STEVENS
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Option Volatility Trading
Update 1

MGT-411

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Current Updates

<u>Goal</u>: Using volatility as an asset class to help generate uncorrelated returns for an investor's portfolio

- We have decided on a volatility strategy to pursue
- We have a working data collection prototype that utilizes python and the Bloomberg-excel API
- Preliminary research on potential portfolio implementations
- Planning our next steps

Dispersion Trading

- Dispersion trading is designed to capitalize on the overpricing/underpricing of index options relative to individual options
  - Sell options on index and buy options on individual options (delta neutral straddles)
  - Can be implemented using market ETFs and sector ETFs
- Strategy makes money when realized volatilities on individual stocks are high and realized vol on index is low (or vice versa)
- Want to find times of high implied correlation or low implied correlation
  - High correlation indicates implied index vol is elevated (shown in index variance formula below)

Index Variance

$$\sigma_I^2 = \sum_{i=1}^{N} \omega_i^2 \sigma_i^2 + 2 \sum_{i=1}^{N} \sum_{j>i} \omega_i \omega_j \sigma_i \sigma_j \rho_{ij}$$

Implied Avg. Correlation

$$\bar{\rho} = \frac{\sigma_I^2 - \sum_{i=1}^{N} \omega_i^2 \sigma_i^2}{2 \sum_{i=1}^{N} \sum_{j>i} \omega_i \omega_j \sigma_i \sigma_j}$$

Dispersion Trading Continued

- Implementing dispersion trades can be done in a variety of ways:
  - Analyzing implied vs realized correlation changes
  - Looking for optimal subset of component stocks/ETFs to buy/sell
  - Different weighting combinations (vega neutral, gamma neutral, or theta neutral at start)
- Profits are derived from the relationship between realized volatility and implied volatility
- Must analyze the cost of implementing trades
  - Straddles are expensive
  - Dynamic delta hedging can increase price as well

Data Collection Update

- Currently, we have a Python class “excelOption” that can create the excel file we need to download any option data in Bloomberg
- Next step is to download the generated data in Bloomberg to read back into Python to analyze trading strategies

In [1]:
```
import os
from excelGen import excelOption
```

```
c:\users\gregg\appdata\local\programs\python\python38-32\lib\site-packages\pand
as_datareader\compat\__init__.py:7: FutureWarning: pandas.util.testing is depre
cated. Use the functions in the public API at pandas.testing instead.
  from pandas.util.testing import assert_frame_equal
```

In [2]:
```
tickers = ["SPY","XLK","MSFT"]
start_date = "2015-01-01"
end_date = None

data = excelOption(tickers, start_date, end_date)

bloomberg_functions = data.generateData()

bloomberg_functions["SPY"]
```

Out[2]:

	SPY 3/20/15 C205	SPY 4/17/15 C201	SPY 5/15/15 C211	SPY
0	=BDH("SPY 3/20/15 C205 Equity","PX_LAST",20150...	=BDH("SPY 4/17/15 C201 Equity","PX_LAST",20150...	=BDH("SPY 5/15/15 C211 Equity","PX_LAST",20150...	=BDH("SPY Equity","PX_L

Data Collection Continued

- When Excel file generated in Python is opened with Bloomberg Excel Add-In, historical option data for all tickers is generated

=BDH("SPY 3/20/15 C205 Equity","PX_LAST",20150102,20150320,"cols=2;rows=54")

B	C	D	E	F	G	H	I	J
SPY 3/20/15 C205		SPY 4/17/15 C201		SPY 5/15/15 C211		SPY 6/19/15 C205		SPY 7/17/15 C210
1/2/2015	5.72	2/2/2015	6.53	3/2/2015	4.86	4/1/2015	6.15	5/1/2015
1/5/2015	4.15	2/3/2015	7.77	3/3/2015	4.37	4/2/2015	6.39	5/4/2015
1/6/2015	3.45	2/4/2015	7.25	3/4/2015	3.89	4/6/2015	7.12	5/5/2015
1/7/2015	4.31	2/5/2015	8.7	3/5/2015	3.98	4/7/2015	6.8	5/6/2015
1/8/2015	5.84	2/6/2015	8.39	3/6/2015	2.72	4/8/2015	6.91	5/7/2015
1/9/2015	4.85	2/9/2015	7.76	3/9/2015	2.98	4/9/2015	7.4	5/8/2015
1/12/2015	4.4	2/10/2015	9.01	#########	1.77	#########	8	#########
1/13/2015	4.19	2/11/2015	8.74	#########	1.72	#########	7.5	#########
1/14/2015	3.6	2/12/2015	10.03	#########	2.45	#########	7.3	#########
1/15/2015	2.9	2/13/2015	10.72	#########	1.95	#########	8.19	#########
1/16/2015	3.84	2/17/2015	10.98	#########	2.84	#########	8.14	#########

Portfolio Implementations

- How can we implement a dispersion trading strategy in any investor's portfolio?
  - Returns and diversification benefit
- Shift focus to pitching an ETF or index that tracks the returns of a dispersion trading strategy.
  - Enables a lot of capital to implement the strategy
  - Access of dispersion to all types of investors
  - Need to consider annual ETF expenses
- Allianz Global Investors created the VPT index that tracks selling volatility via variance swaps to give investors access to volatility as an asset class
- Use Allianz's model to create our own index/ETF

Alternatives

Volatility as an Asset Class

Any strategic investment decision usually centres around risk diversification. Nowadays, however, it is becoming increasingly difficult to diversify in conventional assets. Added to which, the current low interest environment and expensive – in some cases very expensive – equity markets are increasing the pressure to identify sources of return in alternative instruments not related to the conventional asset classes. Against this backdrop, more and more investors are turning to alternative, highly liquid risk premiums. In the process, volatility is increasingly attracting investor focus as an alternative asset class.

Dr Bernhard Brunner
Managing Director, Head of Analytics & Derivatives, AllianzGI Global Solutions – risklab

Volatility as an asset class is investable ...

Investors used to see volatility primarily as a source of risk. In their experience, the risk that fluctuations in valuations might jeopardize earnings increased relative to the brevity of the investment horizon of a portfolio. This view of risk is, however, too short-sighted. Volatility – the phenomenon of fluctuating asset valuations on capital and money markets – has meanwhile evolved into its own asset class offering attractive attributes.

To describe the core elements of a volatility asset strategy, we must first define what is meant by volatility and its risk premium. Volatility basically comes in different shapes and sizes. A distinction is made, particularly, between realized and implied volatility. Realized volatility is defined as the standard deviation of the (logarithmized) returns generated by an investment. Historical return time series are used to compute realized volatility – which is why it is also referred to as historical volatility. Implied volatility, by contrast, is a term that stems from option price theory and describes the volatility that leads straight to the market price of the option when used in an option pricing model – usually the Black-Scholes model. Implied volatility is often also understood as the future realized volatility expected by the market. This interpretation is only correct, however, if the assumptions underlying the Black-Scholes model also prove to hold true in real life, which is regularly not the case. Because in real markets, unlike the theoretical universe, transaction fees are charged, equity prices are not normally distributed, interest rates are stochastic, etc. And these violations of the Black-Scholes assumptions ultimately lead to the volatility structures known as

Allianz Global Investors

Understand. Act.

Next Steps

Possible Challenges and Risks

- Begin implementing dispersion backtest
  - Build on class that generates Excel File
  - Try different dispersion implementation strategies
- Work through cleaning data
  - Missing dates and illiquidity is an issue with option data
  - Incorporate volume into our model
  - Utilize bid/ask spreads if data is available through Bloomberg
- Continue research on how volatility can add benefits to investor portfolios
  - How to compute/quantify diversification benefits
  - Explore further Skew Trading strategies to eventually implement