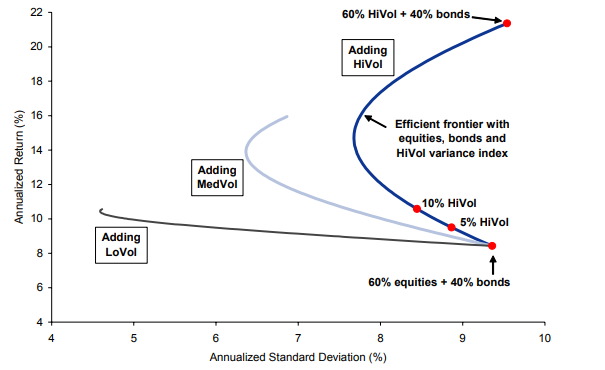
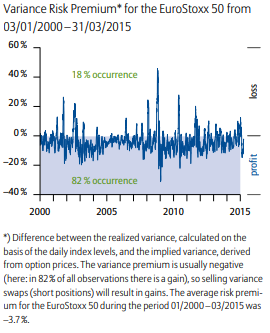
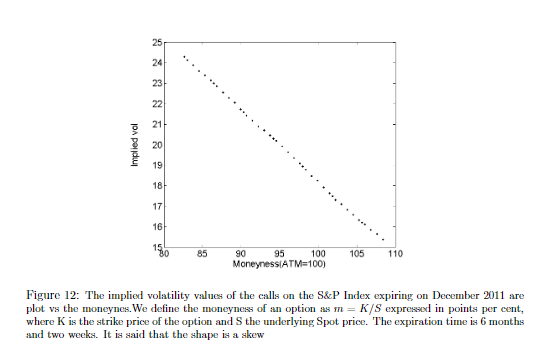
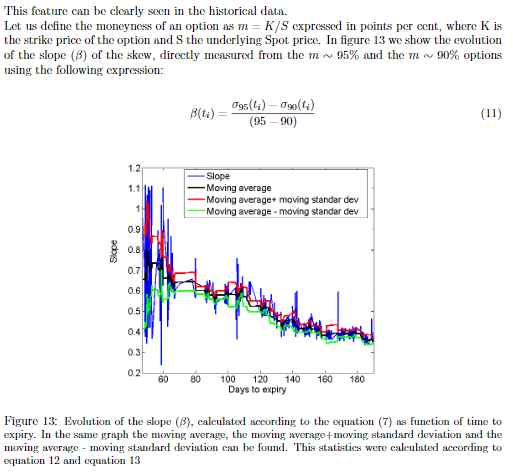
1. **Goldman Sachs: Volatility as an Asset**
   1. Goldman explains how equity index volatility meets the definition of an asset class:
      1. Selling index volatility offers significant, passively generated returns produced by facilitating hedging flow for equity and credit investors
      2. Returns are large enough to justify a nontrivial allocation
      3. Volatility selling tends to outperform long equities in hostile markets, offering appealing diversification benefit
   2. Goldman showing how adding a short high volatility trading strategy can add to efficient frontier of a standard equity-bond portfolio
   3. **Big issue with Goldman’s take is that they are only showing benefits of being short volatility. History has shown being short vol can BLOW people up; however, for our project, Goldman’s analysis and use of efficient frontier comparisons is very relevant to us. We can generate portfolios similar to what they did and compare with different allocations of our own ETF**
2. **Stoxx: Volatility as an Asset Class**
   1. Global index provider
   2. Provide indication that use of volatility arbitrage to profit from the risk premium between implied and realized volatilities are important ways to use volatility as an asset class.
   3. Writes that a portfolio mix of volatility and other asset classes, in particular equity to take advantage of negative correlations between volatility and traditional investment markets to smoothen investor’s returns across the business cycle
   4. **Helps us by showing the importance of capitalizing on realized vs implied vol relationships with a mix of other assets. Strategies are extremely general and more theoretical though so we are actually applying their knowledge**
3. **Allianz: Volatility as an Asset Class**
   1. There is a strong inverse correlation between implied volatility and the direction of the market. This means that to achieve the maximum diversification benefit from trading volatility, it would make the most sense to sell implied volatility.
      1. If markets fall, the long position on IV would rise significantly.
      2. The issue with this is that going long on IV is very expensive to maintain a position in over a long period of time.
   2. Volatility risk premium is the difference between realized and implied volatility. 
   3. Historically, going short on implied vol through variance swaps is profitable.
   4. Their VPT (variance premium trading index) generally maintained a correlation of around 0.5 with global equities markets.
4. **Volatility Skew SP Paper**
   1. Using Black Scholes, options are priced under the assumption that assets follow geometric Brownian motion. This was accurately reflected in option pricing until 1987 when the market tanked 20% in two trading days.
   2. Now, option prices display a unique “volatility smile”; options are still priced using Black Scholes, but the implied volatility of the options change as the moneyness of the contract changes (see below). 
   3. Moneyness is defined as K/S\*
   4. The slope of the skew becomes greater as the expiration of the option shortens. 
   5. There is a negative correlation between ATM implied volatility and underlying asset price.
   6. After the market declines, the convexity of the volatility smile becomes positive, reflecting an anticipation of a market rebound. The IV of the OTM options does not seem to become greater than the IV of the ITM options, however.
   7. Daily changes in the slope of the volatility smile are mean-reverting.
5. **JPM Correlation Trading Vehicles**
   1. Dispersion Trades
      1. This is the first strategy that we are implementing by the first update presentation; all of the index members are bought in the exact proportion to the weights of the members of the index.
      2. Profits from alpha available from short correlation.
      3. **Is short correlation but long volatility. It is long because with a correlation less than one, a given increase in single stock volatilities will lead to a smaller increase in index volatility.**
      4. **Advantages:**
         1. Short correlation exposure hedges against the long vol exposure.
         2. Since implied correlation trades at a premium to realized, the alpha earned from selling correlation funds the long volatility position.
         3. Trade can profit from a decrease in correlation relative to volatility.
   2. Correlation-Weighted Dispersion Trades
      1. Uses implied correlation to weight the single stock variance swaps. Maximizes exposure to correlation while ensuring that initial Vega exposure is zero. Correlation-weights dispersion trades have tracked correlation much better than vanilla dispersion trades.
      2. Profits more directly from correlation and is less affected by moves in volatility.
      3. **Weight each single stock variance swap by the weight of the stock in the index multiplied by the implied correlation. Then multiply by the ratio of the stock’s variance strike to the index variance strike. This trade will be vega neutral at t=0.**
      4. **You want the following things to occur:**
         1. Correlation decreases\*
         2. Average single-stock volatility increases if correlation decreases.
         3. Dispersion of stock volatilities within the index to increase.
   3. Both types of dispersion trading have been historically profitable. Preferences of exposure determine which is optimal for your portfolio.
6. **Bennett – Trading Volatility (Textbook):**