the confidence to turn those hopes and dreams to action.
From now on, America will be empowered by our aspirations, not burdened by our fears ---
inspired by the future, not bound by the failures of the past ---
and guided by our vision, not blinded by our doubts.
I am asking all citizens to embrace this Renewal of the American Spirit. I am asking all members of Congress to join me in dreaming big, and bold and daring things for our country. And I am asking everyone watching tonight to seize this moment and --
Believe in yourselves.
Believe in your future.
And believe, once more, in America.
Thank you, God bless you, and God Bless these United States.

Pasted from <http://www.cnn.com/2017/02/28/politics/donald-trump-speech-transcript-full-text/>

Friday, April 28, 2017
12:59 PM

US Dollar Index (DXY): The dollar trimmed losses but remained within close distance of a five-month trough against other major currencies on Friday, after the release of disappointing U.S. economic growth data and as concerns over U.S. politics continued to weigh. (DXY: -0.18% at 98.84)

EUR/USD: The euro jumped Friday as euro-zone preliminary core CPI rose to its highest level since 2013. The single currency was up 0.57% at $1.0935 at 05.45 ET. That pushed the dollar index 0.35% lower to 98.68. Eurostat said April core CPI was up 1.2% annually from 0.7% in March. Analysts forecast a rise to 1.0%. Headline CPI rose to 1.9% from 1.4%. It was estimated to rise to 1.6%. The ECB Thursday left its monetary policy on hold. (EUR/USD: 0.33% at 1.09)

Japan Yen: The yen gained further in Asia on Friday after a flood of data pointed to a mixed picture with consumer inflation below expectations, but retail sales up more than seen and as President Donald Trump unleashed comments on North Korea. (USD/JPY: 0.26% at 111.56)

British Pounds: The pound was hovering near fresh six-month highs against the U.S. dollar on Friday, after the release of overall positive U.K. economic growth data and as sentiment on the greenback also remained vulnerable ahead of key U.S. data due later in the day. (GBP/USD: 0.16% at 1.2923)

Commodities
Gold rose on Friday as forecast-beating euro zone inflation boosted the euro against the dollar, while global stock markets retreated from Wednesday's record highs as concerns about global trade subdued appetite for cyclical assets. (Gold Prices: +0.18% at $1,266.02)

Oil prices rebounded on Friday after dropping to a one-month low the previous day, prompting investors to buy at cheaper levels ahead of a May OPEC meeting at which producers could extend output cuts. (Brent Crude Futures: +0.79% at $52.23 a barrel. WTI Futures: +0.82% at $49.37 a barrel)

Steel futures jumped more than 4 percent to a three-week high on Friday amid expectations of a pickup in demand next month after a shaky start to what is typically a brisk consumption period. (Shanghai Steel Rebar Futures: +4.4% at 3,115 yuan per tonne. Iron Ore Contract: +4.5% at 521 yuan tonne.)

Econ & Policy

Economy
Americas
U.S. Q1 GDP growth preliminary 0.7% vs. forecast 1.2 and following 2.1% growth for the fourth quarter of 2016. This was the slowest rate of growth since the first quarter of 2014. Personal consumption expenditure slowed sharply to an annual rate of 0.3% from 3.5% previously with weakness in durables spending. As far as investment is concerned there was growth of 4.3% from 9.4% previously with gains in residential and non-residential capital spending. There was a small negative contribution from government spending and both the Federal and state level.

U.S. pending home sales -0.8% vs. -1.0% forecast from 5.5% in the preceding month. Contracts to buy previously owned U.S. homes fell in March as a lack of properties for sale curbed activity.

Canadian GDP was unchanged for February which was in line with consensus forecasts and followed 0.6% growth for January with year-on-year growth of 2.5%. There was a decline of 0.3% for goodsproducing industries after a 1.1% gain the previous month with annual growth of 2.8%.

Europe
Eurozone CPI inflation increased to 1.9% from 1.5% the previous month and compared with consensus expectations of an increase to 1.8%. The core inflation rate increased sharply to 1.2% from 0.7% previously and compared with an expected increase to 1.0%. This was above the 0.7% recorded for April 2016 and the strongest reading since 2013.

German Import Price Index -0.5% vs. -0.1% forecast from 0.7% in the preceding month.

U.K. GDP 0.3% vs. 0.4% forecast from 0.7% in the preceding quarter. There was a slowdown in services-sector growth to 0.3% from 0.8% previously with weakness in retail sales and the accommodation sector due to the impact of rising prices which undermined real spending. In contrast, there was robust growth of 0.7% in the business services sector.

U.K. Nationwide HPI -0.4% vs. 0.1% forecast from -0.3% in the preceding month.

Asia and Pacific
Japan’s retail sales 2.1% vs. 1.5% forecast from 0.1% in the preceding month.

Japan’s industrial production -2.1% vs. -0.8% forecast from 3.2% in the preceding month. Industrial production returned to growth last year amid higher export demand. The gains were associated with a sharp drop in the yen, which began to weaken after the U.S. presidential election.

Japan’s National Core CPI 0.2% vs. 0.3% forecast from 0.2% in the preceding month; Tokyo’s core consumer price inflation -0.1% vs. -0.2% forecast from -0.4% in the preceding month. The BOJ left monetary policy unchanged Thursday, as expected, and raised its economic outlook for fiscal year 2017-18. Policymakers expect real gross domestic product (GDP) to expand 1.6% over that period, higher than the 1.5% forecast in January.

Japan’s unemployment rate 2.8% vs. 2.9% forecast from 2.8% in the preceding month.

Australian producer price inflation 0.5% vs. 0.3% forecast from 0.5% in the preceding quarter.
Policy
Americas
Government shutdown looms: "We'll see what happens. If there's a shutdown, there's a shutdown," President Trump told Reuters, but most of the contentious issues between Democrats and Republicans appear to have been resolved. Congress has until 12:01 a.m. ET on Saturday to pass a spending bill to fund the government through the end of September. Juggling the budget and still looking for GOP support, a vote on healthcare has been postponed.

Trump gets tough on South Korea: President Trump is also threatening to renegotiate another trade deal, this time with South Korea. Stocks of some major exporters headed sharply lower in Seoul on the comments. Trump added that South Korea should pay for its U.S. THAAD missile system and warned of a "major, major conflict" with Pyongyang, but would prefer a diplomatic outcome.

Energy first in the Trump era? In a move that could eventually open up millions of coastal acres to offshore oil and gas drilling, the President is expected to sign an executive order today known as the America First Offshore Energy Strategy. More energy news? Following their initial meeting yesterday, administration officials will likely meet in May to reach a final decision on whether the U.S. should stay in the Paris climate deal.

Drama over NAFTA renegotiation: President Trump was "psyched to terminate" NAFTA with an announcement at a Pennsylvania rally on Saturday, but as rumors spread of the possible action, Mexico's Enrique Pena Nieto and Canada's Justin Trudeau called urging him not to pull out of the accord. Trump was then convinced "they're serious about it and I will negotiate rather than terminate," he declared in an interview with Reuters.

Europe
ECB held its benchmark interest rate at zero on Thursday as Mario Draghi suggested downside risks to the bloc's economy had diminished and its economic recovery picked up pace. The central bank also stuck with its rate of asset purchases until at least the end of the year, proceeding with a monthly pace of QE bond purchases of €60B.

Sunday's vote could spell Renzi's comeback: Italy's Matteo Renzi is running again in primaries for his Democratic Party after he failed to convert his ambitious reform agenda into reality. A vote will take place Sunday. With a national election due by May 2018, Renzi's ability to counter the 5-Star movement, which is at the top of the polls, may be crucial in fending off an existential threat to the eurozone.

EU membership for united Ireland: European leaders are preparing to recognize the potential for a "united Ireland" within the EU, confirming that Northern Ireland would seamlessly rejoin the bloc after Brexit in the event of a vote for Irish reunification. Diplomats will propose the idea in a summit tomorrow, reflecting the terms of the 1998 Good Friday Agreement.

Business News

Industrials
Southwest Airlines (NYSE:LUV) will end overbooking on its flights by the end of June, following outrage over the violent removal of a United Airlines (NYSE:UAL) passenger earlier this month. CEO Gary Kelly said the move had been under consideration for some time. United has meanwhile settled with David Dao, although terms and the amount will be kept confidential.

Boeing (NYSE:BA) presses trade case against Bombardier (OTCQX:BDRAF, OTCQX:BDRBF) over CSeries jet: Growing U.S.-Canada trade tensions? Boeing has asked the U.S. Commerce Department to investigate alleged subsidies and unfair pricing for the new CSeries plane. "Bombardier has embarked on an aggressive campaign to sell CSeries aircraft into the U.S. market at absurdly low prices - less than $20M for airplanes that cost $33M to produce, based on publicly available information."

Shares of Honeywell (NYSE:HON) rose as much as 4% AH following news that hedge fund Third Point had added to its stake in the company. Dan Loeb wants Honeywell to separate its aerospace division, a step he said would create more than $20B in shareholder value. The stock is now a top-five holding of Third Point.
Consumers
China's Didi (Private:DIDI) raises over $5.5B: Making it one of the world's most valuable private technology companies, Didi Chuxing has closed a new $5.5B funding round. That could put its worth at around $50B after snapping up Uber's (Private:UBER) China business last year. Investors reportedly include SoftBank (OTCPK:SFTBY), Silver Lake Kraftwerk, China Merchants Bank and an arm of Bank of Communications.

Uber's Levandowski reduces lead role as Waymo lawsuit proceeds: Anthony Levandowski, the man at the center of UBER's legal spat with rival Alphabet (GOOG, GOOGL) over allegedly stolen self-driving car technology, is stepping aside as chief of the high profile autonomous project. He's not leaving Uber, but he won't be working on LiDAR sensors (key to the dispute) while the litigation proceeds. Eric Meyhofer will take his place for the time being.
Financials
JPMorgan (NYSE:JPM) has left the mammoth bank blockchain consortium led by startup R3 CEV, as the

latest member to depart over the course of the company's fundraising process, It wants to gather $150M from investors and give them a 60% stake in the firm. Goldman Sachs (NYSE:GS), Banco Santander (NYSE:SAN), Morgan Stanley (NYSE:MS) and National Australia Bank left the group in quick succession in late 2016.

Royal Bank of Scotland (NYSE:RBS) has posted its first quarterly profit since 2015 as CEO Ross McEwan stepped up the pace of cost-cutting. Barclays (NYSE:BCS) took a one-off impairment charge on its African business, while boss Jes Staley faces a shareholder revolt. The U.K. government has also cut its stake in Lloyds (NYSE:LYG) to below 1% - more than eight years after a taxpayer bailout.

Information Technology

Facebook (NASDAQ:FB) is pressing its enforcement against "information operations" - bad actors who use the platform to spread fake news and false propaganda. The new technologies will find phony accounts and expand security measures to protect against "more subtle and insidious forms of misuse." Facebook will also add customizable security, privacy features and notify users if they have been targeted.

Apple (NASDAQ:AAPL) fans in Southeast Asia are rejoicing as the first store in the region is expected to open on May 22, according to CNBC. The launch in Singapore has been shrouded in the company's usual veil of secrecy; legal documents that have come to light in the past detail strict non-disclosure agreements for Apple's contractors and suppliers, including $50M payouts for each breach.

AOL's Armstrong assembling leaders for post-Yahoo Oath: AOL chief Tim Armstrong is setting up leadership for Oath, the umbrella of brands that AOL parent Verizon (NYSE:VZ) is taking on in buying the core Internet services from Yahoo (NASDAQ:YHOO). He's tapping Yahoo's Atte Lahtiranta to lead tech, Verizon's Ralf Jacob to manage digital media and AOL president (and former Yahoo) Tim Mahlman to lead advertising.

Data Center

Equity

S&P500

VIX

Bond

World Bond Yield Curve

Sovereign Debt Movement

Sovereign 5Y Debt CDS

U.S. Municiple Bond

U.S. Investment Grade Bond

U.S. High Yield Bond

Emerging Market

ETF Flow

Asset Class

Asset Class: Equity

Geography Regions

Geography Regions: Asia Pacific

Calendar

Economic Calender
8:30 GDP Q1
8:30 Employment Cost Index
9:45 Chicago PMI
10:00 Consumer Sentiment
1:00 PM Baker-Hughes Rig Count

Pasted from <https://www.messenger.com/t/tracy.tian.33>

2.8 Index Research

Wednesday, February 08, 2017
9:43 AM

Objective

The SGI Emerging Markets Mean Reversion Index (the "Index") aims to generate positive performance from potential mean reversion patterns in the iShares MSCI Emerging Markets ETF by capturing the spread between its daily and bi-weekly variances through long exposure to the daily variance of the iShares MSCI Emerging Markets ETF and short exposure to bi-weekly variance of the iShares MSCI Emerging Markets ETF (EEM).

Mechanism

The Index is based on two systematic mechanisms: a long/short variance mechanism and a mid-week rolling mechanism. The long/short variance mechanism consists of hypothetical long positions in the daily variance of the iShares MSCI Emerging Markets ETF and hypothetical short positions in the bi-weekly variance of the iShares MSCI Emerging Markets ETF. In order to achieve the mid-week rolling mechanism, the hypothetical positions are rolled only on Tuesdays, Wednesdays, and Thursdays of each week over a two week period, as these 3 days appear to be the most consistent and least volatile based on SG's historical observations.

The SGI Emerging Markets Mean Reversion Index began publishing on September 3, 2013. Therefore, all data for the Index for the period prior to September 3, 2013 represent S&P Dow Jones ("S&P DJ"s) application of the Index methodology in order to reconstruct hypothetical historical data for the period prior to September 3, 2013 consistent with the Index methodology. Results prior to September 3, 2013 may have been different had the Index actually been in existence. The SGI Emerging Markets Mean Reversion Index (the "Index") is the property of SG, which has contracted with S&P Opco, LLC (a subsidiary of S&P Dow Jones Indices LLC) ("S&P Dow Jones Indices") to maintain and calculate the Index. S&P® is a registered trademark of Standard & Poor's Financial Services LLC ("SPFS"); Dow Jones® is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"); and these trademarks have been licensed to S&P Dow Jones Indices. "Calculated by S&P Dow Jones Indices Custom" and its related stylized mark(s) are service marks of S&P Dow Jones Indices and have been sublicensed for certain purposes by SG. Neither S&P Dow Jones Indices, SPFS, Dow Jones nor any of their affiliates shall be liable for any errors or omissions in calculating the Index.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXEMMR/>

Objective

The SGI Systematic US Short Call tracks a hypothetical portfolio of short positions in call options which aims to generate positive performance in volatile, bearish periods, while smoothing option entry points to potentially reduce drawdowns and overall strategy volatility.

Mechanism

The Option Portfolio consists of ten hypothetical **102% 2-week** call options sold on the S&P 500® Price Return Index over the last ten successive business days with 1/10th of the nominal sold daily. This methodology seeks to reduce sudden drawdown risk by smoothing the volatility.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXSUSC/>

Objective

Some assets appear to have a tendency to "mean revert", meaning that large positive moves are often followed by negative ones (and vice versa). On average, this should result in a positive spread between the daily and bi-weekly realized variance of the returns of such assets. The SGI VI Gravity Index is a systematic index with its level published daily on Bloomberg, that aims to generate positive performance by capturing this potential spread through hypothetical positions that are long the daily variance and short the bi-weekly variance of the SGI VI Spread Index*.

* The SGI VI Spread Index aims to be a systematic investible proxy to the VIX Index, with potentially enhanced mean reversion patterns.

Mechanism

The SGI VI Gravity Index takes hypothetical long positions in the daily variance and hypothetical short positions in the bi-weekly variance of the SGI VI Spread Index. Exposure to the variance spread is capped and floored at 200% and -20% respectively, in order to mitigate the risk of drawdown following a prolonged trend in the SGI VI Spread Index.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVIGR/>

2.9 Index Research

Thursday, February 09, 2017
12:22 PM

Objective

The SGI WISE US Long/Short (USD-Excess Return) Index (the Index) began publishing on March 31, 2008, and the level of the Index was set at 1,000 as of February 6, 2008. The Index reflects **long and short positions in certain of the stocks of the S&P 500® Index** (the S&P 500).

Mechanism

The Index reflects long and short positions in certain stocks of the S&P 500® Index (the S&P 500) by tracking the outperformance of the SGI WISE US Top Index (Top Index) over the SGI WISE US Bottom Index (Bottom Index). By taking short positions in the
Bottom Index and long positions in the Top Index, the Index seeks to pursue a Market Neutral strategy which aims to mitigate the effect of market conditions.

- Components of the Top and Bottom Indices are selected using the WISE Model, a proprietary model developed by Société Générale that ranks the S&P 500 stocks according to 12 scoring criteria, including valuation, price momentum, market short interest, price and volatility.

- Each month, the stocks ranked in the top 10th percentile according to the WISE Model are generally included in the Top Index and the stocks in the bottom 10th percentile are generally included in the Bottom Index.

The Index is rebalanced on a yearly basis so that it is equally exposed to each of the Top Index and the Bottom Index.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXWULS/>

Build a score system. And long top short low. And Market neutral to decrease the vol.

The SGI WISE US Top Index (the "Index") seeks to outperform the US Equity market by tracking the performance of stocks from the S&P 500 that exhibit **high value and momentum opportunities** according to the systematic and rules-based WISE US model.
The index is rebalanced on a monthly basis using a series of 12 criteria. The Index aggregates the last 12 selections to potentially make a diversified yet representative selection of US equities.

Mechanism

Each month, the members of the S&P 500 are screened according to the WISE US Model, using 12 criteria that represent Value and Momentum styles: the 12 scores are summed and determine the WISE US Score for each stock. The top 10% of stocks make the selection for the month. The Index is the aggregation of the last 12 selections with a liquidity threshold, as the scores were designed to deliver performance over a 12-month time horizon.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXWUT/>

Objective

The SG Global Value Beta Index (the "Index") aims to track the performance of a hypothetical global basket of listed shares which exhibit a positive value bias. The methodology consists of ranking stocks based on their global sector relative valuation metrics, as not only has this demonstrated potentially better risk-adjusted returns, but it also makes more intuitive sense to compare companies within the same sector.

Mechanism

The stocks are chosen from a universe of global developed market companies with a free float market capitalization of US$1bn or more at today's price, and where average daily volume has exceeded US $3mn over the past six months. Stocks are ranked relative to their sector peers on the basis of valuation. The value are calculated using the equal-weighted quintile score of a set of five traditional value factors, which have all been associated with positive returns in academic literature: (i) Book to Price Factor, (ii) Earnings to Price Factor, (iii) One Year forward Earnings to Price Factor, (iv) EBITDA to Enterprise Value Factor, (v) Free Cash Flow to Price Factor. After that the index consists of an equal-weighted basket of the EUR Price Return with cheapest 200 stocks based on the above value score.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGVB/>

Objective

The SGI Smart Market Neutral Commodity 2 Index (the Index) began publishing on April 19, 2012 and aims at generating positive returns over the medium term by taking non-directional positions on 3 commodity sectors: **energy, industrial metals and agriculture**, while aiming to maintain the level of volatility of such Index at or close to a predetermined level.

Mechanism

The Index follows a long/short, market-neutral investment strategy, which tracks a hypothetical long position and a hypothetical short position in various commodity indices. The Index seeks to, through replication, take advantage of **potential inefficiencies in the rolling mechanism** used by the more traditional commodity indices, in which the Index takes a short position. This rolling mechanism may impact the performance of the Index. The strategy underlying the Index applies several systematic rolling mechanisms developed by Société Générale to various underlying **hypothetical commodity positions**, with the aim of improving the **roll yield** and therefore the performance of the Index. At the same time, the Index applies a systematic **Volatility Target Mechanism,** which aims to keep the realized volatility of the Index close to the pre-determined target volatility level of 6%.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGICVM2/>

Objective

US equity markets appear to have a tendency to mean revert, meaning that large positive moves are often followed by negative ones (and vice versa). On average, this should result in a positive spread between the daily and bi-weekly realized variance of the returns of such markets.*

The SGI US Gravity Index is a systematic index with its level published daily on Bloomberg, aiming to generate positive performance by capturing this potential spread through hypothetical positions that are long the daily variance and short the bi-weekly variance of the S&P 500 Index.

* For the purposes of this webpage, daily variance refers to the sum of the squared daily returns of the S&P 500 over the given period, whereas bi-weekly variance refers to the squared sum of the daily returns of the S&P 500 over the given period.

Mechanism

The SGI US Gravity Index takes hypothetical long positions in the daily variance and hypothetical short positions in the bi-weekly variance of the S&P 500 Index. In addition, these hypothetical positions are rolled only on Tuesdays, Wednesdays, and Thursdays of each week over a two-week period, in order to avoid a potential weekend effect on the volatility of the S&P 500 Index on Mondays and Fridays.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXUSGR/>

Objective

SGI Vol Premium Dynamic is an investable index, capturing the spread between the implied volatility and the realized volatility by rolling variance swaps. The index is rebalanced on a weekly basis.

Mechanism

The SGI Vol Premium Dynamic Index tracks the performance of a portfolio holding four short or long rolling positions in 1-month variance swaps on the S&P 500 Index. The position in variance swaps gives exposure to the spread between the implied variance and the realized variance. The strike of each variance swap is deducted from the VIX prior to the relevant roll date.

The dynamic exposure mechanism makes it possible to deleverage more quickly in case of a sudden rise in volatility.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVPD/>

Objective

The SGI Vol Target BRIC Index (the Index) consists of and is constructed pursuant to a systematic rebalancing process between three components: (i) the S&P BRIC 40 Index (Net Total Return) (Bloomberg Ticker: SPTRBRIC) (the Underlying Index), (ii) a Hypothetical Deposit yielding at USD 1-month LIBOR (the LIBOR Rate), and (iii) a Hypothetical Borrowing based on the LIBOR Rate. The Underlying Index is designed to track the performance of 40 leading companies from the emerging markets of Brazil, Russia, India and China (the BRIC countries). The Index components' weightings are determined based on the volatility of the Underlying Index compared to a pre-defined target level.

Mechanism

The Index systematically varies its exposure to its three components depending on the annualized 20-day historical volatility of the Underlying Index (the Historical Volatility”) relative to a target volatility of 18% (the Target Volatility):

- When the Historical Volatility exceeds the Target Volatility, the Index is less than 100% exposed to the Underlying Index and will be exposed, in whole or in part, to the Hypothetical Deposit. The greater the excess of the Historical Volatility over the Target Volatility, the lesser the exposure of the Index to the Underlying Index and the greater the exposure of the Index to the Hypothetical Deposit. In this case, the Index is not exposed to the Hypothetical Borrowing.

- When the Historical Volatility is less than the Target Volatility, the Index is more than 100% exposed to the Underlying Index, subject to a maximum of 200% exposure. This leveraged exposure to the Underlying Index is deemed financed by the Hypothetical Borrowing. The greater the Historical Volatility decreases from the target volatility, the greater the exposure of the Index to the Underlying Index and the Hypothetical Borrowing. The Hypothetical Borrowing will have a negative impact on performance of the Index. In this case, the Index is not exposed to the Hypothetical Deposit.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVTBC/>

Objective

The SGI Chipeco Vol Target (USD-Total Return) Index (the Index) began publishing on March 18, 2011, with a level set at 1,000. The Index reflects long positions in the Chilean, Peruvian and Colombian equity markets through American Depositary Receipts (ADRs) or Common Stocks, while benefiting from a volatility control mechanism.

Mechanism

The Index selects the basket of equities according to a systematic stock picking criteria (Equity Basket). Every quarter, the weight of each stock within a given country is adjusted according to its market capitalization. In addition, the weightings of each stock is adjusted to make the Chilean, Peruvian and Colombian portfolios respectively equal to 40,% 40% and 20% of the Equity Basket generally corresponding to the market size of each country.

The Index then varies its exposure to the Equity Basket depending on the historical volatility of the Equity Basket as compared to a Target Volatility of 15%. If the historical volatility is greater or less than 15,% the Index increases or decreases its exposure to the Equity Basket, respectively with a cap of 150% on exposure and a floor of 0% on exposure.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGMDCPCV/>

Objective

US equity markets appear to have a tendency to mean revert, meaning that large positive moves are often followed by negative ones (and vice versa). On average, this should result in a positive spread between the daily and bi-weekly realized variance of the returns of such markets.

*The SGI US Delta Cap Mean Reversion Index is a systematic index with its level published daily on Bloomberg, aiming to generate positive performance by capturing this potential spread through hypothetical positions that are long the daily variance and short the bi-weekly variance of the S&P 500 Index. Exposure to the spread is capped when exposure to the S&P 500 Index reaches an absolute value of 200%.

Mechanism

The SGI US Delta Cap Mean Reversion Index takes hypothetical long positions in the daily variance and hypothetical short positions in the bi-weekly variance of the S&P 500 Index, while capping its maximum exposure to the underlying S&P 500 Index at an absolute value of 200%. In addition, these hypothetical positions are rolled only on Tuesdays, Wednesdays, and Thursdays of each week over a two-week period, in order to avoid a potential weekend effect on the volatility of the S&P 500 Index on Mondays and Fridays.

*FOR THE PURPOSES OF THIS FACTSHEET, DAILY VARIANCE REFERS TO THE SUM OF THE SQUARED DAILY RETURNS OF THE S&P 500 OVER THE GIVEN PERIOD, WHEREAS BI-WEEKLY VARIANCE REFERS TO THE SQUARED SUM OF THE DAILY RETURNS OF THE S&P 500 OVER THE GIVEN PERIOD.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXUSGC/>

Objective

SGI Vol Invest Dynamic Carry Hedge Index (the “Index) is a scaled leveraged long or long/short strategy that aims to generate potential alpha (or yield) from the shape of the forward curve of VIX in most contango market conditions and generate potential alpha in most backwardation market conditions. The Index is a systematic index based on an optimized roll of VIX futures and implementation of dynamic leverage.

Mechanism

The Index relies on SG developed roll methodology which aims to reduce the cost of carry relative to the standard roll methodology by systematically taking hypothetical long positions in the VIX futures with

the smallest cost of carry, and short positions in the VIX futures with the highest cost of carry when the VIX curve is in contango. When the VIX curve is in backwardation, long positions are taken in the VIX futures with the highest cost of carry, and short positions in the VIX futures with the smallest cost of carry (no short leg if the strategy is long of the first contract). The strategy applies 3X leverage, which is scaled back as positions are taken further along the curve. SG's roll methodology is based on the closing price for futures 1 & 2 and the VWAP* for the 3rd future.
* Volume Weighted Average Price as calculated by Bloomberg over the last hour before the close of the market.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVDCH/>

Objective

SGI Vol Invest Index (the Index) aims to provide a hedge against falling equities by providing net long leveraged exposure to the implied volatility of the S&P 500 Index through a strategy that potentially reduces the cost of carry and may mitigate draw downs when volatility falls. The Index is a systematic index based on an optimized roll of VIX futures and a dynamic leverage.

Mechanism

The Index relies on SG developed roll methodology which aims to reduce the cost of carry relative to standard roll methodology (i.e. systematic roll of the first nearby contract).

The Index provides exposure to two sub-indices:

(1) 100% exposure to the SGI VI Beta Index TR component which embeds a scaled long leveraged position on VIX futures using the SG developed roll methodology that aims to provide positive performance when volatility rises. The strategy provides 3X exposure that is scaled back as positions are taken further along the curve.

(2) 50% exposure to the SGI VI Alpha Index ER component which is a long/short strategy that aims to generate alpha (or yield) in order to mitigate the risk of a decline in volatility following a volatility spike. The alpha strategy is long the VIX future picked by the SG proprietary roll methodology and short the first nearby VIX future, with a constant 2X leverage.

The weights of the 2 components in the SGI Vol Invest Index are rebalanced monthly.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVI/>

Objective

SGI Vol Invest Alpha 2 Index (the “Index”) is a long/short strategy that aims to generate yield (alpha) from the volatility curve in contango market conditions. The Index is a systematic index based on an optimized roll of VIX futures and a constant leverage.

Mechanism

The Index relies on SG developed roll methodology which aims to reduce the cost of carry relative to the standard roll methodology by taking hypothetical short positions in the first nearby VIX futures, and hypothetical long positions in the VIX futures with the smallest cost of carry (excluding the first nearby future), with a constant 2X leverage on both positions. SG's roll methodology is based on the closing price for futures 1 & 2 and the VWAP* for futures 3 to 7.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVIA2/>

SGI Vol Invest Alpha Short Term Index (the “Index”) is a long/short strategy that aims to generate yield (alpha) from the volatility curve in contango market conditions. The Index is a systematic index based on an optimized roll of VIX futures and a constant leverage.

Mechanism

The Index relies on SG developed roll methodology which aims to reduce the cost of carry relative to the standard roll methodology by taking hypothetical short positions in the first nearby VIX futures, and hypothetical long positions in the VIX futures with the smallest cost of carry (excluding the first nearby future), with a constant 2X leverage on both positions. SG's roll methodology is based on the closing price for futures 1 & 2 and the VWAP* for the 3rd future.
* Volume Weighted Average Price as calculated by Bloomberg over the last hour before the close of the market.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVIAS/>

Objective

SGI Vol Invest Beta 2 Index (the "Index") aims to provide long exposure to the implied volatility of the S&P 500 Index through VIX futures in order to provide positive performance when volatility rises. The Index is based on an SG systematic methodology that aims to optimize the roll of VIX futures and implement dynamic leverage.

Mechanism

The Index relies on SG developed roll methodology which aims to reduce the cost of carry relative to the standard roll methodology by taking hypothetical long positions on VIX futures. The strategy applies 3X leverage, which is scaled back as positions are taken further along the curve. SG's roll methodology is based on the closing price for futures 1 & 2 and the VWAP* for futures 3 to 7.

* Volume Weighted Average Price as calculated by Bloomberg over the last hour before the close of the market.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVIB2/>

Objective

SGI Vol Premium 3 Index (the "Index") is a systematic and rule based index that aims to capture the potential volatility risk premium that may be observed on the S&P 500 Index between the implied and realized volatility. The Index is designed to track the performance of a hypothetical portfolio of rolling short positions in a group of five (5) hypothetical 1-month variance swaps on the S&P 500 Index.

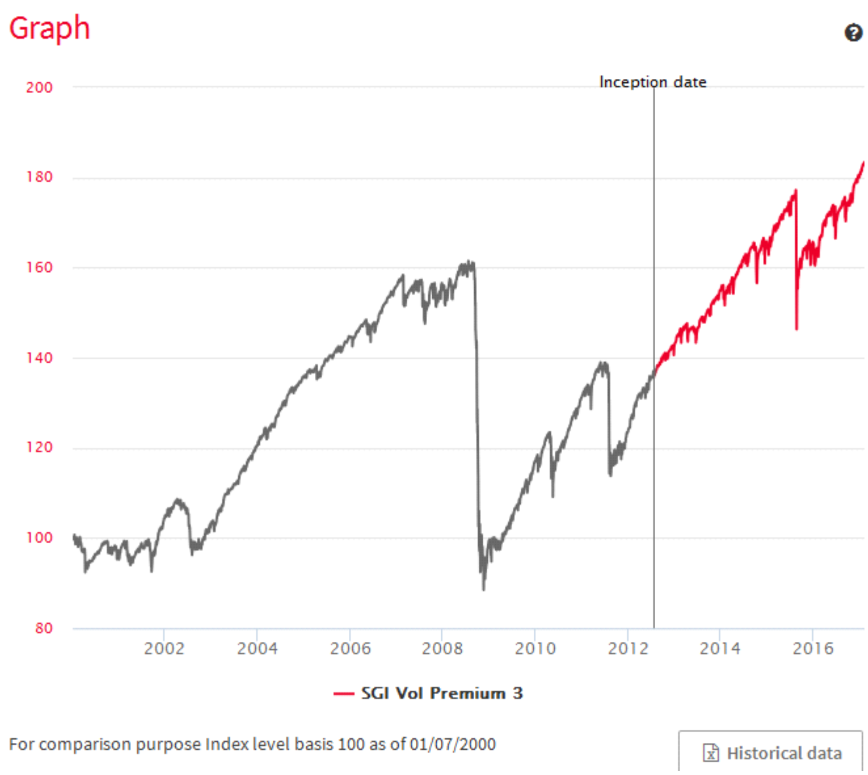
Mechanism

The Index portfolio comprises hypothetical **short** positions in 5 variance swaps each representing **1/5th of the portfolio** (entered into over 5 successive business days). Each new variance swap's characteristics are as follows:

- **Strike**; corresponding to the prevailing implied volatility
- **Maturity**; corresponding to the listed maturity closest to 1 month or slightly longer
- **Nominal**; resulting in a hypothetical exposure equal to 35% of the Index level

Shortly before each variance swap's maturity, the hypothetical position is rolled (spread over 5 successive business days). The previous variance swap positions are deemed unwound (mark-to-market value is deemed realized), and hypothetical short positions in new variance swaps are deemed taken.

Graph



Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGIXVP3/>

目标：
我的短期目标是学习更多credit 相关的model。这是现在非常有未来的领域，并且有非常的发展潜力，有非常有趣的各种model。我希望我能学到很多
长期目标是：
希望能够帮助公司创造更多价值，建立更加完备的分析系统，

My short-term goal is to learn more credit-related models. This is now very much in the field of the future, and there are very development potential, there are very interesting various models. I hope I can learn a lot
Long-term goals are:
Hoping to help companies create more value, build a more complete analysis system,

Pasted from <https://www.google.com/search?q=stress+loss+economic+capital&ie=utf-8&oe=utf-8#newwindow=1&q=translate>

你知道kmv 模型么？
这是一个非常有趣的模型，它是典型的结构型的模型，它将公司的股票看作了公司资产的看涨股权，strike在债券的face value. 也就是说，当公司资产价值高于债券价值的时候，equity 's value = A-K. If the asset value is lower than the face value of the bond, Equity is worthless.
This model assume asset value is log normal distribution, Therefore. Equity value and equity volatility can be priced by black schole model. 通过资产和股票，就能表示处债券的价值。而且公式非常的有经济含义，一部分是asset的恢复价值，另外一部分是如果 生存下来的价值。我们就可以分辨出PD 的价值就是某个值.DD 是log different 资产价值和barrier的价值除以资产的波动率。

我们可以发现用merton 模型算出来的PD并不准确，所以kmv就带来了edf 做为default 的概率。很多公司就用这个来进行评级

另外一种计算PD的方法就是用这每个公司的评级，以及过去某个评级的历史的违约率来计算出transition matrix. 然后通过这个matrix 就可以计算cvar之类的了。

这些都是一些stand alone 的分析方法，并没有结合correlation在里面，当有correlation在里面的时候，就需要用到monte carlo simulation. 这个过程也非常有趣，我并没有特别深刻的研究，就我个人有限的理解，首先，我们需要各个公司的rating. 然后根据rating的transition matrix 可以得到每个公司每个grade 的闸门的level，然后通过simulation得到很多firm asset value 的path. 这一步就需要结合公司行业之间的correlation。 然后我们就能通过simulated asset value and threshold 去决定grade. 当有了公司的grade, 我们就能够通过不同评级自己的discount factor去计算bond 的价值，对于default的债券，就算它回复的价值，这样就能够算处某个path的情况下， bond portfolio的价值。这样我们就能有loss distribution了，我们就可以计算var之类的东西了。。

Do you know the kmv model?
This is a very interesting model, which is a typical structural model, which sees the company's stock as a bullish stake in the company's assets, strike on the face value of the bond, that is, when the company's asset value is higher than the bond value , The equity value is lower than the face value of the bond, Equity is worthless.
The value of the bond is the value of the bond. The value of the bond is the value of the bond. And the formula is very economic meaning, part of the asset is the recovery value, the other part is if the value of survival. We can tell that the value of PD is a certain value.DD is log different asset value and barrier value divided by asset volatility.
We can find the merton model used to calculate the PD is not accurate, so kmv brought edf as the probability of default. Many companies use this to rate
Another way to calculate PD is to use this company's rating, and past a rating of the historical default rate to calculate the transition matrix. Then through the matrix can be calculated cvar like.

These are some of the stand alone analysis methods, and there is no combination of correlation inside, when there is correlation in the inside, you need to use monte carlo simulation. This process is also very interesting, I did not particularly study, I personally Limited understanding, first of all, we need the rating of each company. Then according to the rating of the transition matrix we can get each level of each grade of the gate, and then through the simulation to get a lot of firm asset value of the path. This step will need to combine the company The correlation between. And then we can by the simulated asset value and threshold to determine grade. With the company's grade, we will be able to different rating their own discount factor to calculate the value of bond, for the default bond, even if it replies to the value, Can be considered in the case of a path, bond portfolio value. So we can have a loss distribution, and we can calculate the kind of things like var. The

2.10 Index Research

Friday, February 10, 2017
10:42 AM

Objective

The SGI PH Qlty Europe Index aims to track an equity basket offering to their owners an exposure to high quality shares by taking long position on stocks embedded in STOXX Europe 600 Index and uses a hedging mechanism to provide a market neutral exposure

Mechanism

LONG LEG:

The Quality scoring is based upon :

1. The Piotroski score which consists of:
   - Profitability factors: Return On Asset (ROA), Cash Flow from Operations divided by total assets (CFO), improving profitability and sales driving profit growth
   - Leverage and liquidity factors: Decreasing leverage, increasing liquidity and no issue of equity
   - Operating efficiency factors: Increase in operating margin and increasing turnover.
2. **Merton's Distance to default**
3. **Financials are excluded**

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGBVPHQE/>

The Profitability scoring is based upon (relative to sector) :

- The 12-month Trailing Return-on-Asset ratio (ROA)
- The 12-month Trailing Return-on-Equity ratio (ROE)
- The 12-month Trailing Return-on-Invested Capital ratio (ROIC)
- The 12-month Trailing Gross Profitability to assets ratio (GPO)

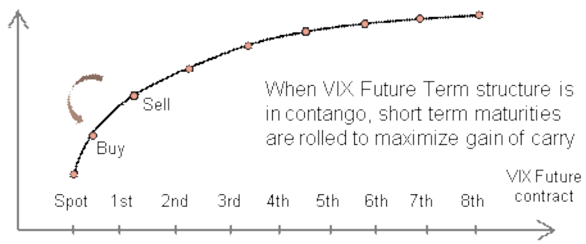
Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:SGBVPHPE/>

The Dynamic Short VIX Futures Index is a dynamic allocation between a hypothetical money market instrument and a dynamic strategy (the "Strategy") designed to provide efficient short exposure to the first two nearby futures contracts on the VIX Index.

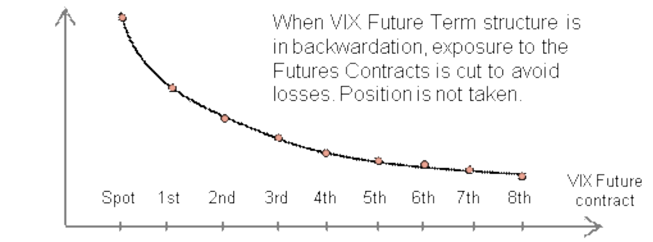
Mechanism

The Index tracks the performance of a hypothetical money market instrument in USD and a Strategy taking short positions on the 1st to 2nd VIX futures contracts.

When the VIX Future Term structure is in contango, the index hypothetically rolls short term futures to potentially generate a carry gain



When the VIX Future Term structure is in backwardation, the index doesn’t roll, which has the potential to avoid losses.



The figures used in this example are given for purely indicative purposes, the objective is to describe the mechanism of the product. It allows an understanding of how the product would have performed at different market stages over previous years, but is no guarantee as to future returns and has no contractual value.

Pasted from <https://sgi.sgmarkets.com/us/index-details/TICKER:DSVIX/>

Fund Objective:
The Fund seeks to generate capital appreciation in rising and falling markets.
Strategy Description:
The Fund seeks to generate capital appreciation in rising and falling markets using a model-based long/short strategy that invests primarily in exchange-traded funds, inverse exchange-traded funds and other mutual funds that are representative of various U.S. large cap equity indices.
The Fund's investment adviser utilizes a model in pursuing the Fund's investment objective. The model produces long or short signals by using technical analysis that attempts to gauge the direction of the overall market by determining market breadth. Market breadth is a technique used in technical analysis that seeks to determine overall market direction by analyzing the number of companies/sectors advancing relative to the number declining or which companies/sectors are exhibiting positive vs. negative momentum.
The model uses a multi-step process in portfolio construction:

- The model analyzes GICS (Global Industry Classification Standard) industry groups over multiple time frames using a combination if trend following and mean reversion indicators with each industry group determined to be bullish or bearish.
- Industry groups are then cap-weighted to generate the overall composite score which will determine a bullish or bearish market state.
- Market states can move between bullish and bearish market states based on the direction and magnitude of change in the overall composite score.
- The Adviser uses these signals in determining portfolio allocations between long and short equity positions. These components are combined in a rules-based framework which determines allocations of 100% long or 100% short positions in U.S. large cap equity indices. The Fund does not short securities but invests in inverse exchange-traded funds in implementing its "short" strategy.

Pasted from <http://www.cmgmutualfunds.com/mutual-funds/cmg-long-short/>

The Aptus Behavioral Momentum Index is designed to track the performance of 25 large US-traded equity securities. The proprietary index methodology developed by Aptus Captial Advisors quantitatively ranks large US companies based on a combination of momentum and irrational investor behavior and seeks to gain exposure to only the highest ranked stocks. The index has an added objective of capital protection during market downtrends, and is therefore risk managed in that it can vary between 100% long only exposure to stocks or 100% exposure to intermediate Treasury Bonds dependent on the overall market environment.

Pasted from <https://www.solactive.com/indices/?index=DE000SLA12M4>

2.23 Index Research

Thursday, February 23, 2017
11:15 AM

AlphaClone Hedge Fund Downside Hedged Index
Track the performance of equity based hedge fund position.

- Publicity disclosed.
- Highest ranking manager
- Hedge Tiggered on when SP500 clsoed below its 200 MA. Tiggered Off when above.
- Hedge - > long its holding and short spx 85% amount of long position.
- Rebalance quarterly. Keep the hedge for multiple month.
- Weights based on the overlap basis. Total number of holder will lead the weight to be high.
- Max weight= 5%, the rest of weight give to rest of component based on pre-adjusted weights.
- 550 hedge fund will filing 13F-HR. Then we can select 100 firm with highest score.
- Based on monthly excess return and fixed hurdle rate . Calculate the degree and persistaence of excess return historically for investment strategy.

- Aptus Behavioral Momentum Index
- based on a combination of momentum and irrational investor behavior and seeks to gain exposure to only the highest ranked stocks. The index has an added objective of capital protection during market downtrends, and is therefore risk managed in that it can vary between 100% long only exposure to stocks or 100% exposure to intermediate Treasury Bonds dependent on the overall market environment.
- Buffer rule: any existing stock will remain in index as long as its cobined ranking remain top 60%.
- Ranking based on total return over 120 trading day and proximity closing level on selection day to their respective 52 week high before selection day. Two ranking is equal weighted.
- Stop loss is based on MDD. If the MDD is larger than 10%, will invest bond. The exit rule is that closing level of index lies above its 100 day MA
- This strategy is track another index. If the index perform well. We will do something more about the component.

Customer Value Index

The Customer Value Index 200 (CVI 200) is derived from a research-based analysis that measures competitive position, social attributes, and authentic core values. The index tracks the price movements of the top 10% of North American listed companies with a market cap over $1 billion that score the highest in our proprietary process, uncovering Customer Value, Social Capital and long-term economic profitability. The CVI 200 is based on the concept that the companies best positioned to outperform in today's competitive environments are those that create exceptional value for customers by operating with a sense of authenticity, transparency, empathy and societal purpose, and consistently generate economic profit

Pasted from <https://www.solactive.com/indices/?index=DE000SLA1KJ1>

EFW (Energy, Food & Water) Efficiency Index

"**EFW Efficiency Index Limits**" captures the following criteria:

(a) Geographic Limits (maximum): South America: 10%; Asia: 20%; Europe: 25%; Middle East: 10%; North America: 60%; Africa: 5%, Oceania: 10%

(b) Category Limits:

EFW Universe - categories	Superior Limit	Inferior Limit
Energy Producers	20%	10%
Food Producers	35%	25%
Water Producers	10%	5%
EFW Efficiency Suppliers	25%	10%
EFW Consumers	30%	15%

The "**EFW Efficiency Scoreboard**" represents a proprietary methodology to quantify companies' capacity either 1) to capture Energy, Food and Water (EFW)-scarcity related growth opportunities or 2) withstand EFW-scarcity related price volatility. Results from the Scoreboard, combined with the EFW Efficiency Index Limits, lead to the final weights for the EFW Efficiency Index

Summery:

Alpha Clone Hedge Fund Downside Hedged Index

The idea is similar as our NXS Activist Index. But it has some different features.

- SPX hedge is triggered on(off) when SPX closes below(above) its 200MA
- Stocks are weighted based on the overlap basis. Total number of holder will lead to the weight of each stock
- Max Weight =5%, If weight is higher than 5%, the rest of weight is given to other components based on pre-adjusted weights
- Screen Hedge Funds based on the degree and persistence of monthly excess returns of their investment strategies.

We have a index high dividend and low vol.

We can also try a high dividend and low vol in the same time

Aptus Behavioral Momentum Index

- Ranking stock based on total return over 120 trading day and proximity closing level on selection day to their respective 52 week high before selection day. Two rankings are equal weighted.
- Stop Loss based on MDD. If the MDD is larger than 10%, strategy will invest 100% bond. Reinvest when closing level of objective index is higher than 100D MA
- Buffer rule: any existing stocks will remain in index as long as it's combined ranking remain top 60%
- This index is based on Parents Index=> when Parents Index perform well, we will rank and invest the component of Parent Index.

MDD makes more sense

2.24 Index Research

Friday, February 24, 2017
4:19 PM

Hanlon Tactical Dividend and Momentum Index
Each time Hanlon's proprietary sector tactical overlay algorithms determine a particular sector is on a "buy," the Index buys the five highest dividend yielding and five highest momentum stocks from that particular sector. This is an equal weight index with respect to sector exposure (11.1%) as well as individual stock exposure (1.11%). When all nine sectors are on a buy, the Index will be fully invested in ninety stocks (ten stocks in each sector). When the proprietary sector tactical overlay algorithms determine a sector is on a "sell," the Index will move to a defensive position with respect to that particular sector by selling all stocks in that sector, and will hold Cash, Cash Equivalents, or US Treasuries until the next "buy" signal. When none of the sectors are on a buy, the Index will be fully defensive, meaning that all of the Index's assets will be invested in Cash, Cash Equivalents, or US Treasuries. The Index is calculated and published on a daily basis by Solactive AG and is available on their website. The Index methodology and composition are evaluated by the adviser annually.

Momentum is measured by a proprietary factor calculation using the rate of change.
Momentum is used to be determined by Average Directional index and average true range. Now it is ROC

Investir 10 - Grandes Valeurs
-benefit from a well recognised know-how which enables them to increase their prices without affecting
their sales volumes ("pricing power");
-have well established activities in emerging countries so that they can benefit from a growth higher than in Europe; and
-are less dependent on evolutions in the world GDP ("non cyclical" companies)

J.P. Morgan Equity Risk Premia - Europe Low Beta Factor Long Only Index
Risk premia factor Normalized

3.3 Index Research

Friday, March 03, 2017
7:46 AM

The Base Index is rebalanced annually over a five day period (the “Base Index Rebalancing Period”) beginning on the day that is three Index Business Days after the
applicable Base Index Observation Day and including the four following Index Business
Days. Each Index Business Day in a Base Index Rebalancing Period will be deemed a
“Base Index Rebalancing Day”. On each Base Index Rebalancing Day, component changes are made after the close of markets and become effective at the opening on the next trading day

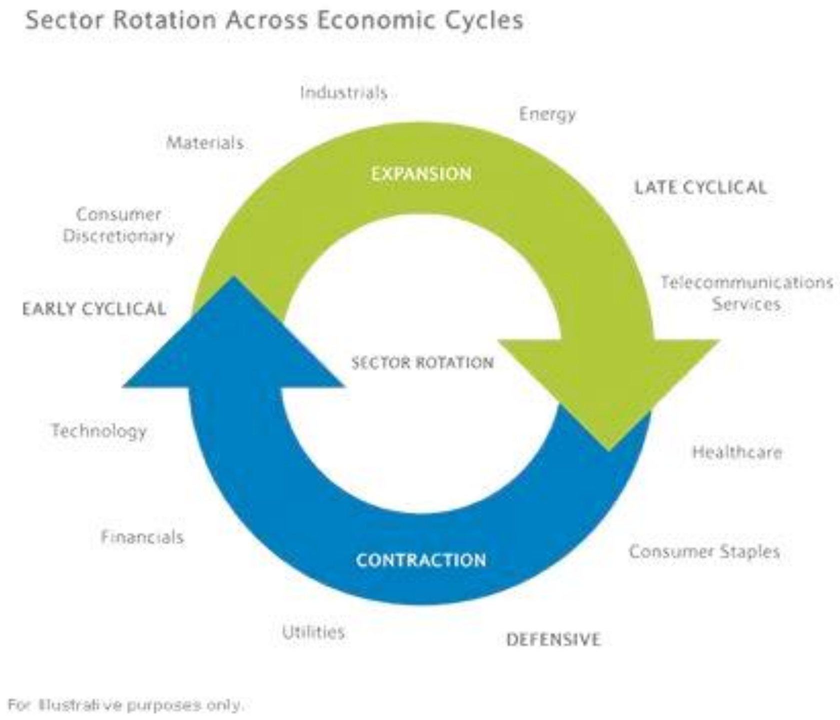
Motif thematic index (Goldman Sachs)

1. Identify companies with keyword matches
    a. Companies providing therapies for medical conditions disproportionately affecting seniors
        i. Find the diseases related with aging or adult using data in Tables of summary health statistics
        ii. Match the companies regulatory filing with keyword such as "Cancer", "Oncology"
    b. Companies providing age-restricted services used by seniors
        i. Matches the key work like "Independent living facilities"
2. Apply Stock Screen
    a. Average Daily Dollar Volume
    b. Capital
    c. Price .1
    d. Revenue > 25M
    e. More than 90 days historical price
3. Apply Thomson Reuters Business Classification Screen
    a. Exclude the stock which are not classified as healthcare or real estate
4. Calculated Exposure to Aging American Theme
    a. Measure = Total Theme Revenue / Total Revenue
        i. Total Theme Revenue Determined By key word matched revenue stream. (Very complicate rules)
5. Equal Allocation

Top-down investing involves analyzing the "big picture". Investors using this approach look at the economy and try to forecast which industry will generate the best returns. These investors then look for individual companies within the chosen industry and add the stock to their portfolios. For example, suppose you believe there will be a drop in interest rates. Using the top-down approach, you might determine that the home-building industry would benefit the most from the macroeconomic changes and then limit your search to the top companies in that industry.
Conversely, a bottom-up investor overlooks broad sector and economic conditions and instead focuses

on selecting a stock based on the individual attributes of a company. Advocates of the bottom-up approach simply seek strong companies with good prospects, regardless of industry or macroeconomic factors. What constitutes "good prospects", however, is a matter of opinion. Some investors look for earnings growth while others find companies with low P/E ratios attractive. A bottom-up investor will compare companies based on these fundamentals; as long as the companies are strong, the business cycle or broader industry conditions are of no concern.

Pasted from <http://www.investopedia.com/ask/answers/193.asp>



Geography and sector are key drivers of global equity risk and return

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Market sentiment generates momentum effects in indices, which leads to concentration risk that builds and collapses

l

A more diversified portfolio can help mitigate concentration risk and downside ris

Pasted from <http://www.qsinvestors.com/wp-content/uploads/2013/06/DBI-White-Paper-Dec-2012-2.pdf>

Diversification Based investing
Using Up-Down Method.

1. Partition
   a. Classify the stocks by geography and sector.
2. Cluster
   a. Group units based on correlation
3. Weight
   a. Equally weight the stocks and unites
4. Rebalance

a. Quarterly rebalance + annually update

Cluster Example:

1. Global Energy
2. Asian Cyclical and Material
3. European Non- Cyclical
4. Global Health Care and Non Cyclicals
5. Americas and European Cyclicals
6. American IT and Telecom

Rationale:

1. Geography and Sector are key drivers of global euqity risk and return
2. Market sentiment generates momentum effects in indices which leads to concentration risk that builds and collapses
3. Diversified portfolio can help mitigate concertration risk and downside risk

Solactive Eurozone Exporters Efficient Index
Mean-Variance variation

2. Based on the final index selection of n stocks, on each Selection Day, an optimization algorithm determines weights for the stocks which would lead to minimal portfolio volatility.

$$\min_{w} w'\Sigma w$$

Subject to the constraints

$$\sum_{i=1}^{n} w_i = 1$$

$$w_i \geq 0, i = 1, \ldots, n$$

$$w_i \leq w^{max}, i = 1, \ldots, n$$

With

w = n-dimensional vector of weights with generic element w_i

Σ = n-by-n-dimensional variance-covariance matrix (using 125 daily returns)

w^{max} = the maximum weight of each stock (5%)

In a second step, the 30 stocks with the highest weights from the above optimization are chosen and adjusted (the target weights of the other stocks are set to 0). The target weights for these 30 stocks are calculated as follows:

$$w_i^{target} = \begin{cases} w^{max}, if\ w_i = w^{max} \\ \dfrac{w^s}{(30 - n_{w^{max}})}, if\ w_i < w^{max} \end{cases}$$

With

$w^s = 1 - n_{w^{max}} * w^{max}$

$n_{w^{max}}$ = Number of stocks whose weight from the optimization step is equal to w^{max}

Pre-filter
The Solactive Debt/Equity-Ratio Index includes the 10 companies with the lowest debt/equity ratio out of the 100 largest companies globally with a maximum of two companies per sector. The index is calculated as a total return index in USD.

Guru Activist index
Variation based on different level of information
Quarterly find the highest 50
Monthly check the order. If the current member is 60+, keep, if something new is 40+, we will add it into basket.

Solactive Insider Performance-Index
The Solactive Insider Index includes German companies which have had the highest ratio of company insider share purchases in comparison to the market capitalization in the most recent quarter. 15 components are included which are weighted equally. The index is calculated as a total return index in EUR.
anyone can log into the SEC's Edgar database (sec.gov/info/edgar.shtml) and collect that data free

3.6 Index Research

Monday, March 06, 2017
9:11 AM

Diversification Based Investing
Using Up-Down Method.

1. Partition
   a. Classify the stocks by geography and sector.
2. Cluster
   a. Group units based on correlation
3. Weight
   a. Equally weight the stocks and unites
4. Rebalance
   a. Quarterly rebalance + annually update

Cluster Example:

1. Global Energy
2. Asian Cyclical and Material
3. European Non- Cyclical
4. Global Health Care and Non Cyclicals
5. Americas and European Cyclicals
6. American IT and Telecom

Rationale:

1. Geography and Sector are key drivers of global equity risk and return
2. Market sentiment generates momentum effects in indices which leads to concentration risk that builds and collapses
3. Diversified portfolio can help mitigate concentration risk and downside risk

Solactive Eurozone Exporters Efficient Index
Mean-Variance variation

2. Based on the final index selection of n stocks, on each Selection Day, an optimization algorithm determines weights for the stocks which would lead to minimal portfolio volatility.

$$\min_{w} w'\Sigma w$$

Subject to the constraints

$$\sum_{i=1}^{n} w_i = 1$$
$$w_i \geq 0, i = 1, \dots, n$$
$$w_i \leq w^{max}, i = 1, \dots, n$$

With

w = n-dimensional vector of weights with generic element w_i

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w^{max} = the maximum weight of each stock (5%)

In a second step, the 30 stocks with the highest weights from the above optimization are chosen and adjusted (the target weights of the other stocks are set to 0). The target weights for these 30 stocks are calculated as follows:

$$w_i^{target} = \begin{cases} w^{max}, if\ w_i = w^{max} \\ \dfrac{w^s}{(30 - n_{w^{max}})}, if\ w_i < w^{max} \end{cases}$$

With

$w^s = 1 - n_{w^{max}} * w^{max}$

$$\left(\frac{}{(30 - n_{w^{max}})}, if\ w_i < w^{max}\right.$$

With

$w^s = 1 - n_{w^{max}} * w^{max}$

$n_{w^{max}}$ = Number of stocks whose weight from the optimization step is equal to w^{max}

Pre-filter
The Solactive Debt/Equity-Ratio Index includes the 10 companies with the lowest debt/equity ratio out of the 100 largest companies globally with a **maximum of two companies per secto**r. The index is calculated as a total return index in USD.

Guru Activist index
Variation based on **different level of information**
Quarterly find the highest 50
Monthly check the order. If the current member is 60+, keep, if something new is 40+, we will add it into basket.

Solactive Insider Performance-Index
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anyone can log into the SEC’s Edgar database (sec.gov/info/edgar.shtml) and collect that data free

Gold Hedged Index
The hedge only protects against adverse movements in the relative value of the U.S. dollar, as expressed in the dollar price of gold.
R_hedged=Return_SPTR+HedgeRatio*R_Gold
HedgeRatio=1
Long Gold Future, roll to the next desinated contract at the close of business on the fifth to the last business day.
Rebalance Monthly to make sure notional exposure is matched. If difference of exposure larger than 10%, rebalance. If the sum of return is more than 20% or less than -20%, rebalance as well.

3.10 Index Research

Friday, March 10, 2017
2:43 PM

Momentum Calculation

As of the rebalancing reference date, momentum value is calculated for each of the stocks in the eligible universe. The momentum value is computed as the 12-month price change, excluding the most recent month of the security. If 12 months of price history is not available, momentum value is calculated from nine months of price history. The effective rebalancing month is stated as month (*M*).

$$\text{Momentum Value} = \left(\frac{price_{M-2}}{price_{M-14}} \right) - 1$$

or

$$\text{Momentum Value} = \left(\frac{price_{M-2}}{price_{M-11}} \right) - 1 \quad \text{if 12 months of price history is not available.}$$

The 12-month price momentum is calculated for all stocks in the eligible universe. Additionally, the 12-month betas relative to the underlying index are computed for the eligible universe. If 12 months of pricing is unavailable, then the nine-month momentum and nine-month betas are calculated.
See Appendix A for Momentum and Beta calculations.
2. Stocks that rank in the bottom 50% by momentum or the bottom 25% by beta are removed from the eligible universe.
3. Based on each stock's historical dividend payment cycle or a declared payment calendar change, the remaining stocks after Step 2 are evaluated to determine their next dividend payment ex-date.
4. The 50 stocks with the highest betas that are expected to have a dividend ex-date in the subsequent calendar month are selected and form the index.
5. If less than 50 stocks have been selected in Step 4, then the stocks with the highest betas that are not expected to have a dividend ex-date in the subsequent calendar month are selected for index inclusion until the constituent count reaches 50.

Way to improve risk premia(by checking the underperformance stock -> see whether the logic hold.)
1. Annual dividends per share (DPS)
2. Annual Earnings per share (EPS)
3. Par value per share (PVPS)

At each annual rebalancing, eligible companies must meet the following criteria:
1. The most recent DPS/EPS must be 4% or greater and less than 100%.
2. The DPS/EPS for at least seven of the past nine years must be at least 4%.
3. The DPS/PVPS for at least seven of the past nine years must be at least 4%.
Companies that do not satisfy the above criteria are excluded from index consideration. Those companies meeting the criteria detailed above are selected and form the index.

Dow Jones U.S. Thematic Market Neutral Low Beta Index
Easy to do. Good feature

We Believe The Fundamental Index Strategy:

- Uses fundamental variables that don't depend on the fluctuations of market valuation
- May be less influenced by market bubbles
- Seeks to avoid overweighting overvalued stocks — a potential with market-cap-weighted indexes
- Provides an alternative to traditional market-cap-weighted indexes
- Preserves the benefits of traditional passive indexing, i.e. broad economic representation, high liquidity and capacity and low cost.

We Believe Cap-Weighted Index Strategies:

- Incorporate analysts' optimistic growth projections
- Use outdated research technology
- Overweight overpriced stocks
- Underweight underpriced stocks
- Fully participate in market speculation
- Are distorted measures of the economy
- Display substantial growth bias

The RAFI methodology assigns weights based on the economic size of a company and can help to reduce the performance drag caused by the overweighting of overvalued securities and underweighting of undervalued securities inherent in traditional market capitalization weighted indices, while still maintaining the benefits of traditional passive indexing, i.e. broad economic representation, high liquidity and capacity and low cost.

3.15 Index Research

Wednesday, March 15, 2017
8:37 AM

Mitigating Tail Risk
Stop Loss: Simple, reactive
Use Derivative: Time Sensitive, Potential Expensive
Subjective approach: Subjective, Perceived as black box
Quantitative Model: Reactive, Objective
Quantitative Model:

Mitigating Tail Risk

Approach	Description	Remarks
Stop Loss Mechanism	Divest from risky assets when the market drops to a predetermined barrier	• Simple • Reactive
Use Derivatives	Derivatives such as options or futures to provide downside protection	• Timing sensitive • Potentially expensive
Subjective approach	For example "bonus smoothing" Gradually divest from equities in good years	• Subjective • Perceived as black box
Quantitative Models [Reactive]	Rule based asset allocation such as CPPI or volatility target strategies	• Reactive • Objective
Quantitative Models [Forecasting]	Fundamental research based quantitative models	**Equity Markets ARPI and Risk Control Framework**

3.20 Index Research

Monday, March 20, 2017
5:39 PM

3.21 Index Research

Tuesday, March 21, 2017
10:02 AM

3.28 Index Research

Tuesday, March 28, 2017
8:54 AM

By Cameron Crise
(Bloomberg) -- Given the ascendancy of passive investing over active management these days, there's nothing I love more than a good fixing model.
* NOTE: Fixing models seek to extract alpha from the predictable herding behavior of passive investors, typically around fixed calendar events like month-end rebalancing. While currency hedge adjustments are a popular class of fixing model, probably the most notable is the monthly equity/bond re-allocation from
pension funds. * JPMorgan's Marko Kolanovic and Bram Kaplan wrote a note on this a few years ago. I updated their work to see if there was still value in trading month-end flows.
* The idea behind the model is a simple one. If stocks outperform bonds, by the end of the month pension funds will be overweight versus benchmarks and need to sell stocks and buy
bonds to return to the target asset allocation. If bonds outperform, the same principle applies in the opposite
direction.
* Using the S&P 500 Total Return Index and the Bloomberg Barclays Treasury Total Return Index, I modeled month-to-date returns since 1994. With five business days to go in each month, I determined which asset (stocks or bonds) had performed better on a month-to-date basis and assumed that pension funds would sell that asset class to buy the underperformer. I then tracked the performance of going long the underperformer and short the outperformer until the end of the month, at which point the trade was closed.
* It turns out there is quite a bit of alpha in these signals. While the performance of the strategy dipped soon after JPMorgan published the note, over the past couple of years the returns have been solid, particularly in bond markets. Click here for a chart that plots the return curves of the model components since 2000. (Note that this model assumes equal nominal trade amounts between stocks and bonds, rather than equal risk-weighted trade amounts.)
* As you can see, the performance has been pretty good for some time now. (It yielded negligible returns in the 1990s.) The model also works over different time frames; I tested trading seven days and three days before month end. Each were profitable, though not as good as trading five days before. Summary performance statistics are set out in a table you can click here to see.
* Note that over the past five years, the information ratio of the bond model has exceeded 1.0; that's not too shabby for such a simple signal. These results may not reflect real-world performance (there are no transaction costs included), but the strength and persistence of the signals suggests that there is real information content there.
* Although I cannot provide investment advice, I observe that we are five business days before month-end. As of last night's close, bonds have outperformed stocks this month according to my input indices. Do with that information what you will.

* And if you are an investor that engages in periodic asset-allocation rebalancing, consider an alternative to doing so at month-end.

* NOTE: Cameron Crise is a macro strategist who writes for Bloomberg. The observations made are his own and are not intended as investment advice.

4.27 Index Research

Thursday, April 27, 2017
2:06 PM

- Hedge Fund highly leverage. Get margin call and investor redemption. So create massive sell off