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# HOW TO EXTEND MODERN PORTFOLIO THEORY TO MAKE MONEY FROM TRADING EQUITY OPTIONS

## HOW TO READ DISPERSION NUMBERS, OR MARKET IS THE BIGGEST PORTFOLIO ONE COULD EVER MANAGE


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# HOW TO READ DISPERSION NUMBERS, OR MARKET IS THE BIGGEST PORTFOLIO ONE COULD EVER MANAGE

## *1. INTRODUCTION*

Every trader, market-maker or financial analyst knows what risk is and methods to estimate it. There are various theories on how to estimate risk in the world of finance. The most popular are thus by definition the most widely used. We do not endeavor in this forum to evaluate some of the more sophisticated theories of risk estimation but a brief discussion of what is probably the best known theory of portfolio risk, Value At Risk, is warranted. Value At Risk has become so prevalent that it is almost impossible to find professionals in the financial markets that are not at least remotely familiar with the measure.

What is commonly referred to as VAR is the risk expressed in dollar terms showing what amount of money your portfolio can lose during a defined interval with a given probability. The terms which are most commonly mentioned along with VAR and are similar in meaning to VAR are dispersion, variance and volatility. So, VAR is in essence the volatility of portfolio expressed in dollar terms. Beginning with the basics of VAR analysis we can then demonstrate how this concept can be applied not only to estimate the risks of a portfolio of assets, but as to how this theory can be applied to trading the market itself.

In general, we could consider the markets as one large portfolio of various assets with each having their respective weights in the global market place. Furthermore, we can estimate the global market risk, draw comparisons with historical data and perform many types of empirical studies etc. The only significant practical difficulties that one would encounter would be the large quantity of historical information required and the substantial attendant technical resources to manage it.

We can more efficiently explore the same concepts however by opting to focus on a few subsets of the global markets. Let's consider a few major indices within the markets which were introduced specifically to provide an assessment of the general market conditions, and let's venture to apply dispersion analytics to these indices.

An index measures the price performance of a portfolio of selected stocks. It allows us to consider an index as a portfolio of stock components. From that point of view, index risk can be evaluated as the risk of the portfolio of stock constituents.

It is well known that the portfolio risk is a weighted sum of covariation of all stocks in the portfolio. Thus, it can be calculated by the following formula that hereinafter will be referred to as the main formula.

$$\sigma_p^2 = \sum_{i=1}^{N} W_i^2 * \sigma_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i * W_j * \sigma_i * \sigma_j * corr_{ij}$$

Here is a weight of an asset in the portfolio or a component weight in the index, $\sigma_i^2$ is dispersion of a stock component.

**NOTE**

The formula above can be used in several ways. First, remark that all the data in this equation are provided by observations of the market. But if we were to input actual data on the left and right side, we would not find exact equality. This leads to idea that substituting some parameters with actual data, we can determine theoretical values of the remaining ones. We can substitute historical or implied volatilities in this formula in place of $\sigma_i^2$, and correlations between stock prices or between implied volatilities of stocks in place $corr_{ij}$ of to calculate theoretical risk of an index.

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With this formula the portfolio or index risk can be calculated for different terms, since we can use volatilities and correlations calculated on any desired historical time interval for price data and different forecast times for implied data. Also, by using this formula we can calculate a value that expresses the correlation level between the implied volatilities of the stocks and the index implied volatility observed on the market.

All charts introduced in the paper are provided by EGAR Dispersion and IVolatility.com database.

## 2. FUNDAMENTAL INDEX PARAMETERS

Let's discuss the types of values that can be employed in the dispersion strategy. These values enable traders to determine whether current conditions are suitable for a dispersion trade. We will distinguish amongst these three kinds of values: realized, implied, and theoretical.

**Realized** values can be calculated on the basis of historical market data, e.g. prices observed on the market in the past. For example, values of historical volatility, correlations between stock prices are realized values.

**Implied** values are values implied by the option prices observed on the current day in the market. For example, implied volatility of stock or index is volatility implied by stock/index option prices, implied index correlation is an internal correlation implied by the market. More details on this value type can be found below.

**Theoretical** values are values calculated on the basis of some theory, so they depend on the theory you choose to calculate them. Index volatilities calculated on the basis of the portfolio risk formula are theoretical, and can differ from realized or implied volatilities.

A comparison of theoretical values with realized ones allows traders to determine what market behavior are best applied to the actual trading environment. By studying and analyzing the historical relationship between these two types of values one can make an informed decision about related forecasts.

By comparing implied and historical volatilities, theoretical and realized, or theoretical and implied values of the index risk, we can attempt to ascertain the best time to employ the dispersion strategy or to choose to continue to monitor the markets.

The dispersion strategy typically consists of short selling options on a stock index while simultaneously buying options on the component stocks, the reverse dispersion strategy consist of buying options on a stock index and selling options on a the component stocks.

Over the last year the index options were priced quite high (as shown on the charts below), while historical volatility was lower. As a result, it was generally profitable to sell rich index options. However, there also were short periods, when the reverse scenario occurred, thus buying index options in those periods would have generally resulted in profits.

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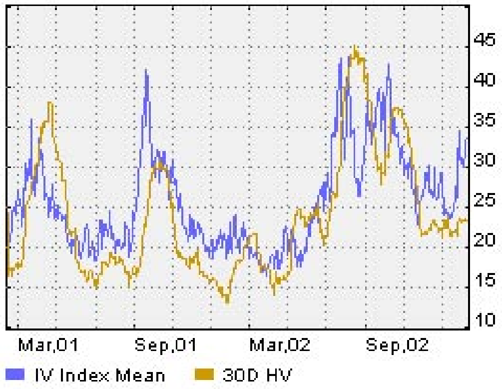


Chart 1: IV Index and HV for OEX

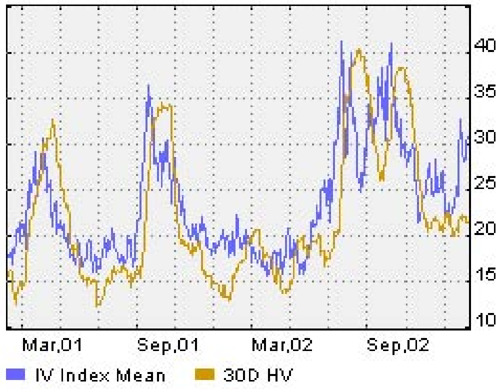


Chart 2: IV Index and HV for DJX

As you can see on the second chart, historical volatility of DJX was greater than implied volatility at times and reached a local maximum in the last week of September 2001. The explanation for this lies in the tragic events of September 11. A similar jump in volatility which was driven by very different factors can be observed in the September 2002. This particular time was quite good for buying cheap index options, and thus to engage in the reverse dispersion strategy.

## 2.1 Realized Values

### Historical Volatility %

As mentioned above, historical volatility is calculated on the basis of stock price changes observed over a given time period. Prices are observed at fixed intervals of time (named terms): every day, every week, every month etc.

**Historical Volatility** is calculated as the standard deviation of a stock's returns for the last N days. Return is defined as the natural logarithm of close-to-close price observations.

## 2.2 Implied Values

### IV Index %

**Implied Volatility Index**, or IVIndex, is the main parameter used for implied data in dispersion strategy analysis.

**Implied Volatility** is Volatility which is implicit in the option prices observed within the markets. Implied Volatility can be used to monitor the market's opinion about the Volatility of a particular stock or index. Also implied volatility values may be used to estimate the price of one option from the price of another option.

As implied volatilities are different for different options, it is useful to have a composite Volatility for a stock/index by taking suitable weighted individual volatilities. Such a composite volatility, calculated on the basis of 16 Vega weighted ATM options and normalized to a fixed maturity, is called the **Implied Volatility Index**. Hereinafter when we refer to implied volatility of a stock or index we mean the **Implied Volatility Index**.

**The chart below shows the time history of Implied Volatility Index for OEX, DJX, SPX, SOX, NDX, and OSX indexes. As one can observe on the chart:**

- In whole implied volatilities of indices move synchronously.
- The Implied Volatility Index of global equity indices such as SPX, OEX, and DJX are almost coincident, since such indexes reflect the state of economics in general, and so their performances are affected by the similar factors.
- The implied volatilities of global equity indexes are lower than those of sector indexes, e.g. see SOX and OSX. It can be explained by that changes in one sector considerable affect indexes from this sector, but may slightly enough influence on the global market indexes. So risk for index that consists of equities from within the same industry is higher.
- As you can see NASDAQ-100 (violet line on the chart) has higher implied volatility that other major market indexes. It can be explain by the fact that this index includes companies listed on the NASDAQ Stock Market only, while DJX, OEX, SPX cover broader group of stocks listed on different exchanges.

As was mentioned above, major market indices have in whole lower implied volatility in comparison with sector indices. But it should not be considered as some indexes are better, and other is worse for the dispersion strategy. The important role in the strategy plays not absolute value of implied volatility, but historical relationship between implied and realized index volatility.

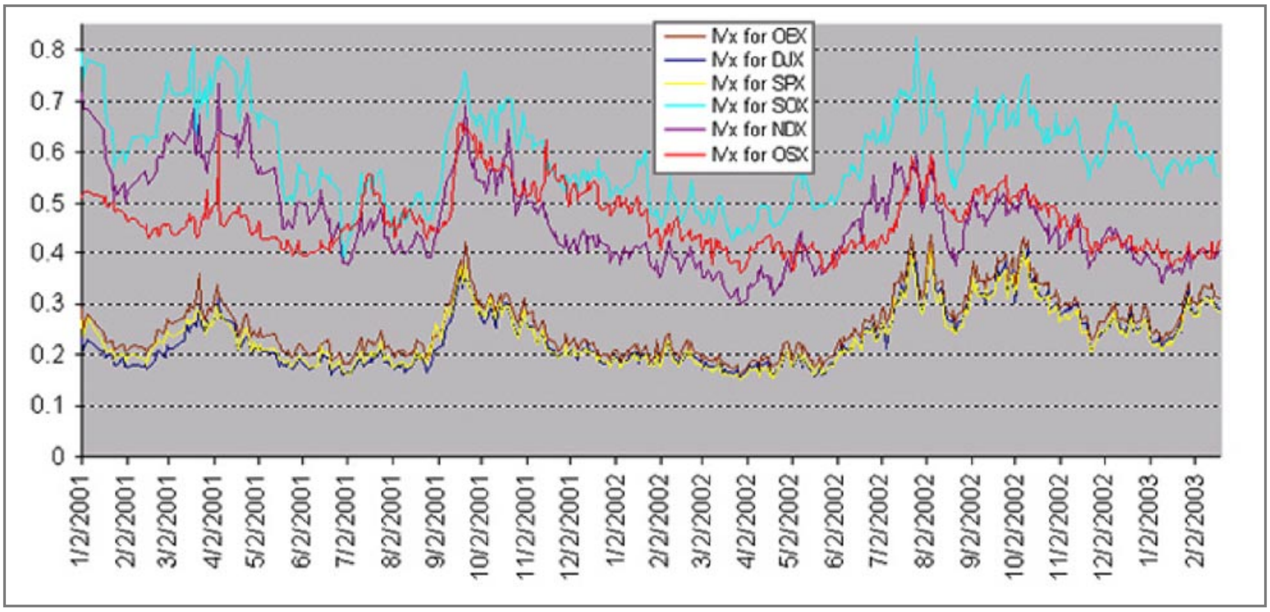


Chart 3: Time history of Implied Volatility for OEX, DJX, SPX, SOX, NDX, OSX.

## *EXAMPLE*

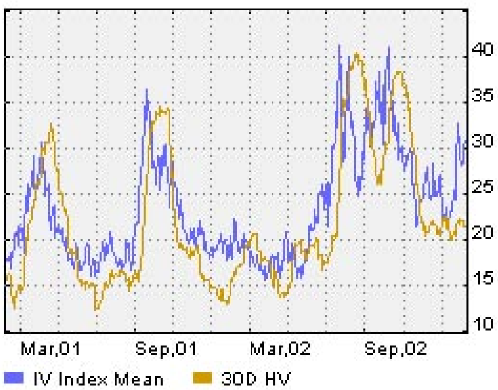


Chart 4: 30 day IVIndex and HV of DJX index.

You can see the Implied Volatility Index and Historical Volatility of the DJX index on the chart.

The most recent implied volatility of index (31%) is not far from the recently registered maximum value (41%), and it reaches its local maxim and higher than realized (historical) volatility. It suggests that it is a good time for selling options on the DJX Index in the dispersion strategy, because it means selling relatively rich options.

Note: If the implied volatility of the index was relatively low and lower than historical volatility it would mean a good time for buying options on the index, i.e. to engage in the reverse dispersion strategy.

## Implied Index Correlation %

**Implied Index Correlation** defines correlation level between the actual implied volatility of the index and the implied volatility of its stock components. In other words, it is a component-averaged correlation between implied volatilities calculated from the formula of the portfolio risk, where $\sigma_I$ and $\sigma_i$ are actual index and stock components implied volatilities $w_i$, is a weight of a component in the index.

$$\text{Implied Index Correlation} = \frac{\sigma_I^2 - \sum_{i=1}^{N} W_i^2 \sigma_i^2}{2 \sum_{i=1}^{N} \sum_{j>i} W_i W_j \sigma_i \sigma_j}$$

The greater **Implied Index Correlation**, the stronger correlation between the index implied volatility and that of its constituent stocks, and therefore the more suitable the market conditions for deploying a dispersion strategy. However, this is not an absolute measure and should therefore be examined in the light of its historical (realized) performance.

**Realized Index Correlation** can be calculated from the same formula by using the historical volatilities of stocks and the index instead of implied volatilities.

Empirically sector indices usually have exhibited higher implied and realized correlations than major market indices. As you can see in the table below, the 30 day implied index correlation of sector indexes SOX and OSX are 75.75% and 93.90% correspondingly, while the implied correlation of broader market indexes such as the NDX, OEX, and DJX are lower (60.87%, 66.40% and 68.50% correspondingly). This phenomena has a reasonable explanation in that sector indexes consist of equities from within the same industry, thus they are much more co-dependant on the same conditions rather than equities from different industries.

| Data Term : 30 | CAC | DAX | DJX | MSH | NDX | OEX | OSX | SOX | SPX | TX60 |
|---|---|---|---|---|---|---|---|---|---|---|
| Index IV % | 38.56 | 44.94 | 30.39 | 43.23 | 40.51 | 32.25 | 40.48 | 58.26 | 30.32 | 21.70 |
| HV % | 27.10 | 42.06 | 21.50 | 36.84 | 31.96 | 23.34 | 35.66 | 46.80 | 22.12 | 13.79 |
| IC % | 81.96 | 65.17 | 68.50 | 54.17 | 60.87 | 66.40 | 93.90 | 75.75 | 58.49 | 53.46 |
| WtdCompIV % | 42.38 | 54.67 | 36.39 | 58.01 | 51.47 | 39.34 | 41.68 | 66.17 | 39.51 | 29.24 |
| WtdCompIV / IndexIV | 1.10 | 1.22 | 1.20 | 1.34 | 1.27 | 1.22 | 1.03 | 1.14 | 1.30 | 1.35 |
| HistCorrWtdCompIV % | 29.82 | 45.98 | 26.46 | 42.46 | 37.81 | 28.10 | 38.27 | 56.29 | 26.78 | 15.66 |
| HistCorrWtdCompIV / IndexIV | 0.77 | 1.02 | 0.87 | 0.98 | 0.93 | 0.87 | 0.95 | 0.97 | 0.88 | 0.72 |
| CorrWtdCompIV % | 8.37 | 20.06 | 19.74 | 25.10 | 21.27 | 21.23 | 17.31 | 32.35 | 18.42 | 8.08 |
| CorrWtdCompIV / IVIndex | 0.22 | 0.45 | 0.65 | 0.58 | 0.53 | 0.66 | 0.43 | 0.56 | 0.61 | 0.37 |
| CorrWtdCompIV - IVIndex % | -30.19 | -24.88 | -10.65 | -18.13 | -19.24 | -11.02 | -23.17 | -25.91 | -11.89 | -13.62 |
| orrWtdCompHV % | 25.16 | 39.82 | 20.61 | 35.70 | 30.86 | 22.53 | 34.18 | 44.25 | 21.67 | 12.32 |
| WtdCompHV / HV | 0.93 | 0.95 | 0.96 | 0.97 | 0.97 | 0.97 | 0.96 | 0.95 | 0.98 | 0.8[illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | -1.48 | [illegible] | [illegible] | [illegible] |

Looking at the time history of Implied Correlation for global market indexes (DJX, OEX,SPX etc) one can observe, that the implied index correlation for them has a tendency to increase (certainly, there are some jump and drops, but in whole it rises), while average implied correlation of sector indexes (OSX , SOX etc) remain on the same high level (see charts 5 and 6).

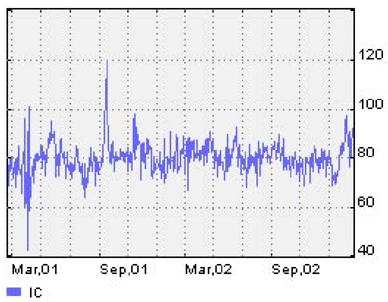


Chart 5: Implied Index Correlation of OSX

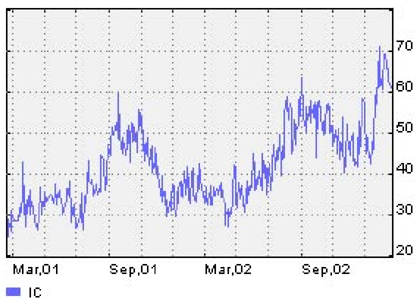


Chart 6: Implied Index Correlation of OEX

**NOTE:**

The implied index correlation is calculated on the basis of the implied volatilities of the stock components and the index options which are implicit in the option prices observed in the market. So, the implied index correlation can be greater than 1, or 100%, since the individual stock options and index options markets are in reality separate markets. Implied Index Correlation greater than one means that actual implied volatility of the index substantially exceeds the theoretical volatility, i.e. theoretically index options are too overpriced (see formula below). But as a rule, for American indexes Implied Index Correlation is less than 100%.

$$IC > 1 \Rightarrow \sigma_I^2 > \sum_{i=1}^{N} W_i^2 \sigma_i^2 + 2\sum_{i=1}^{N} \sum_{j>i} W_i W_j \sigma_i \sigma_j > \sum_{i=1}^{N} W_i^2 \sigma_i^2 + 2\sum_{i=1}^{N} \sum_{j>i} W_i W_j \sigma_i \sigma_j corr_{ij} = \sigma_P^2$$

In this formula $\sigma_I$ is actual implied volatility of index calculated from the market conditions, and $\sigma_P$ is theoretical implied volatility of index calculated from the formula of the portfolio risk.

## *EXAMPLE*

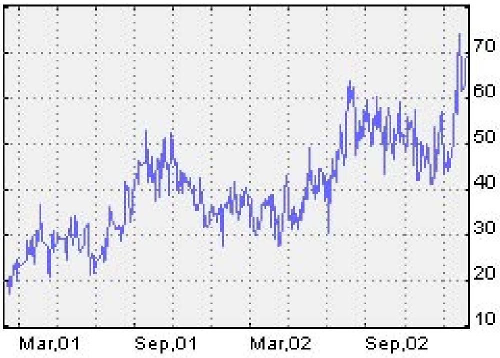


Chart 7: Implied Index Correlation for DJX

As mentioned above, the greater the implied index correlation (IC), the greater the components and index volatilities are moving in the same direction. Therefore, the higher the average correlation between index volatility and volatilities of constituent stocks, the better the timing of a dispersion strategy. Let's look at the chart 7 which shows the 30 day Implied Index Correlation for the DJX index. Last year correlation was positive, and current value of 70% is close to the maximum. It suggests an opportune time for a dispersion strategy.

## 2.3 Theoretical Volatility Values

There are several ways to calculate the risk of the index. Theoretical Index Volatility can be calculated from the formula of portfolio dispersion, or as a weighted sum of components' volatilities. The calculation of theoretical volatilities is not difficult, but it is a very laborious task, since it requires processing of a substantial quantity of historical volatility data.

### WtdCompIV %

The simplest method to calculate an index volatility is to consider it as a weighted sum of volatilities of its components. This sum will be called **weighted components implied volatility**, or weighted volatility of index.

The weighted volatility of index calculated this way expresses overall implied volatility of the index components, but ignores correlation between component stocks. The ratio of the components implied volatility (WtdCompIV %) to actual implied index volatility hereinafter will be referred to as a **first volatility level coefficient**.

Let's clear up connection between the weighted component implied volatility and implied index correlation described above. As it follows from the formula of implied index correlation

$$\sigma_I^2 = \sum_{i=1}^{N} W_i^2 \sigma_i^2 + 2 * IC * \sum_{i=1}^{N} \sum_{j>i} W_i W_j \sigma_i \sigma_j$$

, where $\sigma_I$ and $\sigma_i$ are actual values of the index and stock components implied volatilities, IC is implied index correlation. It is not difficult to re-arrange this expression to the following form

$$\sigma_I^2 = (\sum_{i=1}^{N} W_i \sigma_i)^2 + 2 * (IC - 1) * \sum_{i=1}^{N} \sum_{j>i} W_i W_j \sigma_i \sigma_j$$

So if implied index correlation is 1 the actual implied volatility of index is exactly the weighted sum of the individual stock constituent implied volatilities (see the formula above). As was mentioned above, generally, IC is less than one, so, as a rule, the first volatility level coefficient is greater than 100%, i.e. theoretical volatility of index calculated without taking correlations between index components is greater than actual implied volatility (see chart 8). But since implied index correlation can be greater then 100%, e.g. this happens for European indexes, the first volatility level coefficient can be less than one.

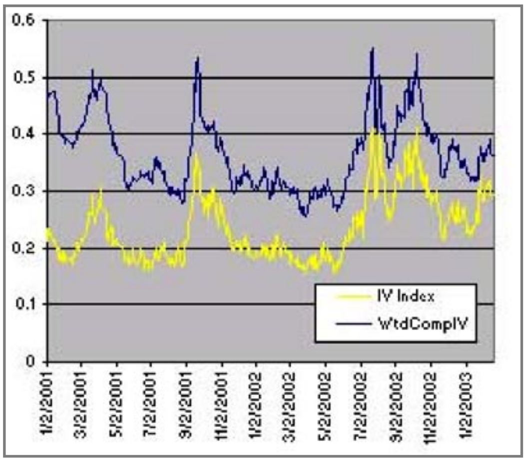

Chart 8: Theoretical and implied volatilities of DJX

The main factor affected the first volatility level coefficient is changing correlation between stock and index volatility. Let's look at the chart 8 which shows components implied volatility and actual implied volatility for DJX. As you can see on the chart, in whole components implied volatility and actual implied volatility move synchronously. But lately the weighted components implied volatility verges towards the actual implied volatility (see chart 9). It can be explained by growing implied index correlation (see chart 10).

Chart 9 displays the first volatility level coefficient for the DJX index. The coefficient falls over the last two years. The current value of the coefficient is 1.2. It is close to its lowest value in two years. Thus, it is convenient time for dispersion strategy, because it means that correlation level between implied volatilities of stocks and index is high.

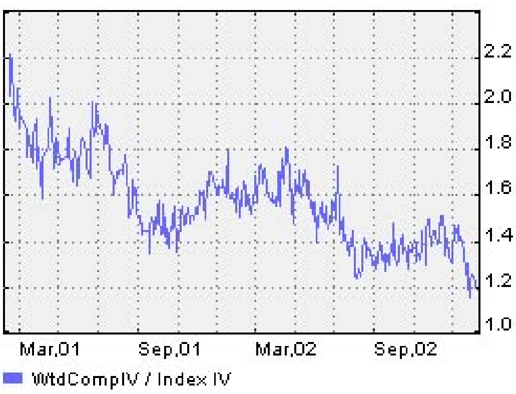

Chart 9: First volatility level coefficient for DJX

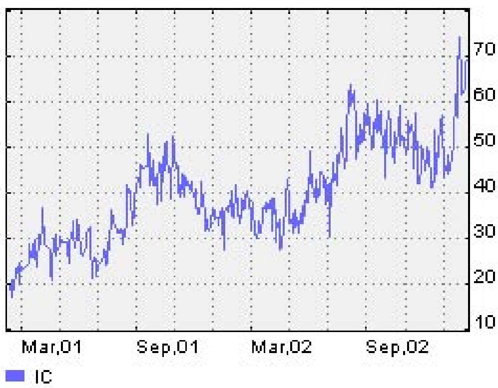

Chart 10: Implied Index Correlation for DJX

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## CorrWtdComponent IV%

Let's consider the index as a portfolio of component stocks with the corresponding weights. Thus, by using the main formula we can calculate risk of index as risk of portfolio.

$$\sigma_p = \sqrt{\sum_{i=1}^{N} W_i^2 * \sigma_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i * W_j * \sigma_i * \sigma_j * corr_{ij}}$$

We can calculate the theoretical value of index volatility on the basis of implied volatility index (IVIndex) of each component, and correlations between components' IVIndex values. This volatility further will be referred to as **theoretical correlated implied volatility** of index.

$$\text{CorrWtdCompIV}_p = \sqrt{\sum_{i=1}^{N} W_i^2 * IVIndex_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i * W_j * IVIndex_i * IVIndex_j * corr(IV_i, IV_j)}$$

Here $w_i$ is a component weight in the index, $IVIndex_i$ is implied volatility index of a component stock, $corr(IV_i, IV_j)$ - correlation between implied volatility indexes of two stocks.

The ratio of theoretical correlated implied volatility of the index to the actual implied volatility is calculated to estimate the difference between theoretical and real prices of index options. Furthermore, this relationship will be called a **second volatility level coefficient**.

If the second volatility level coefficient is less than one, and relatively low, it means that, theoretically, index options are too overpriced. Thus it is profitable to sell index options. If the second volatility level coefficient is greater than one, and relatively high, it means that, theoretically, index options are conservative priced and represent a value. Thus it is profitable to buy them.

In practical terms, since the second volatility level coefficient is based on correlations of implied volatilities, it is a better measure for a "vega" trade, i.e. trade in which you are trying to capture the relative value based solely on vega. Longer term trades have lower gamma but higher vega, and so predominant risk factor is volatility. The second volatility level coefficient tends to perform better for longer term trades where vega is the prevalent risk factor while gamma and theta are minor risk factors. Comparing second volatility level coefficients for different terms allows to select the best term for dispersion trades.

### *EXAMPLE*


Chart 11: Second volatility level coefficient for SOX

The following chart shows second volatility level coefficient of SOX for a 30 day term. The current value is 0.57. So historically theoretical correlated implied volatility is lower than actual implied volatility, and this was observed for all indexes over last few years. Nevertheless, drops and jumps over histories can show times where options theoretically were more or less overpriced relatively. So selling index options is profitable in these periods.

### *ADDITIONALLY*

It is simply to prove that the theoretical correlated implied volatility of an index, which is calculated on a correlation adjusted basis, cannot be greater than weighted implied volatility, which ignores correlations.

$$CorrWtdCompIV^2 = \sum_{i=1}^{N} W_i^2 IV_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i W_j IV_i IV_j corr_{ij} \le \sum_{i=1}^{N} W_i^2 IV_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i W_j IV_i IV_j = WtdCompIV^2$$



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Thus second volatility level coefficient is always less or equal to first coefficient. As you can see on the chart below, taking into account the correlation between stocks essentially reduces overall theoretical index volatility.

Chart 12: Time history of WtdCompIV and CorrWtdCompIV for DJX.

## CorrWtdCompHV, %

The **theoretical historical volatility** of index can be calculated from the main formula on the basis of historical volatilities of each component and correlations between stock prices.

$$\text{CorrWtdCompHV}_p = \sqrt{\sum_{i=1}^{N} W_i^2 HV_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i W_j HV_i\, HV_j\, corr(price_i, price_j)}$$

In this formula $HV$ is historical volatility of constituent stocks calculated on the basis of recent 10, 20, 30, 60, 90, 120, 150, 180 days, $corr_{ij}$- correlation between stock prices for the corresponding term.

The ratio of theoretical historical volatility of index to actual volatility is shown on the chart 13. This ratio that henceforth will be referred to as **third volatility level coefficient** indicates how much theoretical historical volatility differs from actual volatility.

If the third coefficient is less than 1 and low, it means that theoretical performance of the index is less then actual volatility and trader can gain profit selling index options. As a rule, for American indices the third volatility level coefficient is less than 1. The higher the value of third volatility level coefficient, the better time for buying index option.

The shorter term options have much less vega risk but more gamma risk, i.e. risk to the price moves of the underlying. On a practical level since the third volatility level coefficient is based on stock prices and correlations between them, it is a better measure for a "gamma" trade, i.e. trade in which you are trying to capture the relative value based solely on gamma. Thus this measure tends to be better suited for short term portfolios where gamma is the dominant factor.

### *EXAMPLE*

Let's look at the chart 13, which shows third volatility level coefficient for DJX. Current value is relatively high and less than 1, thus it is not a good time for selling short term index options, since the theoretical historical volatility is not far from actual one. But because the current value of second volatility coefficient is relatively low and less than 1, selling long term index options can be profitable, because theoretically they are substantially overpriced.

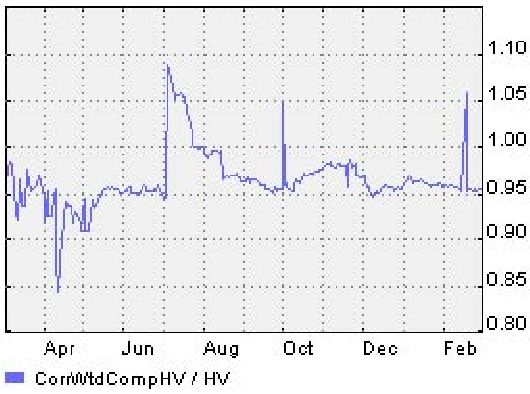


Chart 13: Third volatility level coefficient for DJX

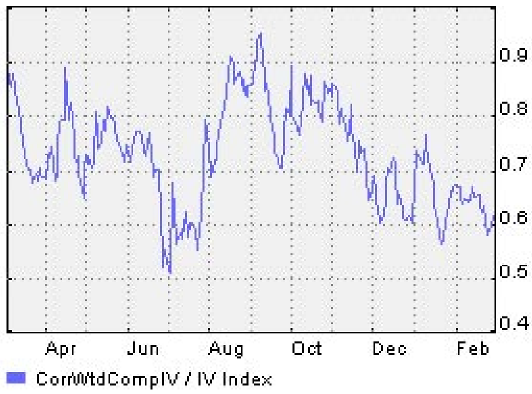


Chart 14: Second volatility level coefficient for DJX.

Let's look at the chart 15 which shows theoretical implied volatility (CorrWtdCompIV) and theoretical historical volatility (CorrWtdCompHV) for DJX. As a rule CorrWtdCompHV (calculated on the basis of price correlations and historical volatility) is higher that CorrWtdCompIV (calculated on the basis of implied volatilities and correlations between them). It arises from higher level of correlations between stocks' prices in comparison with correlations of stocks' implied volatilities.


Chart 15: CorrWtdCopmIV and CorrWtdCompHV for DJX

## HistCorrWtdCompIV %

Theoretical correlated implied volatility of an index is calculated on the basis of implied volatilities of its constituent and correlations between them, the theoretical historical volatility of index is calculated from the main formula on the basis of stock historical volatilities and correlations between stock prices.

But we can use mixed data, historical and implied, to calculate theoretical volatility of index. Such volatility is calculated by using the main formula, where $\sigma$ is implied volatility index of a component, and $corr_i$ is correlation between stock prices, not between implied volatilities.

$$\text{HistCorrWtdCompIV}_p = \sqrt{\sum_{i=1}^{N} W_i^2 IVIndex_i^2 + 2\sum_{i=1}^{N}\sum_{j>i} W_i W_j\, IVIndex_i\, IVIndex_j\, corr(price_i, price_j)}$$

The chart 16 shows the ratio of such a theoretical volatility to actual implied volatility of index. As a rule, this relation is less than one.

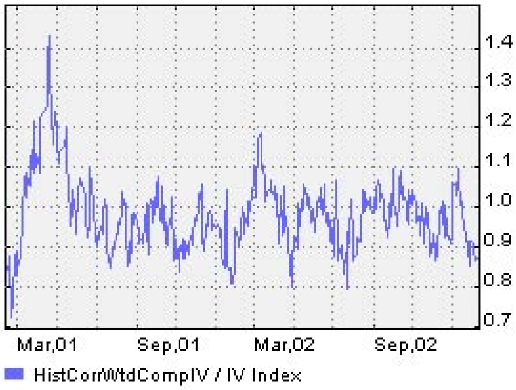


Chart 16: HistCorrWtdCompIV/IV Index for DJX

The only difference between CorrWtdCompIV and HistCorrWtdCompIV consists in different correlations used in calculations. One can observe that as a rule HistCorrWtdCompIV is higher than CorrWtdCompIV since stock prices correlations are higher than correlations between implied volatilities.


Chart 17: 30 day HistCorrWtdCompIV and CorrWtdCompIV for DJX.

## *3. DISPERSION STRATEGY*

**Volatility Dispersion Strategy** is considered to be one of the best working strategies in sophisticated analytics. It can be explained by the fact, that historically index volatility has traded rich, while individual stock volatility has been fairly priced. Thus the dispersion strategy allows traders to profit from price differences using index options and offsetting options on individual stocks.

The dispersion strategy typically consists of short selling options on a stock index while simultaneously buying options on the component stocks, i.e. leaves short correlation and long dispersion. The reverse dispersion strategy consists of buying options on a stock index and selling options on the component stocks.

The success of the Volatility Dispersion Strategy lies in determining whether the time is right to do a dispersion trade at all, and selecting the best possible stocks for the offsetting dispersion basket.

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## *THE BEST TIME FOR THE DISPERSION STRATEGY*

**When selecting the best time to engage in the dispersion strategy, you should to pay attention to the following parameters:**

**IV Index of index**

If the relation of actual implied volatility of index to historical volatility is greater than 1 and relatively high, it is good time for selling index options, since it means selling expensive options on the stock index.
If the relation of actual implied volatility of index to historical volatility is less than 1 and relatively low, it is good time for buying index options, since it means buying relatively cheap options.

**Implied Index Correlation**

Implied Index Correlation should not be too far from the maximum registered value, since the dispersion strategy works better if the implied volatility of the index is highly correlated with the implied volatilities of its stock components.

**WtdCompIV/Index IV** – first volatility level coefficient

The low value corresponds to high Implied Index Correlation. So the lower the value of the first volatility level coefficient, the better the time to engage in a dispersion strategy.

**CorrWtdCompIV/IVIndex** – second volatility level coefficient is a better measure for for longer term trade.

If the second volatility level coefficient is less than one and relatively low, it means that theoretical performance of the index is less then implied by market and a trader can gain profit selling index options. Otherwise, if the second coefficient is greater than one and relatively high, it is a better time for buying index options.

**CorrWtdCompHV/HV** - third volatility level coefficient is a better measure for shorter term trade.

If the third volatility level coefficient is less than one and relatively low, it means that theoretical performance of the index is less then implied by market and a trader can gain profit selling index options. Otherwise, if the third coefficient is greater than one and relatively high, it is a better time for buying index options.

### *COMPONENT STOCKS SELECTION FOR THE DISPERSION STRATEGY*

Assuming that the timing is propitious for a dispersion trade, the next step is to select the best component stocks to sell (or buy in the case of reverse dispersion strategy). This step will be discussed in the next article.