Deutsche Bank
Markets Research

Global

Quantitative Strategy

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Proceedings from our 2012 Global Quant Strategy Conference

Innovative but practical ideas from academia

Bridging the gap between theory and practice

Deutsche Bank held its first annual Global Quantitative Strategy Conference in New York on November 16th. The event was attended by nearly 300 buy-side investment professionals who participated in two tracks – one focusing on bottom-up stock selection and one targeting top-down macro investing.

Ten presentations across two tracks

The ten speakers who presented were drawn from the best of academia and industry, with an emphasis on those doing cutting-edge but practical research. The goal with every talk was that each would contain at least one useful, implementable idea. We think the speakers met, and indeed exceeded, that expectation. In this report, we try to summarize some of those ideas.

Debating the hot topics in the world of quant

The conference also featured two interactive panel discussions on two of the hot topics in the quant world. On the bottom-up stock selection track, our panelists debated the question "Are low risk strategies here to stay?"; meanwhile, upstairs in the macro investing track, the question "Alternative beta – has their time finally come?" was equally well contested.

Rochester Cahan, CFA
rochester.cahan@db.com

Marco Salvini
marco.salvini@db.com

Miguel-A Alvarez
miguel-a.alvarez@db.com

Jean-Robert Avettand-Fenoel
jean-robert.avettand-fenoel@db.com

Zongye Chen
john.chen@db.com

Javed Jussa
javed.jussa@db.com

Ada Lau
ada-cy.lau@db.com

Khoi Le Binh
khoi.lebinh@db.com

Yin Luo, CFA
yin.luo@db.com

Spyros Mesomeris, Ph.D
spyros.mesomeris@db.com

Sheng Wang
sheng.wang@db.com

Yiyi Wang, Ph.D
yiyi.wang@db.com

North America: +1 212 250 8983
Europe: +44 20 754 71684
Asia: +852 2203 6990

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A letter to our readers

It's a macro world out there

We were delighted to host almost 300 of you at Deutsche Bank's 1st annual Global Quantitative Strategy Conference in New York earlier this month. Markets have been tough this year, so we really appreciate you taking time out from your busy schedules to share your day with us.

The conference was run as two separate tracks. The first focused on bottom-up quantitative stock selection and the second targeted top-down macro investing. Both are important, and increasingly both approaches are being used simultaneously in holistic systematic strategies. This is a response to the current environment which is challenging for traditional bottom-up quantitative strategies. Big macro themes are dominating investors' thinking, and as a result assets are being priced less on fundamentals and more on their exposure to macro risk. This makes it difficult for the old quant factors, which play mainly on company-level characteristics, to add as much value as they did in the past. What we need is a way to inject the macro world into systematic models. If there is one common theme running through the conference program, it is the idea of melding the macro world into the micro world. We believe that it is no longer sufficient to run a systematic strategy in a vacuum devoid of top-down macroeconomic inputs.

In this report, we summarize the key takeaways from each talk. For those of you who were able to attend, we hope it will be a useful document to augment your own notes. For those who couldn't make it, we hope this will give you a flavor of the topics discussed. Either way, we hope you can join us for next year's conference!

Regards,
Deutsche Bank Global Quantitative Strategy

Conference agenda

Figure 1: Presentation schedule from Deutsche Bank's first annual Global Quant Strategy Conference

Track 1: Bottom-Up Quant Equity	Track 2: Top-Down Macro Investing
Zhi Da, University of Notre Dame A Tale of Two Markets - Combining Securities Lending and Options Data	Pierluigi Balduzzi, Boston College Survey Forecasts and the Time-varying Second Moments of Stock and Bond
Turan Bali, Georgetown University Dynamic Conditional Beta is Alive and Well in the Cross-Section of Daily Stock Returns	Steven Thorley, Brigham Young University Low-Risk Portfolio Construction: What the Math Can Tell Us
Nusret Cakici, Fordham University The Joint Cross-Section of Stocks and Options	Ronnie Sadka, Boston College Liquidity Risk and Security Prices
Lin Peng, City University of New York Liquidity Shocks and Market Reactions	Marcos Lopez De Prado, Tudor Investment Markowitz meets Darwin: Portfolio Oversight and Evolutionary Divergence
Panel Discussion: Are Low-Risk Strategies Here to Stay? *- Christopher Guthrie, CEO & CIO, Hillsdale Investment (Canada)* *- Matthew Rothman, Head of Quantitative Global Macro Research, Acadian* *- Ross Garon, MD - Quantitative Strategies, SAC Capital Advisors* *- Sven Thiessen, Head of Quantitative Products, Deka (Germany)*	Alternative Beta: Has Their Time Finally Come? *- Andrew Chin, Global Head of Quantitative Research, AllianceBernstein* *- Carlos Chujoy, PM - Strategic Research, Employees Retirement System of Texas* *- David Long, CIO, Healthcare of Ontario Pension Plan (Canada)* *- Frank Nielsen, MD - Quantitative Research - Global Asset Allocation, Fidelity* *- Wai Lee, CIO - Quantitative Investment Group, Neuberger Berman*
Attilio Meucci, SYMMYS Quantitative Risk Management for Hedge Funds: a Visual Introduction	Andrea Vedolin, London School of Economics Bond Variance Risk Premia

Source: Deutsche Bank

Track 1: Bottom-Up Quant Equity

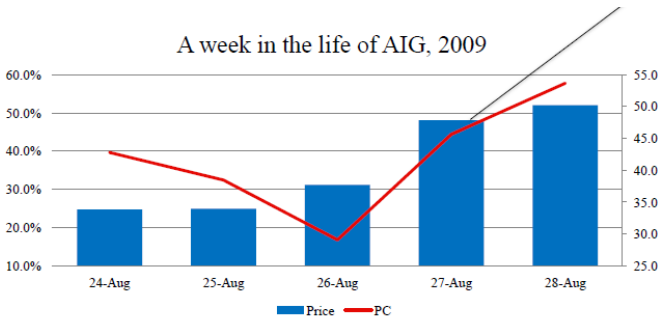
A Tale of Two Markets

- Associate Professor Zhi Da, University of Notre Dame
- Abstract: "Buying put options and shorting are two ways investors can express negative opinions about a stock. As a result, both the short interest and a put-call ratio, which measures the imbalance between open buys of calls and puts, negatively predict stock return. By combining proprietary datasets on daily equity lending and option trading, we find that while these two variables are uncorrelated on average, they interact in two interesting ways. Among stocks with low put-call ratios, very high short interest may actually predict higher stock return over a horizon up to a week, consistent with a "short squeeze" where short sellers are forced to cover their positions as positive information arrives at the market. Among stocks with high short interest, the predictive power of put-call ratio is more than doubled, consistent with the notion that as short-sale constraints become binding for the underlying stock, the option market becomes a better place to reveal negative opinion."

Key takeaways

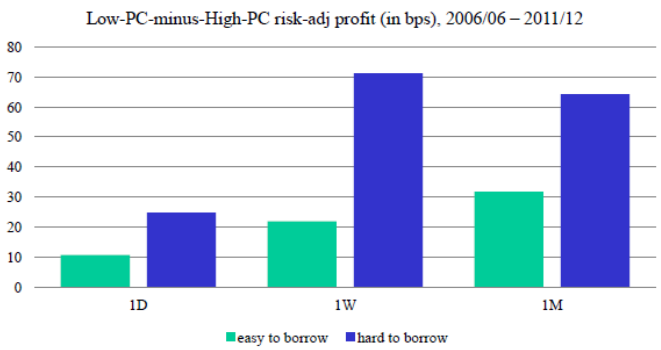
- The interaction between sentiment in the securities lending market (measured with short interest) and the options market (measured with put-call ratio) is important, and can be a useful stock selection signal.
- Past research has shown that stocks with high short interest tend to underperform in the future on average. However, this research shows that stocks with high short interest but positive options sentiment on average have higher returns in the next week.
- This is a useful short squeeze indicator: watch options market sentiment for an early warning of an impending squeeze, e.g. see Figure 2 for a classic example.
- The second key result is that options sentiment is a more powerful future return predictor for stocks that have high short interest – see Figure 3.

Figure 2: A classic short squeeze



Source: Professor Zhi Da

Figure 3: Return spread for high-low Put-Call ratio stocks



Source: Professor Zhi Da

Dynamic Conditional Beta is Alive and Well in the Cross-Section of Daily Stock Returns

- Professor Turan Bali, Georgetown University
- Abstract: "This paper investigates the significance of dynamic conditional beta in predicting the cross-sectional variation in expected stock returns. The results indicate that the time-varying conditional beta is alive and well in the cross-section of daily stock returns. Portfolio-level analyses and firm-level cross-sectional regressions indicate a positive and significant relation between dynamic conditional beta and future returns on individual stocks. An investment strategy that goes long stocks in the highest conditional beta decile and shorts stocks in the lowest conditional beta decile produces average returns and alphas of 8% per annum. These results are robust to controls for size, book-to-market, momentum, short-term reversal, liquidity, co-skewness, idiosyncratic volatility, and preference for lottery-like assets."

Key takeaways

- The CAPM model assumes an unconditional world where all investors are single-period, risk-averse, utility maximizers. But in practice investors are concerned about multiple periods and expectations change frequently.
- Therefore, instead of using the static CAPM beta to measure risk, we should use a conditional beta that can change over the business cycle.
- Introduces the Dynamic Conditional Beta (DCC), which is time-varying and determined by solving the system of equations in Figure 4, using trailing 252 day returns.
- At a daily frequency, the DCC beta positively and significantly predicts day-ahead stock returns, whereas for a variety of other more traditional beta metrics, the day-ahead return spread between high and low beta names is insignificant (Figure 5).
- However, for those who rebalance less frequently than daily, the results are less useful, because the positive relationship does not persist beyond a few days.[1]

Figure 4: Computing the DCC beta

$$
\begin{aligned}
R_{i,d+1} - r_{f,d+1} &= \alpha_0^i + \sigma_{i,d+1} \cdot u_{i,d+1}, \\
R_{m,d+1} - r_{f,d+1} &= \alpha_0^m + \sigma_{m,d+1} \cdot u_{m,d+1}, \\
E_d[\varepsilon_{i,d+1}^2] \equiv \sigma_{i,d+1}^2 &= \beta_0^i + \beta_1^i \sigma_{i,d}^2 u_{i,d}^2 + \beta_2^i \sigma_{i,d}^2 \\
E_d[\varepsilon_{m,d+1}^2] \equiv \sigma_{m,d+1}^2 &= \beta_0^m + \beta_1^m \sigma_{m,d}^2 u_{m,d}^2 + \beta_2^m \sigma_{m,d}^2 \\
E_d[\varepsilon_{i,d+1}\varepsilon_{m,d+1}] \equiv \sigma_{im,d+1} &= \rho_{im,d+1} \cdot \sigma_{i,d+1} \cdot \sigma_{m,d+1} \\
\rho_{im,d+1} &= \frac{q_{im,d+1}}{\sqrt{q_{ii,d+1} \cdot q_{mm,d+1}}}, \\
q_{im,d+1} &= \overline{\rho_{im}} + a_1 \cdot (u_{i,d} \cdot u_{m,d} - \overline{\rho_{im}}) + a_2 \cdot (q_{im,d} - \overline{\rho_{im}}),
\end{aligned}
$$

$$
BETA_{i,d+1}^{DCC} = \frac{\sigma_{im,d+1}}{\sigma_{m,d+1}^2}.
$$

Source: Professor Turan Bali

Figure 5: Day-ahead return spread for traditional betas

	$BETA_{CAPM}$		$BETA_{FF}$		$BETA_{SW}$		$BETA_{Dimson}$	
Decile	RET	$BETA_{CAPM}$	RET	$BETA_{FF}$	RET	$BETA_{SW}$	RET	$BETA_{Dimson}$
1 (Low)	11.36	0.37	10.70	0.35	11.31	0.32	11.39	0.14
2	11.76	0.59	11.72	0.59	12.36	0.57	12.35	0.48
3	13.39	0.71	13.67	0.73	11.54	0.71	12.51	0.67
4	13.43	0.81	12.42	0.84	13.20	0.83	13.18	0.82
5	13.38	0.91	13.37	0.94	13.59	0.93	14.66	0.96
6	12.92	1.01	13.13	1.05	14.54	1.04	13.44	1.10
7	13.79	1.12	14.94	1.16	14.57	1.16	14.54	1.25
8	14.44	1.26	15.20	1.30	14.56	1.31	15.05	1.44
9	15.24	1.48	14.34	1.51	15.07	1.52	14.41	1.70
10 (High)	15.18	1.96	15.41	1.95	14.17	2.00	13.37	2.33
High - Low	3.82		4.71		2.86		1.98	
	(0.95)		(1.18)		(0.71)		(0.56)	
FFC4	3.83		3.60		2.67		2.25	
alpha	(1.18)		(1.15)		(0.86)		(0.80)	

Source: Professor Turan Bali

[1] In fact, in our own research, we found the relationship between DCC beta or CAPM beta and *month*-ahead stock returns was fairly similar (negative in both cases). See Cahan et al., "Disentangling the Downside", 5 November 2012.

The Joint Cross Section of Stocks and Options

- Professor Nusret Cakici, Fordham University
- Abstract: "Option volatilities have significant predictive power for the cross section of stock returns and vice versa. Stocks with large increases in call implied volatilities tend to rise over the following month and increases in put implied volatilities forecast future decreases in next-month stock returns. The spread in average returns and alphas between the first and fifth quintile portfolios formed by ranking on lagged changes in implied call volatilities is approximately 1% per month. Going in the other direction, stocks with high returns over the past month tend to have call option contracts that exhibit increases in implied volatility over the next month, but realized volatility for those stocks tends to decrease."

Key takeaways

- The change in call or put implied volatility factor is defined by using the interpolated volatility surface to find the one month change in implied volatility for a hypothetical call or put option with certain characteristics (e.g. 30 days to maturity, at-the-money, 0.5 delta, etc.).
- Interestingly, at the stock level the change in call implied volatility factor has only a 57% correlation with the change in put implied volatility, on average. This is because change in call IV better predicts positive future returns whereas change in put IV better predicts negative future returns (but not significantly so).
- The average month-ahead return spread for the high-low change in call IV portfolio is around 1% (see Figure 6), whereas the return spread for change in put IV negative but is not significant (Figure 7).
- However, given their negative correlation, there is value in combining change in call and put implied volatility into a single factor. We have done this in our own research and found this factor to be moderately useful as a stand-alone factor, but very useful as an ingredient in a wider composite options sentiment factor.[2]

Figure 6: Change in call IV portfolios

	Return	CAPM Alpha	FF3 Alpha	FF4 Alpha
Low ΔCVOL	0.10	–0.53	–0.69	–0.38
2	0.50	–0.07	–0.32	–0.16
3	0.80	0.25	–0.04	0.10
4	1.00	0.42	0.15	0.34
High ΔCVOL	1.07	0.41	0.21	0.58
Avg. 5-1 Diff.	0.97	0.94	0.90	0.96
t-stat.	(3.37)	(3.59)	(3.37)	(3.18)

Source: Professor Nusret Cakici

Figure 7: Change in put IV portfolios

	Return	CAPM Alpha	FF3 Alpha	FF4 Alpha
Low ΔPVOL	0.60	–0.04	–0.19	0.15
2	0.72	0.14	–0.10	0.07
3	0.89	0.34	0.06	0.18
4	0.84	0.26	–0.01	0.15
High ΔPVOL	0.45	–0.21	–0.41	–0.04
Avg. 5-1 Diff.	–0.15	–0.17	–0.22	–0.19
t-stat.	(–0.62)	(–0.93)	(–1.29)	(–0.95)

Source: Professor Nusret Cakici

[2] For more details, see Cahan et al., "The Options Issue", 12 May 2010.

Liquidity Shocks and Market Reactions

- Associate Professor Lin Peng, City University of New York
- Abstract: "This paper investigates how the stock market reacts to firm level liquidity shocks. We find that negative and persistent liquidity shocks not only lead to lower contemporaneous returns, but also predict negative returns for up to six months in the future. Long-short portfolios sorted on past liquidity shocks generate a raw and risk-adjusted return of more than 1% per month. This economically and statistically significant relation is robust across alternative measures of liquidity shocks, different sample periods, and after controlling for various risk factors and firm characteristics. Furthermore, the documented effect is stronger for small stocks, stocks with low analyst coverage and institutional holdings, and for less liquid stocks. Our evidence suggests that the stock market underreacts to firm level liquidity shocks, and that this underreaction can be driven by investor inattention as well as illiquidity."

Key takeaways

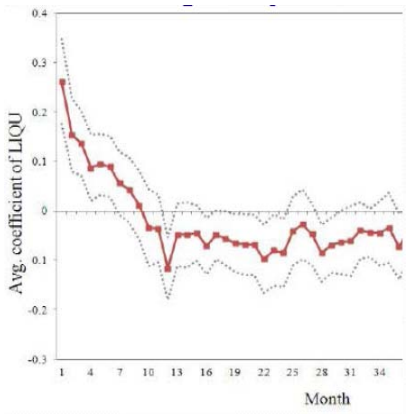
- Constructs a simple liquidity shock factor (LIQU) as the time-series z-score $LIQU_{i,t} = (LIQ_{i,t} - \overline{LIQ_i}) / \sigma(LIQ_i)$ where $LIQ_{i,t} = -|return| / volume$ is the negative of the Amihud illiquidity ratio for stock i at time t.
- Shows that a decile spread portfolio that goes long stocks with large increases in liquidity and short stocks with large decreases in liquidity generates a month-ahead return spread of 123 bps (Figure 8).
- The decay of the signal is surprisingly slow – around six months – despite the fact that the factor is measuring something that we might think of as short-term, i.e. a liquidity shock (Figure 9).
- What is the economic rationale for this result? The author argues that this anomaly is a manifestation of the investor inattention hypothesis; because liquidity shocks are harder to define and less easily measured, investors tend to initially underreact to such events.
- Support for this argument comes from the fact that the performance of the factor is weaker in the subset of stocks with higher "attention", as proxied through institutional ownership, analyst coverage, and market cap.

Figure 8: Return spread for decile portfolios

LIQU Decile	Avg. RET	Alpha
1 (Low)	0.35	-0.94
	(0.27)	(-5.69)
	...	...
10 (High)	1.58	0.48
	(4.45)	(5.25)
High-Low	**1.23**	**1.42**
	(5.86)	(6.67)

Source: Professor Lin Peng

Figure 9: Decay profile for signal



Source: Professor Lin Peng

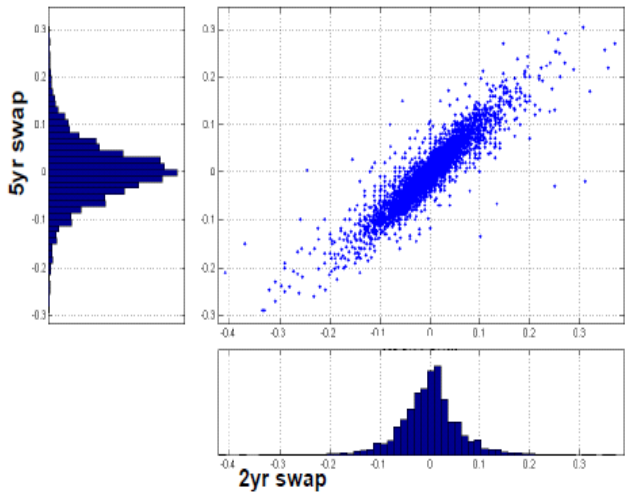
Quantitative Risk Management for Hedge Funds: a Visual Introduction

- Dr. Attilio Meucci, SYMMYS
- Abstract: "We show how to: (a) Monitor the P&L in different market conditions using Fully Flexible Probabilities and Entropy Pooling; (b) Stress-test jointly market risk and liquidity risk via Conditional Convolution; and (c) Stress-test extreme events scenarios via Panic Copula"

Key takeaways

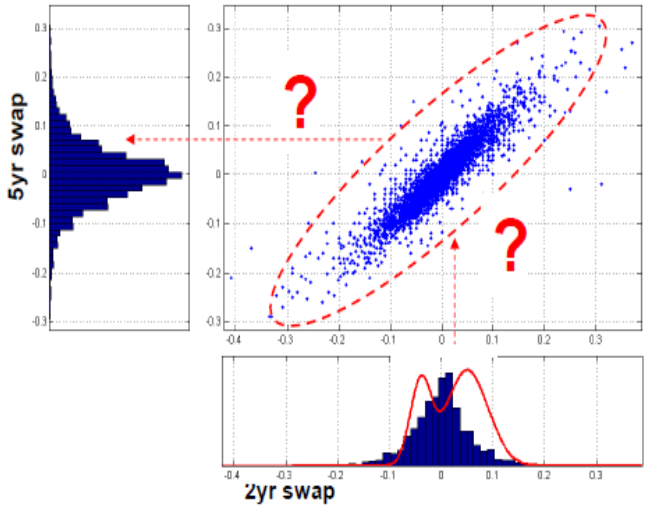
- Presentation walked through a visual framework for stress testing (illustrated nicely with a couple of snazzy video animations). In the case study, the author assumed a fixed income portfolio driven by two factors – the two and five year swap rate – and then proceeded to force a new distribution on one of the factors to see what happens to P&L (see Figure 10 for the starting case).
- Now, suppose we want to impose a view on one of the factors, say the two year swap rate (Figure 11). How can we model this new distribution? The idea is to use the concept of entropy to find a distribution that is "least different" from the prior, subject to the view being satisfied. More specifically, the goal is to minimize the relative entropy "distance" between the two distributions.
- Use the new distribution to see how P&L changes in this new world. Note that the other factors' distributions will not be static, they will change too because typically the factors will be correlated in some way.
- While the example used was a portfolio from the fixed income world, the framework is, as the abstract suggests, fully flexible and could easily be applied to a quantitative equity portfolio that is driven by exposure to quant factors like value, momentum, earnings revisions, etc.

Figure 10: Simple two factor example



Source: Dr. Attilio Meucci

Figure 11: Suppose we apply a new distribution



Source: Dr. Attilio Meucci

Panel Discussion: "Are Low Risk Strategies Here to Stay?"

- Christopher Guthrie, CEO, CIO, Founding Partner, Hillsdale Investment Management
- Matthew S. Rothman, Ph.D, Director, Quantitative Global Macro Research, Acadian Asset Management
- Ross Garon, Managing Director, Quantitative Strategies, S.A.C. Capital Advisors
- Session Chair: Miguel Alvarez, Director, Deutsche Bank Quantitative Strategy

Key questions put to panelists

- Investors are showing greater interest in these strategies and many asset managers are now entertaining the idea of creating low-volatility equity products. Are these the new 130/30s? Do you think investor demand for these strategies is solely a product of the sustained uncertain macroeconomic environment, or are they strategies that will persist beyond this current regime? What has been your experience with investors with regards to these types of products?
- The Economist magazine recently had an article that compared Warren Buffet's value strategy to a low volatility strategy. We know this is an oversimplified comparison, but to what extent do you think low volatility strategies are just capturing risk premium from more conventional sources of equity risk such as the value or quality? What is your particular hypothesis on why low-volatility equity strategies seem to generate superior risk-adjusted performance?
- Do you believe that low volatility equity strategies will outperform traditional active equity strategies going forward? Why or why not? Will it be regime dependent and if so are they another tool for diversification?
- Given some of the special properties underlying these strategies and the hypotheses believed to drive their success, should they be implemented and measured as traditional active strategies or do they require an alternative treatment? For example, should these strategies be benchmarked given that their tracking error relative to any benchmark may be excessively large when compared to that of a traditional active strategy?

For a summary of the ensuing discussion, please contact a member of the Deutsche Bank Quantitative Strategy team.

Track 2: Top-Down Global Macro

Survey Forecasts and the Time-varying Second Moments of Stock and Bond Returns

- Professor Pierluigi Balduzzi, Boston College
- Abstract: "We use data from survey forecasts to study the factors driving the second moments of stock and bond returns. Most of the change in the stock-bond covariance between the pre-and post-1997 periods—from positive to negative—is due to factors related to the behavior of risk premium news. Indeed, more than 50% of the change is explained by stock and bond risk premium news covarying less positively, and by stock risk premium news covarying negatively, rather than positively, with inflation news. Risk premium news is also responsible for most of the variance in stock and bond returns, although cash flow (interest rate) news is also important for stocks (bonds). Similarly, risk premium news is responsible for most of the stock-bond covariance, and the second most important factor is interest rate news, before 1997, and cash flow news, after 1997."

Key takeaways

- Presentation walked through how to use the present-value representation of stock and bond prices to identify factors behind returns.
- The stock and bond return decomposition consists of: the unconditional and conditional second moments, the variance of the conditional second moments, and the covariance between realized and conditional second moments of stock and bond returns, respectively.
- The author highlights that the main driver of the stock and bond variance and stock-bond covariance are: the risk premium news, the cash flow news for stock and the interest rate news for bonds.

Figure 12: Computing cash flow innovation, interest rate news, and risk premium news

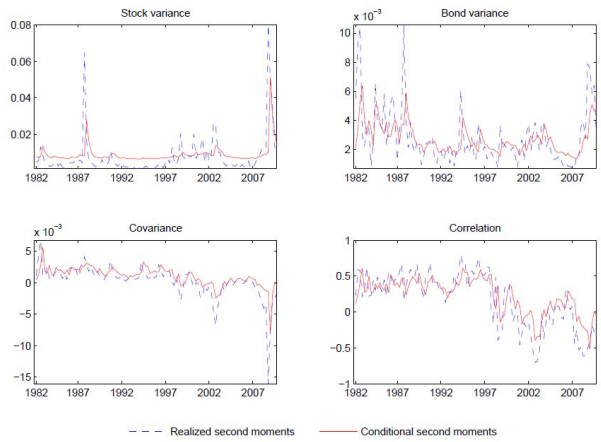
$$\widetilde{S}_{CF,t} = (E_t - E_{t-1})\left(\sum_{j=0}^{\infty} \rho^j h_{t-1+(1+j)y}\right)$$

$$\widetilde{B}_{\pi,t} = (E_t - E_{t-1})(\sum_{j=0}^{39} \pi_{t+j}$$

$$\widetilde{B}_{r,t} = (E_t - E_{t-1})\left(\sum_{j=0}^{39} r_{t+1}\right)$$

Source: Professor Pierluigi Balduzzi

Figure 13: Realized and conditional second moments of stock and bond returns



Source: Professor Pierluigi Balduzzi

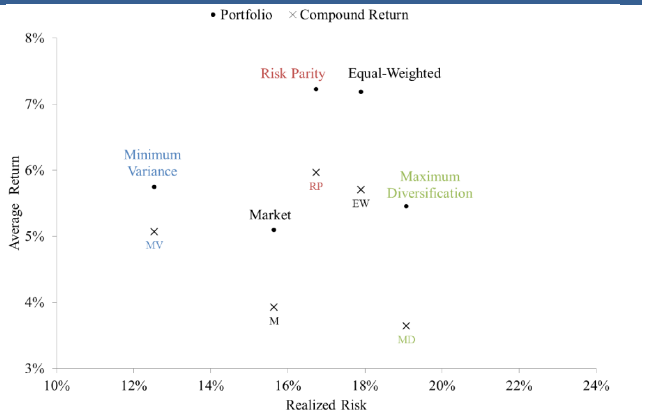
Low-risk Portfolio Construction: What the Math Can Tell Us

- Professor Steven Thorley, Brigham Young University
- Abstract: "Analytic solutions to Risk Parity, Maximum Diversification, and Minimum Variance portfolios provide useful perspectives about their construction and composition. The algebraic forms for optimal asset weights yield generalizable properties of risk-based portfolios, in contrast to empirical simulations that employ a specific set of historical returns, proprietary risk models, and multiple constraints. This presentation will summarize material in the forthcoming Journal of Portfolio Management paper "Risk Parity, Maximum Diversification, and Minimum Variance: An Analytic Perspective" and introduce a new semi-analytic solution for optimal security weights in general mean-variance optimization."

Key takeaways

- This presentation was topical given the current focus on risk-based allocation strategies. The novel aspect was that the author tackled the problem from an analytical perspective instead of the usual "let's horse race some different strategies empirically" approach that is pervasive in the literature (although he also shows this for completeness, see Figure 14).
- The author argues, and we agree, that analytical solutions to portfolio construction can help us understand the key drivers in each optimization, and the relationship between the moving parts, even in a world where powerful computers make numerical optimization trivial in many cases.
- Like our own research on the topic, the author focused on some of the most common risk-based strategies: minimum variance, maximum diversification, and risk parity.[3] A useful feature of his presentation is an analytic representation of the portfolio weights under each of the three strategies using both a one factor and multi-factor risk model (see Figure 15 for the latter).
- Analytically he shows that under all three strategies, asset weights decline with systematic and idiosyncratic risk. Furthermore, in long-only optimized portfolios, high systematic risk eliminates the majority of investable assets.

Figure 14: Empirical performance of risk-based strategies, 1968-2011



Source: Professor Steven Thorley

Figure 15: Risk-based asset weights under multi-factor risk model

Minimum Variance

$$w_{MV,i} = \frac{\sigma_{MV}^2}{\sigma_{\varepsilon,i}^2}\left(1 - \sum_{k=1}^{K}\frac{\beta_{k,i}}{\beta_k}\right)$$

Maximum Diversification

$$w_{MD,i} = \frac{\sigma_{MD}^2}{\sigma_{\varepsilon,i}^2}\frac{\sigma_i}{\sigma_A}\left(1 - \sum_{k=1}^{K}\frac{\rho_i}{\rho_k}\right)$$

Risk Parity

$$w_{RP,i} = \frac{\sigma_{RP}^2}{\sigma_{\varepsilon,i}^2}\left[\left(\left(\sum_{k=1}^{K}\frac{\beta_{k,i}}{\gamma_k}\right)^2 + \frac{1}{N}\frac{\sigma_{\varepsilon,i}^2}{\sigma_{RP}^2}\right)^{1/2} - \sum_{k=1}^{K}\frac{\beta_{k,i}}{\gamma_k}\right]$$

Source: Professor Steven Thorley

[3] See Alvarez et al., "Risk Parity and Risk-Based Allocations", 13 October 2011; and Avettand-Fenoel et al., "Low Risk Strategies", 16 November 2011

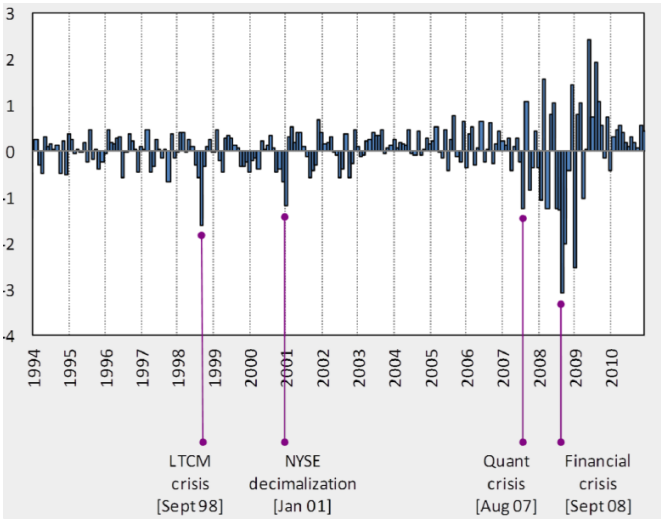
Liquidity Risk and Security Prices

- Professor Ronnie Sadka, Boston College
- Abstract: "The recent financial crisis highlights the necessity of understanding liquidity risk and its implications for financial securities and institutions. A general overview of the measurement of liquidity is provided, as well as the distinction between liquidity level and liquidity risk. A liquidity-risk factor is introduced along with evidence for its relevance for the pricing of different asset classes (equities, mutual funds, and hedge funds). Concluding remarks include a discussion of the relation between investment horizon and the liquidity-risk premium."

Key takeaways

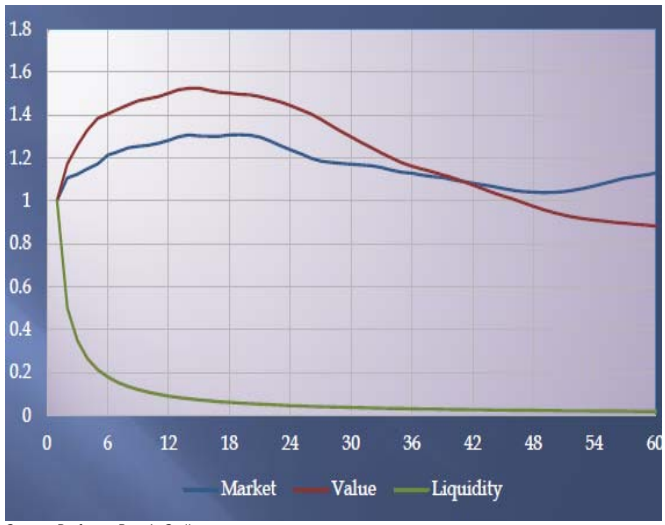
- Liquidity has multiple roles in investment management. The author highlights the difference between liquidity level (return premium for holding illiquid securities) and liquidity risk (aggregate liquidity as a systematic risk factor).
- The author introduces a monthly liquidity factor defined as the average liquidity (intraday price impact of trades) across stocks. This factor is uncorrelated with the other well known risk factors.
- The liquidity risk is measured though a regression of asset returns on the liquidity factor. A high liquidity beta signifies outperformance during liquid periods and underperformance during illiquid periods .
- The distinction between liquidity risk and liquidity level is an important one, and was illustrated during the financial crisis where ironically illiquid stocks actually outperformed, but only because in the fire sale it was easier to sell liquid assets! In contrast, stocks with high liquidity risk (i.e. beta to market-wide liquidity) underperformed severely.
- The author studies the liquidity risk in relation to different asset classes. Liquidity risk predicts performance in the cross-section of hedge funds. Liquidity risk is also priced in the cross-section of equity, fixed-income securities, and mutual funds.

Figure 16: Time Series of Liquidity Factor



Source: Professor Ronnie Sadka

Figure 17: Term Structure of Risk-Return



Source: Professor Ronnie Sadka

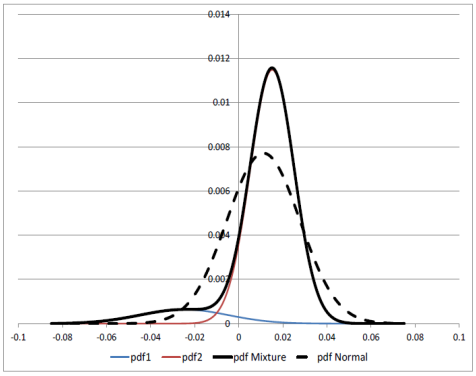
Markowitz meets Darwin: Portfolio Oversight and Evolutionary Divergence

- Dr. Marcos López de Prado, Head of Global Quantitative Research at Tudor Investment Corp.
- Abstract: "An analogue can be made between: (a) the slow pace at which species adapt to an environment, which often results in the emergence of a new distinct species out of a once homogeneous genetic pool, and (b) the slow changes that take place over time within a fund, mutating its investment style. A fund's track record provides a sort of genetic marker, which we can use to identify mutations. This has motivated our use of a biometric procedure to detect the emergence of a new investment style within a fund's track record. In doing so, we answer the question: "What is the probability that a particular PM's performance is departing from the reference distribution used to allocate her capital?" The EF3M approach, inspired by evolutionary biology, may help detect early stages of an evolutionary divergence in an investment style, and trigger a decision to review a fund's capital allocation."

Key takeaways

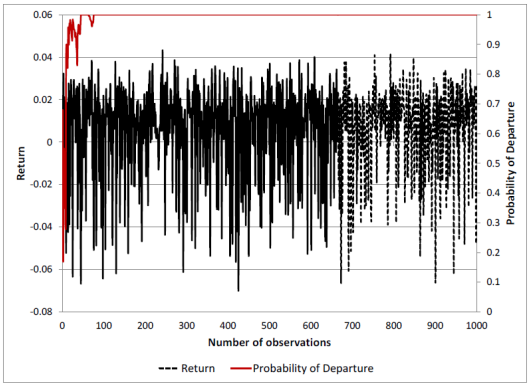
- The thesis in this novel presentation was that we need to move away from the idea of a sudden "break" or regime shift – so beloved in econometrics – and instead recognize that investment styles gradually evolve over time. Hence by using the tools of biology we can potentially detect shifts in style before they are obvious enough to be detected as a structural break.
- More specifically, suppose we want to evaluate whether a portfolio manager has deviated from her mandate? We can start with the distribution of returns from her original track record (i.e. the record used to hire her) and then evaluate whether the new distribution of "live" returns is different from that reference distribution.
- The idea is to treat the returns as a mixture of two distributions (Figure 18). The author proposes to use the EF3M algorithm to recover the unknown parameters of the mixture, i.e. $(\tilde{u}_1, \tilde{u}_2, \tilde{\sigma}_1, \tilde{\sigma}_2, \tilde{p})$.
- For example, consider Figure 19. Here we have a return stream (the black line) and want to determine if it deviates from the original track record of the manager. Applying the algorithm gives the red line, which quickly jumps up to a probability of 1, i.e. this manager has already diverged from his original style.

Figure 18: Mixture of two distributions



Source: Dr. Marcos López de Prado

Figure 19: Algorithm in action



Source: Dr. Marcos López de Prado

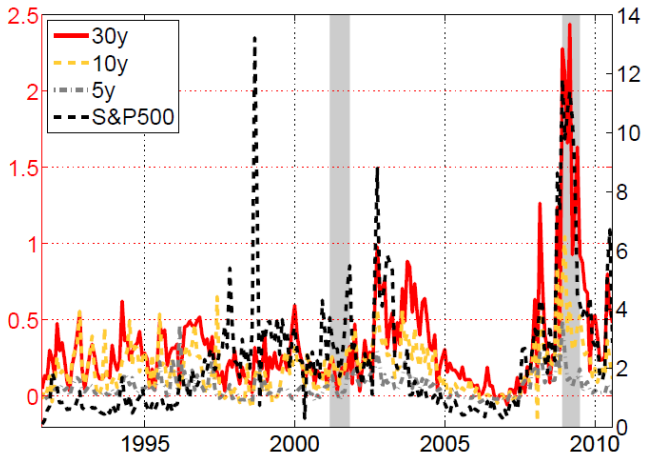
Bond Variance Risk Premia

- Assistant Professor Andrea Vedolin, London School of Economics
- Abstract: "We construct bond variance risk premia defined as the difference between the implied variance and an expected variance estimate using jump robust autoregressive models. Variance risk premia in bond markets behave very differently from those in equity markets in many respects: First, while equity variance risk premia remain mostly positive and display pronounced spikes, bond market variance risk premia are highly volatile and change sign quite often. Second, we show that bond variance risk premia predict (i) bond returns, (ii) stock returns, and (iii) corporate credit spreads. In addition, the predictive power of bond variance risk premia is stronger than for the equity variance risk premium and predictability is remarkably robust to the inclusion of standard predictors suggested in the literature. Finally, we show that uncertainty about macroeconomic variables is an important determinant of the variance risk premia."

Key takeaways

- The equity Variance Risk Premium (VRP) has been discussed in the literature for a few years now, and in our own work we have found it useful in a number of applications including market timing, style/factor rotation, country/sector rotation, and tail risk management.[4]
- However, this talk moved in an innovative new direction, and showed that a bond VRP, constructed using options on Treasuries, is also a useful tool.
- She first constructs a measure of bond implied volatility, called TIV, using options on Treasuries. Next, she uses this to build not one but three different bond VRPs, using 30Y, 10Y, and 5Y Treasuries. (Figure 20).
- The presentation then showed that the first three principal components of these VRPs (representing level, slope, and curvature) is predictive of the future returns to asset classes, including equities (Figure 21).

Figure 20: Equity VRP and various maturity bond VRPs



Source: Professor Andrea Vedolin

Figure 21: Explanatory power in predicting equity returns

$$rx_{t+h}^{(i)} = \beta'^{(i)}\mathbf{VRP}_t + \epsilon_{t+h}^{(i)}$$

	Market		Growth		Value	
	6m	12m	6m	12m	6m	12m
$VRP^{(PC1)}$	0.091	0.150	0.123	0.188	0.053	0.162
	(0.91)	(1.42)	(1.42)	(1.94)	(0.41)	(1.33)
$VRP^{(PC2)}$	**0.241**	0.212	**0.193**	0.176	**0.277**	**0.305**
	(2.34)	(1.86)	(2.10)	(1.90)	(2.49)	(2.39)
$VRP^{(PC3)}$	**0.176**	0.137	**0.162**	0.140	0.122	0.038
	(2.59)	(1.58)	(2.38)	(1.65)	(1.66)	(0.43)
$\text{Adj}R^2$	0.09	0.08	0.07	0.08	0.09	0.11

Source: Professor Andrea Vedolin

[4] For more details and further references, see Luo et al., "From Macro to Micro", 2 May 2012

Panel Discussion: "Alternative Beta: Has Their Time Finally Come?"

- Andrew Chin, Global Head of Quantitative Research and Risk, AllianceBerstein
- Carlos Chujoy, Portfolio Manager, Strategic Research, Employees Retirement System of Texas
- David Long, Senior Vice President & Chief Investment Officer, Healthcare of Ontario Pension Plan
- Frank Nielsen, Managing Director, Quantitative Research, Global Asset Allocation, Fidelity Investments
- Wai Lee, CIO – Quantitative Investment Group, Neuberger Berman
- Session Chair: Marco Salvini, Vice President, Deutsche Bank Quantitative Strategy

Key questions put to panelists

- There are different alternative beta families (value, momentum, risk, etc) to be captured. However, there are many ways to formalize these premia. For example, we have the Fama-French value definition or Carhart's momentum definition. In the literature there have also been plenty of ways presented to build alternative beta mimicking portfolios. So with that in mind, what is your favorite mimicking portfolio methodology and why?
- Related to the above: What is the best way to promote effective premia capture (long-only tilting, long-short)?
- Alternative beta mimicking portfolios may have some sector and country biases. Do you think it makes sense to neutralize these biases to try to capture the pure premia? Also, related to this, do you believe factors should be orthogonalized against each other?
- Based on your experience, what are the best ways to select and combine these individual building blocks into a portfolio?
- One of the most difficult factors to define is the momentum factor. Do you think it could be useful to compute this factor as a combination of momentum strategies and market sentiment indicators (i.e. stocks can react differently respect positive or negative market shocks)?
- In our report we have studied value, momentum and carry across different asset classes. We show how these risk factors have guaranteed over time (normal and turbulent periods) better diversification compared to the traditional asset class allocation. Do you think the risk-parity portfolio construction methodologies are the most efficient ways to maximize portfolio diversifications?
- Investors are investigating alternative betas to increase portfolio diversification. However, we are starting to have many questions from clients regarding the expected returns of alternative beta premia. If everyone starts to invest in alternative beta premia, wouldn't that lead to crowdedness? Don't you fear a repeat of the summer 2007?

For a summary of the ensuing discussion, please contact a member of the Deutsche Bank Quantitative Strategy team.

Appendix 1

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Deutsche Bank Securities Inc.

International Locations

Deutsche Bank Securities Inc.
60 Wall Street
New York, NY 10005
United States of America
Tel: (1) 212 250 2500

Deutsche Bank AG London
1 Great Winchester Street
London EC2N 2EQ
United Kingdom
Tel: (44) 20 7545 8000

Deutsche Bank AG
Große Gallusstraße 10-14
60272 Frankfurt am Main
Germany
Tel: (49) 69 910 00

Deutsche Bank AG
Deutsche Bank Place
Level 16
Corner of Hunter & Phillip Streets
Sydney, NSW 2000
Australia
Tel: (61) 2 8258 1234

Deutsche Bank AG
Filiale Hongkong
International Commerce Centre,
1 Austin Road West,Kowloon,
Hong Kong
Tel: (852) 2203 8888

Deutsche Securities Inc.
2-11-1 Nagatacho
Sanno Park Tower
Chiyoda-ku, Tokyo 100-6171
Japan
Tel: (81) 3 5156 6770

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