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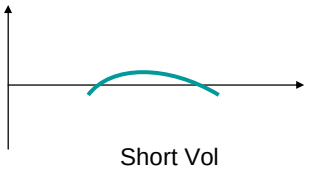
Trading Market Volatility

Marco Avellaneda
Finance Concepts
49-51 Avenue Victor Hugo
75116 Paris
marco.avellaneda@finance-concepts.com

Volatility Trading in a Nutshell

- Long volatility: buy call option, sell shares
  buy put option, buy shares
- Short volatility: sell call option, buy shares
  sell put option, sell shares

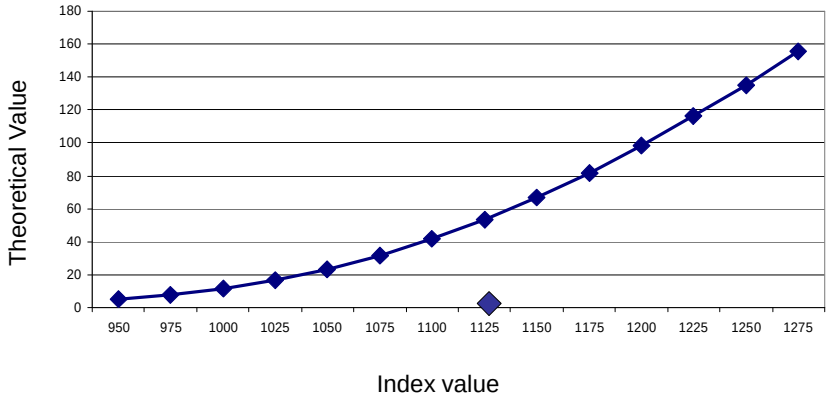
Long Vol



Short Vol

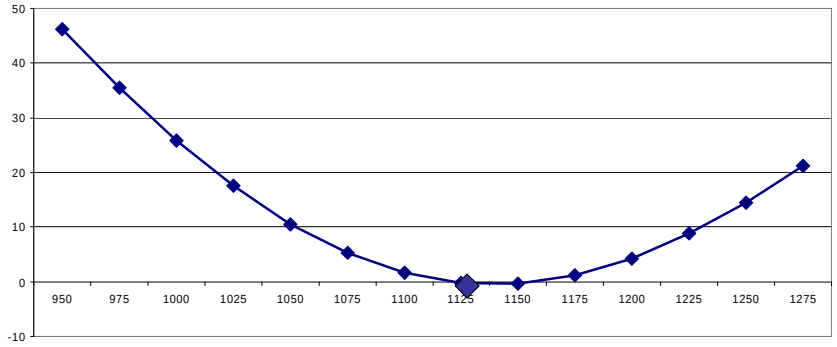
SP 500 June05 1125 Call

Vol=16%



1-day P/L for Long Call/Short Stock

(Constant volatility=16%)

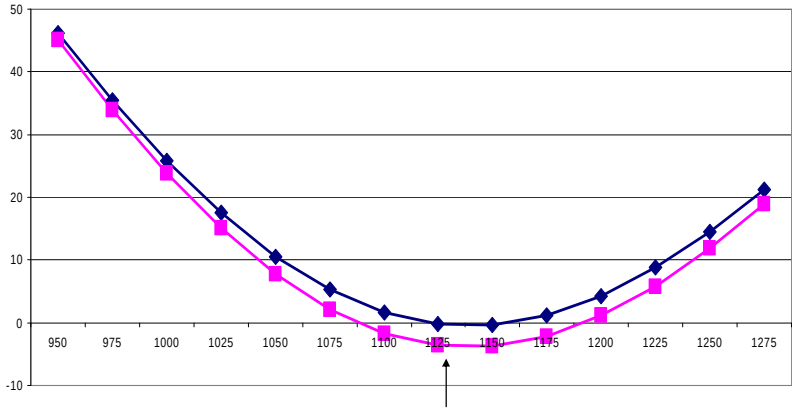


$$\text{P/L} \approx \theta \cdot \left(n^2 - 1\right)$$

$$\theta = \text{daily time-decay}, \quad n = \frac{\text{percent index change}}{\text{expected daily volatility}}$$

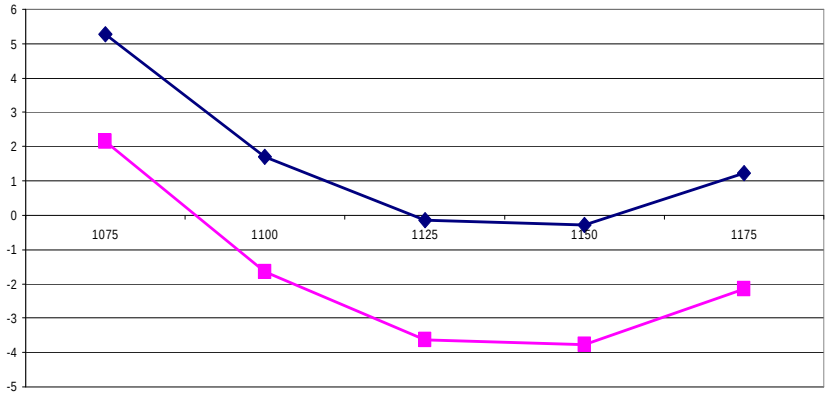
Assuming an implied volatility drop of 1%

Vol=15%



3.80 loss if stock does not move and volatility drops 1%

A closer look at the profit-loss due to a change in volatility



1% move in vol => 8% move in premium for a 6m ATM option

Book-keeping: profit/loss from a delta-hedged option position

$$\text{P/L} = \theta \cdot \left(n^2 - 1\right) + V \cdot d\sigma$$

or

$$\text{P/L} = \frac{1}{2}\Gamma \cdot \left(\frac{(dI)^2}{I^2} - \sigma^2 dt \right) + V \cdot d\sigma$$

Return Characteristics

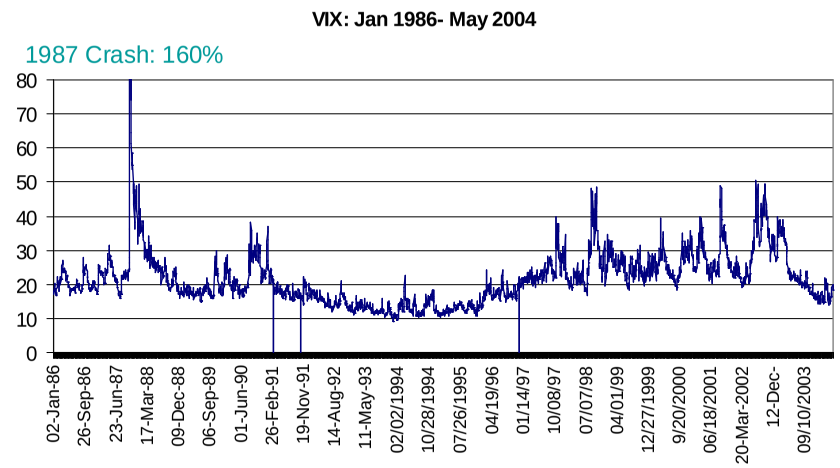
- Implied volatility is a market forecast of the future volatility of the underlying stock (level-dependent)
- Long volatility positions gain when realized volatility (over the lifetime of the option) is higher than implied volatility at inception
- Changes in implied volatility affect the MTM of the position

S&P500 Implied and Realized Volatilities

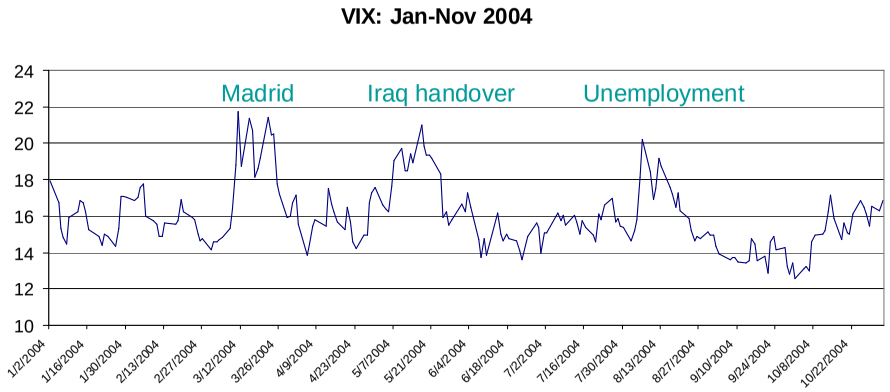
Are current levels of volatility justified?

- Market volatility is at a historical low
- We believe that these levels of volatility are associated with the ``investment cycle'' in equities
- The crash of 2000-2002 diminished the public's appetite for equities
- The volatility environment resembles the early 1990's (somewhat)

VIX: 30-day Implied Volatility index of S&P 100



This year's VIX



Can we forecast volatility?

- Volatility cannot be predicted over long periods of time
- Option markets in stocks and indices provide ``market forecasts'' for periods ranging from 1 month to 1 year
- Statistical models may be used to forecast volatility over short periods of time
- Importance of taking into account ``exogenous news'' and events, macro news

Equity Volatility Markets

- 3000 optionable stocks in the U.S., 500 names have liquid options
- Index options (SPX, OEX) and ETF options (QQQ)
- In Europe, liquid markets in Eurostoxx50 and DAX index options
- Moderate liquidity in single-name options in Europe
- Asia: Nikkei and Kospi200 are very active

Examples of trading strategies

- Think of volatility trading as trading in insurance premiums (against large moves in the underlying stock)
- Analyze market in options as an ``insurance'' market via normative models and build positions
- Long-only strategies: always buy volatility to capitalize on market dislocations. Typically proposed as an insurance overlay to other investments
- Long-short strategies: relative value approach. Capitalize on perceived mispricing of options. Originated from market-making activities in dealing rooms. Only recently adapted to asset-management
- Macro strategies: invest across asset classes (equity, fx, fixed income, currencies)

Long-Only Strategies

- Strategies are natural hedges/overlays
- Performed well before 2001
- Performed less well after 2001 due to drop in levels
- P/L profile: many small losses (time decay), occasional large windfalls

Long-Short Strategies

- Vega-neutrality as hedge to changes in market volatility
- Sell AND buy volatility (like insurance/reinsurance)
- Adapted from dealing room (market-making) practice
- Use correlation models for the underlying assets and their volatilities
- Require strict control of exposure to single-name risk and market crash risk

Practical aspects of vol trading

- Market structure: specialist system in the US, OTC in Europe
- Electronic versus voice trading
- Reduction in trading costs and improved access allows hedge funds to compete with B&Ds
- Liquidity in single names and ETFs can be a problem
- Technical infrastructure for trade processing, risk-management, models, etc

Worst-case scenarios for volatility trading & remedies

- Short volatility positions are such that underlying stock moves considerably and implied volatility goes up
- Long volatility positions are such that stocks move moderately and volatility collapses
- Limit exposure by asset
- Limit sector exposure
- Limit correlation exposure (dispersion trading)

Links between volatility trading and primary markets

- Issuers of structured products (guaranteed principal with equity upside) are sellers of long term equity volatility and correlation
- Convertible bond issuers are sellers of equity volatility
- Institutional investors tend to be long converts and banks are short structured notes
- Hedging these exposures creates flows in listed options (Eurostoxx50, Dow, S&P) and basket trades (dispersion) which connect long-term volatility markets with listed markets
- Estimated exposure by issuers of structured products is EUR 200 MM per correlation point *(RISK, May 2004)*