**Paper: *Volatility Dispersion Trading***

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[**https://papers.ssrn.com/sol3/papers.cfm?abstract\_id=1156620**](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1156620)

**Notes:**

**What is Dispersion Trading?**

* There is empirical evidence that index options, especially index puts, appear to be more expensive than their theoretical Black-Scholes prices, while individual stock options do not experience the same phenomenon.
  + **Dispersion trading is designed to capitalize on the overpricing of index options relative to individual options** 
    - **The strategy is achieved by selling options on an index and buying options on individual stocks that comprise the index**
* Dispersion trading is essentially a hedged strategy designed to take advantage of relative value differences in implied volatilities between an index and a basket of component stocks. Common to see a short position of a straddle or near-ATM strangle on the index and long positions of straddles or strangles on 30%-40% of stocks that make up the index
* The exposure to volatility risk from the long leg of the strategy on individual stock options tends to be canceled by that of the short leg in index options.

**Why does dispersion trading make money?**

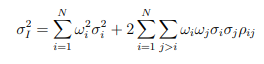
* This paper analyzes where profits from dispersion trading comes from. Most arguments are that profits are attributed to the correlation risk premium embedded in index options; however, the alternative argues that the profitability results from option market inefficiency.
  + There were institutional changes to the options market in late 1999 and 2000 that provide evidence supporting the market inefficiency hypothesis and against the risk-based hypothesis since a fundamental market risk premium should not change as the market structure changes
* **Risk-based hypothesis:** argues that index options are more expensive relative to individual stock options because they bear some risk premium that is absent from individual stock options
* **Market Inefficiency Hypothesis:** Argues options market demand and supply drive option premiums to deviate from their theoretical values

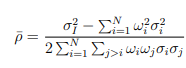
**How the paper tests dispersion trading?**

* Initially examine dispersion trading strategy that writes the ATM straddles of the S&P 500 and buys the ATM straddles of S&P 500 components.
  + This strategy loses profitability after year 2000
* Refined strategies which include analyzing implied correlation, delta hedging, and finding the cheapest components does do better over time
  + **Not delta hedging the initial is stupid**
* **They only use 85% to 115% strikes**

**Theory/Formulas Behind Dispersion Trading:**

**Index variance:**



**Implied Avg. Correlation:**

**Since the dispersion strategy involves long positions on individual volatilities and short positions on index volatility, it will make profits when the realized volatilities on individual stocks are high and the realized volatility of the index is low.**

* In other words, the strategy loses little on the short side and makes a lot on the long side if large “dispersion” among constituent stocks is achieved.
* **This will happen when the realized average correlation turns out to be lower than implied correlation** 
  + **Want to find areas of elevated implied correlation to make this trade**
* The main source of risk this strategy is exposed to can be interpreted as the variation of correlation between individual component stocks
* Profits could come from the negative correlation risk premium, or overpricing of index options relative to individual stock options, or both

**What the paper is truly trying to figure out:**

* Around 2000, options could be traded on different exchanges as opposed to certain options only trading on one exchange. This enabled price discovery, and decreased spreads on options significantly
* The paper looks to see if dispersion profits comes from market inefficiency (profits should disappear after 2000 then) or if it is from bearing correlation risk in which case profits should remain the same

**Paper Implementation:**

*Naïve Dispersion Strategy*

* Starting from Jan 1996, on the first trading day following options’ expiration date of each month, a portfolio of near-ATM straddles on S&P 500 index is sold and a portfolio of near ATM straddles on S&P 500 component stocks is bought.
* All options traded on this strategy expire in the next month and the paper simply rolls this strategy every single month to see returns
* Essentially returns on the strategy struggle after 2000 (1996-2000 does great and 2000-2006 not good)
* **This Naïve strategy is not what we are looking to do since it just enters the trades blindly and does not hedge at all**

*Dispersion Trading Conditional on Correlation*

* Dispersion takes long positions on the vol of index constituents and short positions on index vol. Index implied vol is supposed to be so high that the implied correlation is higher than the realized correlation between individual stocks
  + Sometimes the opposite situation proposes itself
* When forecasted correlation is higher than the current implied correlation, you take the trade
* This strategy performs much better than naïve

*Other possibilities of improving the trade include using PCA to find the optimal subset of component stocks and delta hedging which we will do regardless*