Option Trading

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Session Two Overview

- Why options are appealing to trade.
- Realized volatility.
- Implied volatility.
- The volatility premium.

Options and Trading

- General rule: simplest products trade in the most complicated ways.
- Futures: market makers use many “tricks” such as book stacking, spoofing, flipping and stop hunting.
- Vanilla options: capturing edge is easy and traders are differentiated by risk management.
- Exotic Options: edge comes from structuring, legal and sales.

Why Options?

- The main point of this course is that options depend on *volatility,* the fluctuations of the market.
- The market going up or down has no bearing on the instantaneous price of an option.
- Because the major driver of option prices is volatility, trading options is implicitly trading volatility.

Why Options?

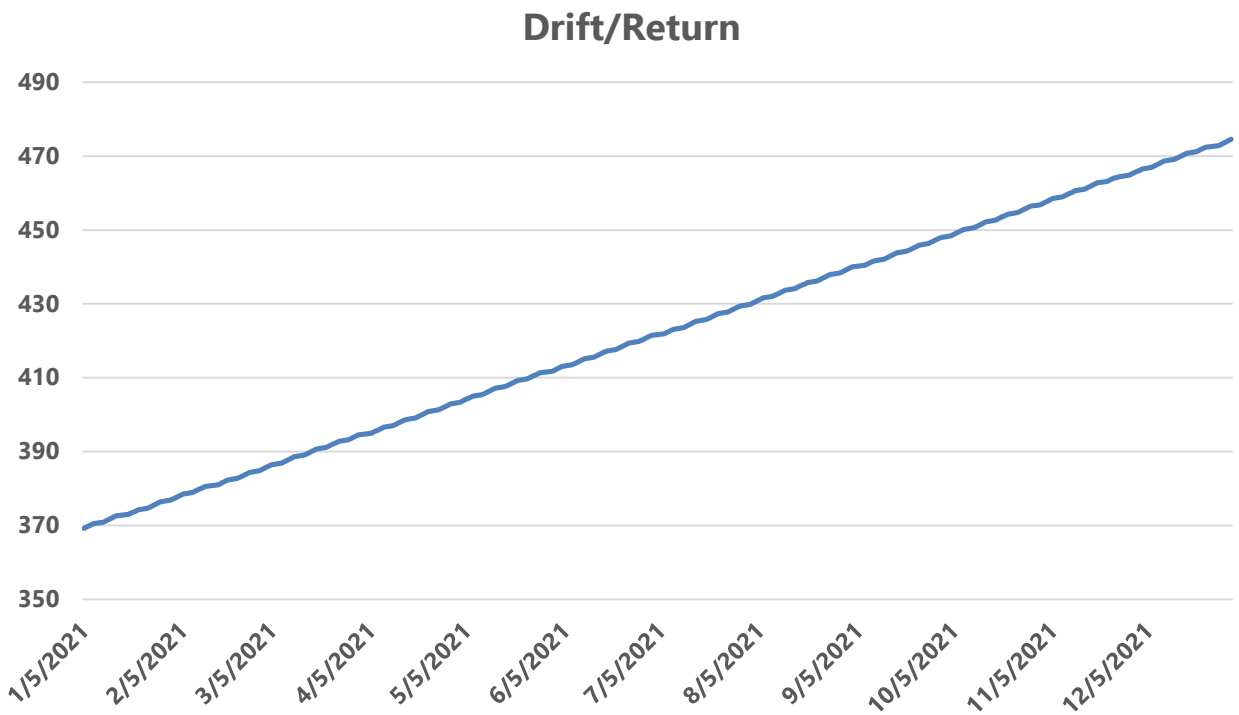
"For predicting future values, historic data appear to be quite useful with respect to standard deviations… and virtually useless for expected returns." -- William Sharpe

What is Volatility?

What is Volatility?

- A time series has (at least) two components.
- A trend (or drift): In 2016, SPY rose 11%.
- But there was considerable variability around this return.
- Informally, volatility is a way to quantify these fluctuations.

What is Volatility?



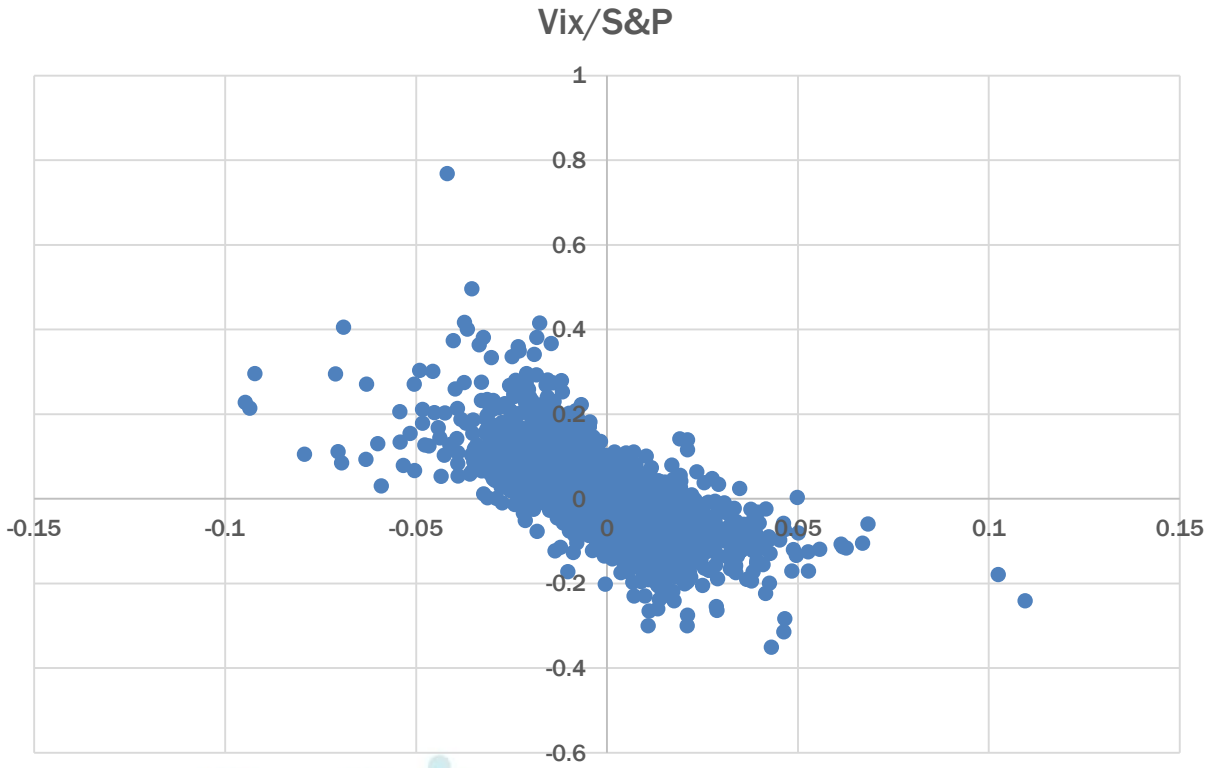
What is Volatility?

Facts about Volatility

- Negatively correlated to return.
- Mean-reverting.
- Generally, much larger than returns e.g., SPY in 2016 had a daily return of 0.04% but a daily volatility of 0.8%.

Correlation to Returns

- S&P 500 volatility/return correlation is -.70 (weekly is -0.71, monthly is -0.68)



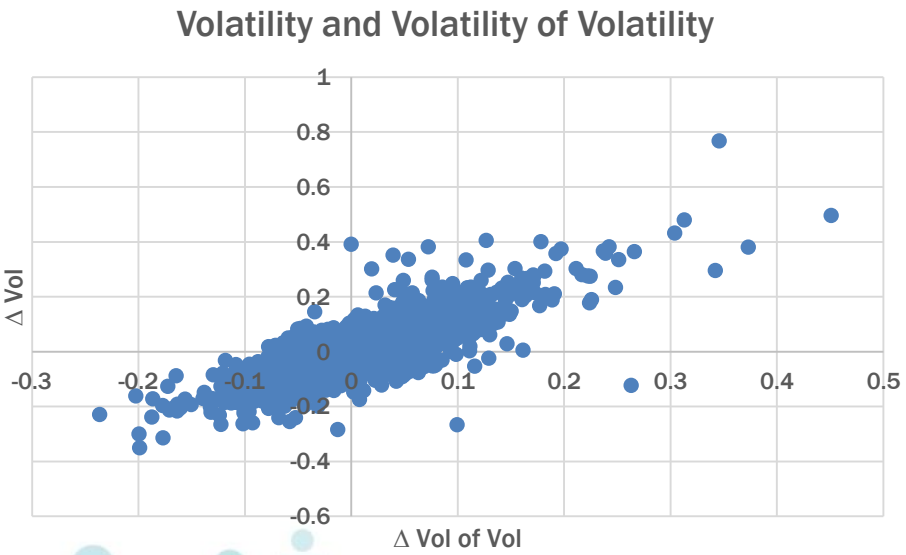
Correlation to Returns

- This effect is less prevalent for commodities and individual stocks.
- Over the last five years the correlations have been.

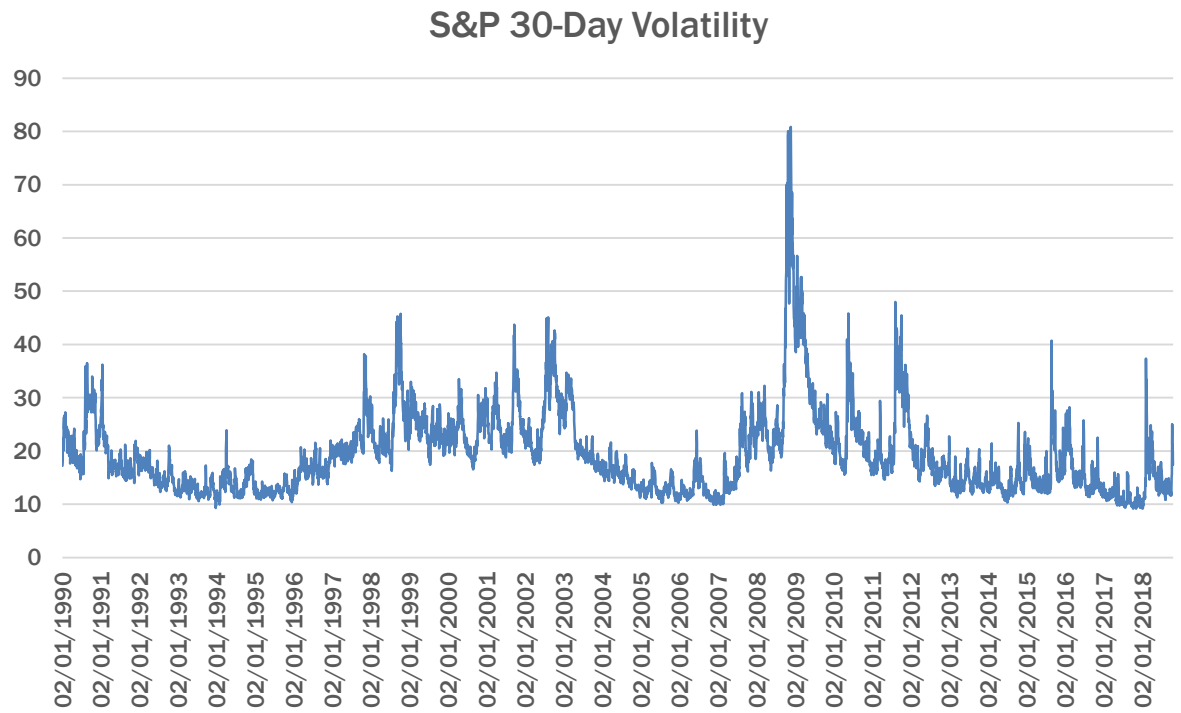
Product	Correlation
Oil	-0.47
Gold	0.15
AAPL	-0.59
AMZN	-0.50
IBM	-0.05

Vol and Vol of Vol

- Can see from the picture that volatility is itself more volatile at high levels.
- Correlation is 0.8.

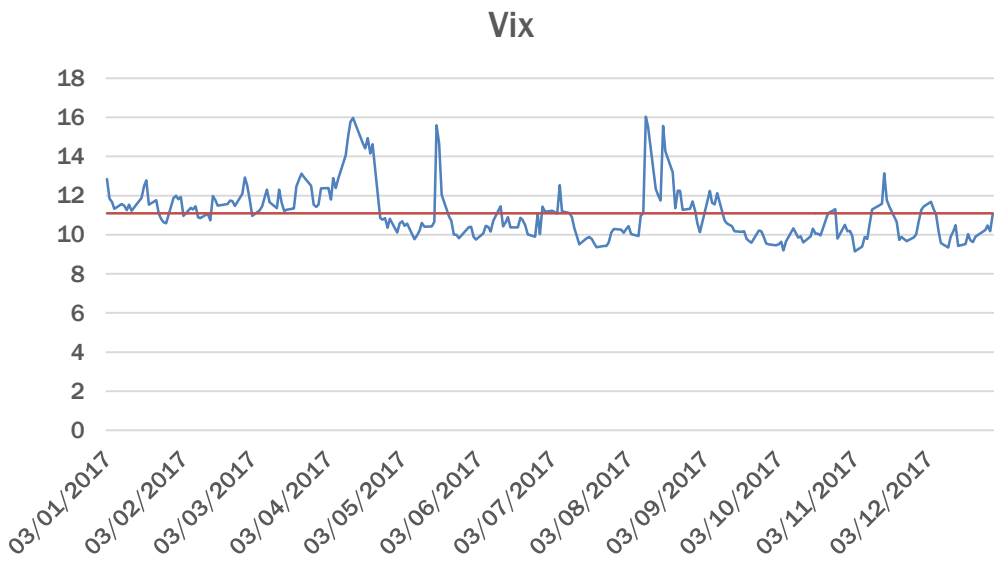


Reversion



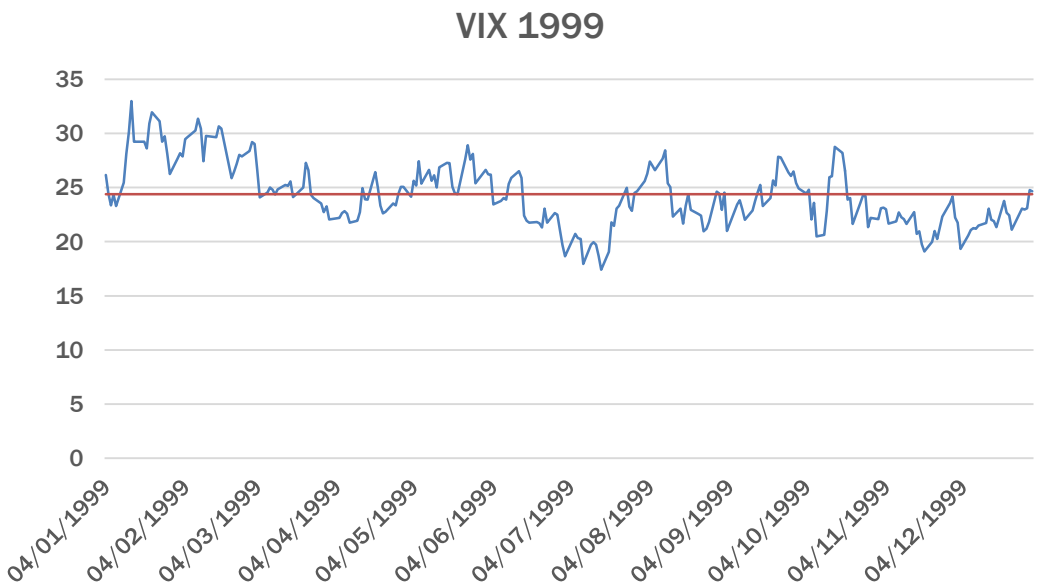
- Doesn't really "go anywhere".
- Mean reverts to time varying mean.

Volatility in 2017



- Mean: 11.1

VIX 1999



- Mean: 24.4

Reversion

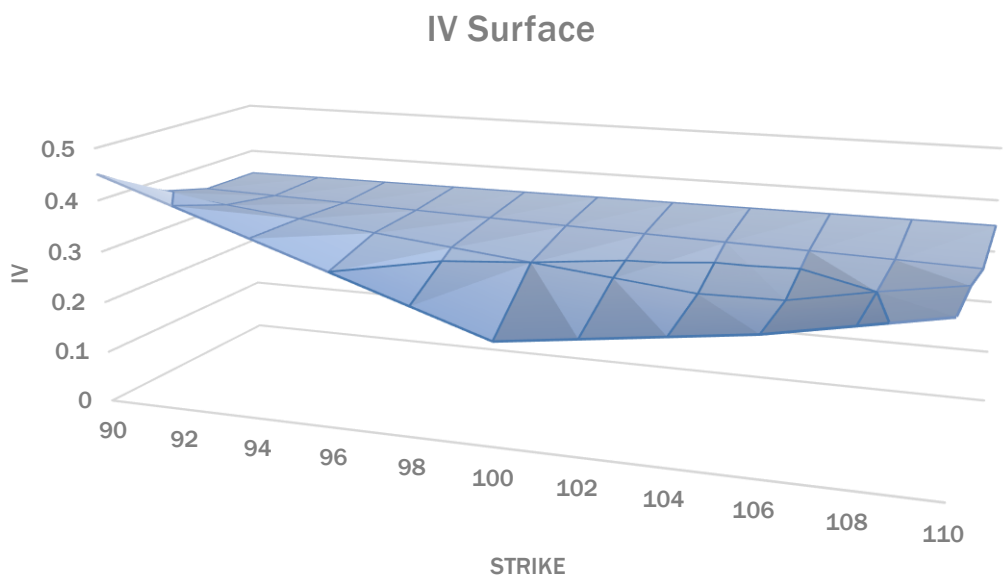
- VIX since 1990:
- Daily autocorrelation= -8.9% (51% of days have opposite sign return of previous day)
- Weekly autocorrelation= -19.8% (56% reversal)
- Monthly autocorrelation= -16.6% (60% reversal

Two (very different) Volatilities

- Historical volatility: Calculated from the returns of the underlying instrument.
- Implied volatility: Option market's guess of future volatility. Specifically, we get the option price from the market and calculate what volatility we need to put into the BSM model to get that number.
- Historical => Backward looking
- Implied => Forward looking

Implied Volatility

- There is no single implied volatility.
- Generally, every strike and maturity pair has its own implied volatility (forming the IV surface).



- Volatility as a function of strike is called “smile” or “skew”.
- Volatility as a function of time is called “term structure”.

Reasons for Smile

- Mathematically: Model misspecification, the BSM model isn't an accurate representation of reality.
- Financially:
  1. Correlation between underlying and volatility: as the stock drops, implied volatility increases so lower strikes have higher implied volatilities.
  2. Leverage effect: as stock price drops, a company becomes more leveraged as their debt/equity ratio increases.
  3. Longshot bias: far OTM options are cheap in dollar terms, so they are bought as lottery tickets. This pushes the volatility up.

Reasons for Term Structure

- Mean reversion: If the market is currently volatile, short dated options will have high implied vols, but the back months will increase far less as we expect the effect to be temporary.
- Different things happen in different time periods:
  1. Earnings announcements
  2. Takeover speculation
  3. Different crops
  4. Different weather patterns

Volatility Trading

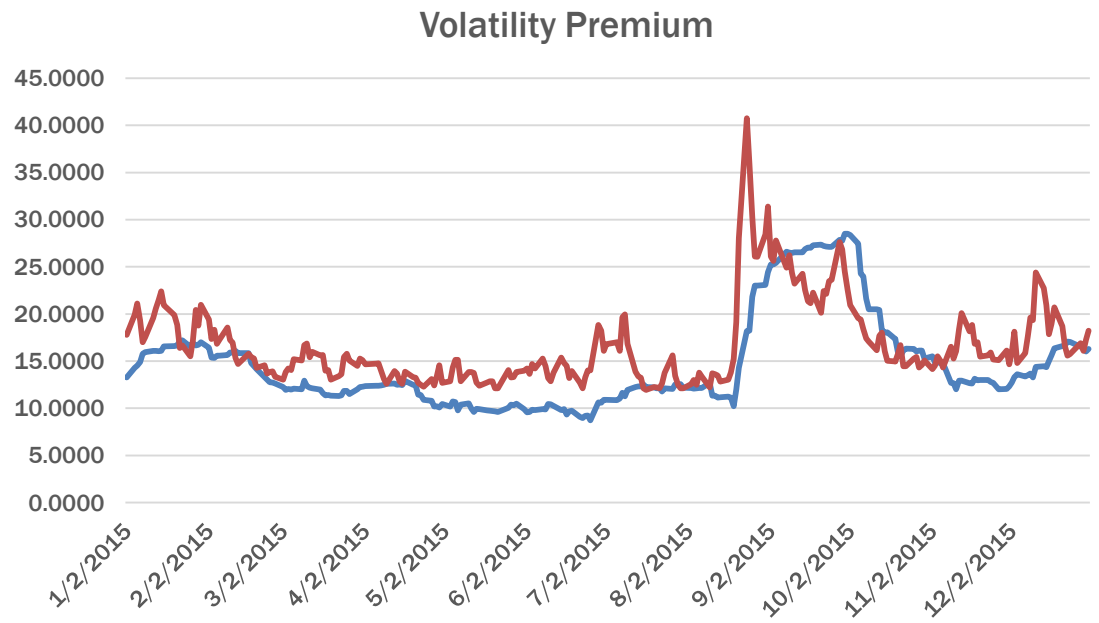
- The implied volatility is like the bookie's odds on the game, the price of the bet that gets locked in.
- Then the game is played, or the stock realizes a volatility.
- If implied and realized volatilities are different, the option was mispriced.
- Unless you have this volatility edge, you are making bad bets.

Volatility Trading

- So next we need to find situations where we expect realized volatility to be different to the implied volatility.
- Model driven methods are based on time series analysis, using the empirical regularities documented earlier.
- Situational methods can be based on unusual events such as elections or earnings, or unusual times such as weekends.
- But we must also acknowledge the variance (or volatility) premium.

Volatility/Variance Premium

- Implied volatility > subsequent realized volatility.
- S&P shown below.



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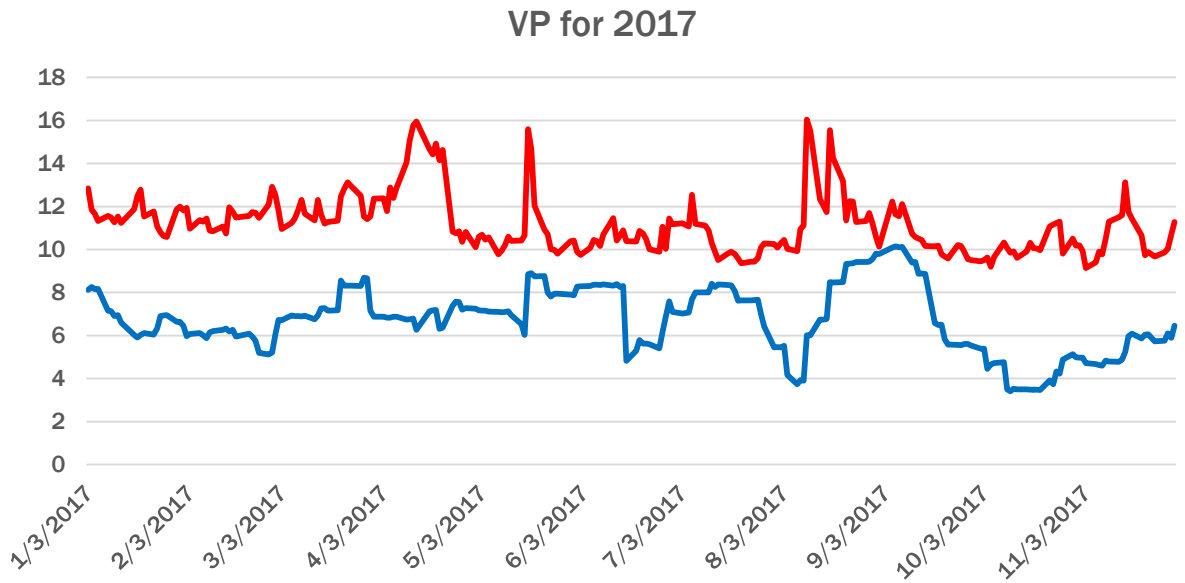
- Average premium=3.6 volatility points.
- Median premium=4.0 volatility points.

Volatility Premium

- Persistent even at very low volatility levels.
- 2017 shown below.



- Average premium=4.4 volatility points.
- (about 40% of the implied volatility level).

Volatility Premium

- As a percentage, the premium is generally *higher* at low volatility levels.
- From 1990 to 2018:

VIX Level	Volatility Premium (as %)
<15	0.27
15<20	0.26
20<25	0.20
25<30	0.20
30<35	0.18
35<40	0.14
>45	0.10

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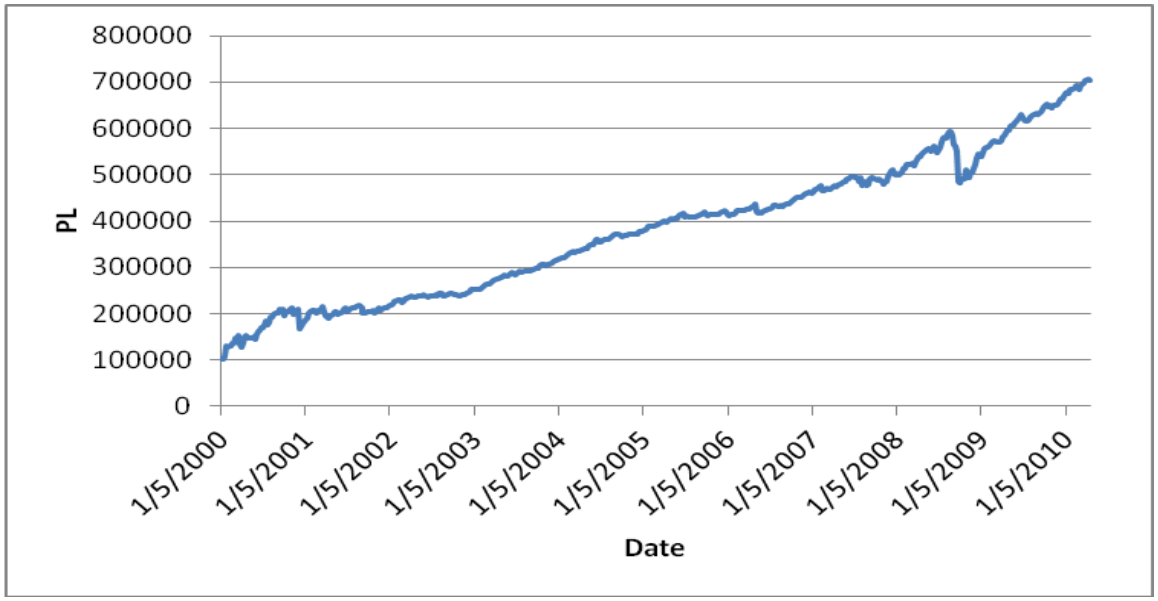
Volatility Premium



- Selling 10 delta QQQ, 2nd month strangles (using account value for margin).

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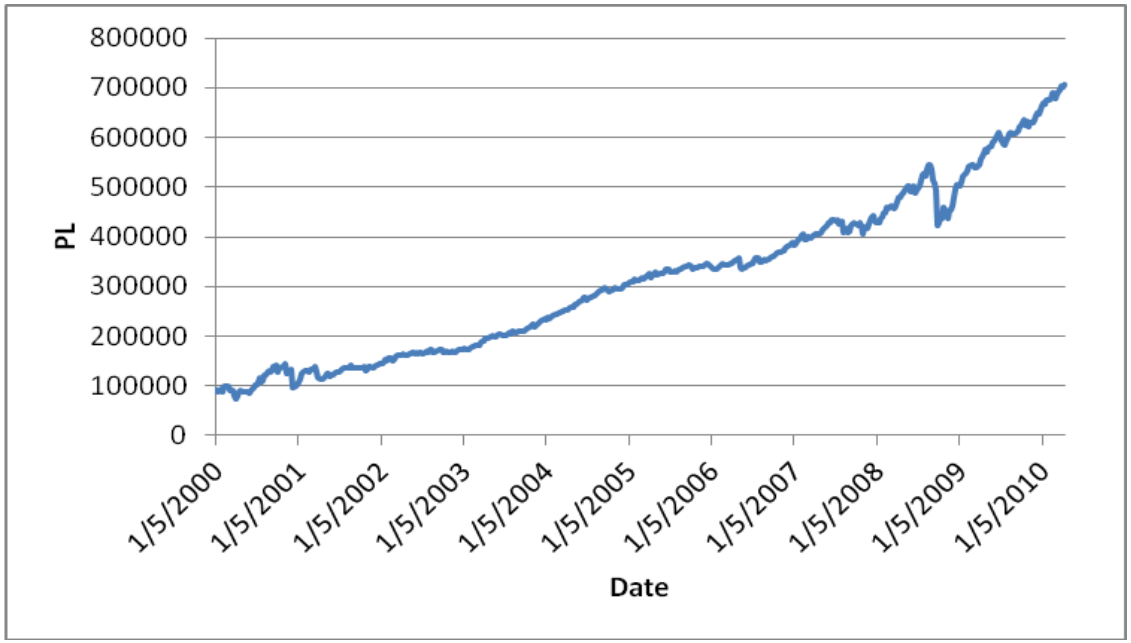
Volatility Premium



- Selling ATM QQQ, 2nd month straddles.
- (Same vega exposure as with strangles).

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Why Does the Premium Exist? - Insurance Premium

- Both calls and puts provide insurance.
  - Puts against a crash hurting an existing portfolio.
  - Calls against FOMO (Fear Of Missing Out).
- All insurers charge a premium for their products so they can make a profit.
- This is no different from any other shop.

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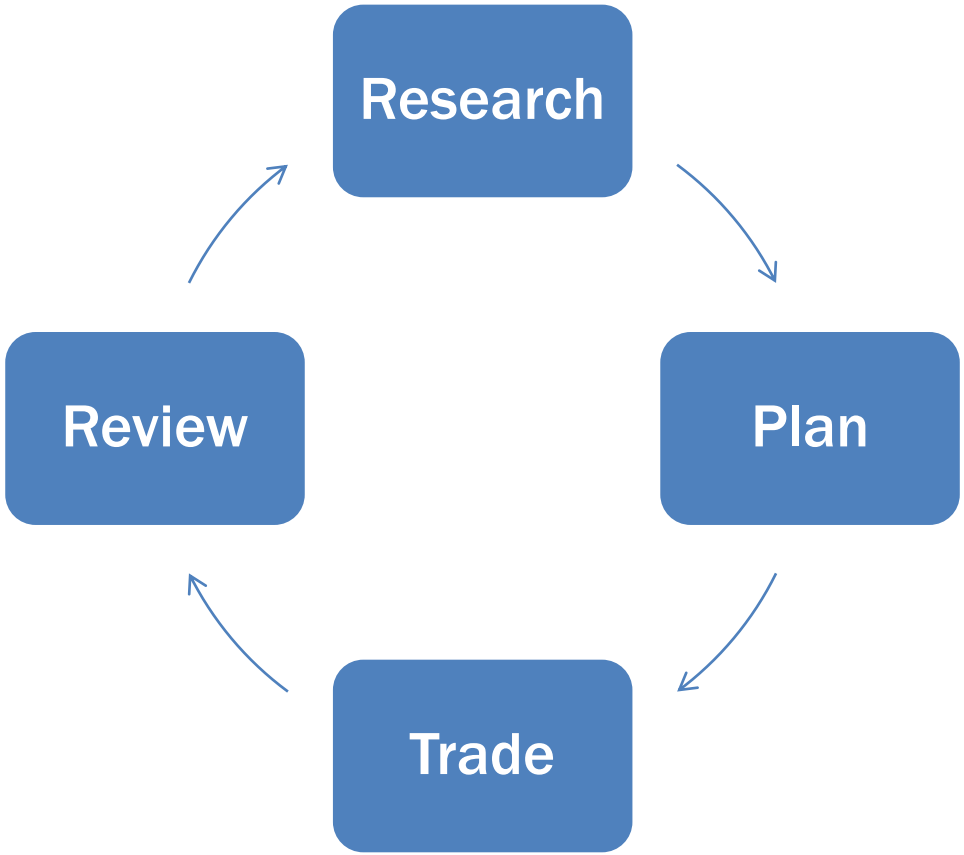
Why Does the Premium Exist? - Fear of Atypical Events

- People vastly over-estimate the danger of extreme events.
- Terrorism kills 180 Americans a year (about 8 if we exclude 9/11).
- Heart disease kills 600,000 Americans each year.
- This mistake means options are overpriced.
- “Black Swans” don’t happen very often.

Process



Conclusion

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