

# How to Use the IV Index



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## 1. Introduction

The IV index includes data on the underlying stock, index, or ETF, such as Last Price, Change, Bid, Ask, Ask Size, High, Low, and Volume. It also uses the Implied Volatility Index and Historical Volatility, including volume charts that depict the 30-day Historical Volatility, the Implied Volatility Index Mean, and the options volume.

## 2. Getting Started

Just enter an underlying stock, index, or ETF symbol in the space provided in “Underlying” box located on the left side of the screen as shown below and then click Search, or just press enter. (If you don't know the symbol, click “Find Symbol” and enter the company, index or ETF name.)



Underlying:  
   
[Find Symbol](#)

## 3. Reading the Data

### 3.1 Basic Underlying Quote Information

After clicking “Search”, data for the selected underlying stock will appear in the quote table as shown below.

GOOG - GOOGLE INC. As of 9:41:00AM ET 09/10/2010<sup>†</sup> | [Refresh](#)

Last	Change	Bid Size	Bid	Ask	Ask Size	High	Low	Volume	90-Day Avg. Vol.	Avg. Option Vol.	Avg. Options Open Interest
453.66	-5.17	5	453.43	453.66	4	459.76	453.02	918,949	3,145,403	700,010	21,070,653

The following columns are represented:

- **Last** is the current market price of the underlying stock.
- **Change** shows the absolute change in price from previous close.
- **Bid Size** is the number of shares at the bid price, expressed in terms of hundreds of shares.
- **Bid** is the highest price the buyer is willing to pay for the underlying stock at this time. It is also called the bid price.
- **Ask** is the lowest price currently being offered for sale.
- **Ask Size** is the number of shares that are being offered for sale at the ask price, expressed in terms of hundreds of shares.
- **High** is the highest price recorded for the day.
- **Low** is the lowest price recorded for the day.
- **Volume** is the number of shares traded during a day.
- **90-Day Avg. Vol.** is the number of shares traded per day, averaged over last 90 days.
- **Avg. Option Vol.** is the average number of options contracts traded in the last five days.
- **Avg. Option Open Interest** is the average number of options contracts still open for the last five days.

The last quote date and time are shown in the upper right corner. To refresh the data, click the “Refresh” link in the upper right corner of the data table.

## 4. Implied Volatility Index Table

The Implied Volatility Index table shows both the call and put values for six time periods, along with the one-day change. To compare how the current values have changed over time, it displays each period value for the prior week and prior month for both the calls and puts.

### Implied Volatility Index

Term	Current IV Index				1 Week Ago		1 Month	
	Call	Chg.	Put	Chg.	Call	Put	Call	Put
30 Days	25.16%	-1.41%	25.14%	-0.33%	28.46%	28.32%	28.51%	27.78%
60 Days	25.93%	-0.98%	25.62%	-0.42%	27.10%	27.20%	26.75%	26.19%
90 Days	26.96%	-0.73%	26.56%	-0.34%	27.55%	27.62%	26.14%	25.63%
120 Days	27.75%	-0.46%	27.23%	-0.43%	27.99%	28.06%	26.53%	26.11%
150 Days	28.25%	-0.29%	27.65%	-0.49%	28.25%	28.34%	27.05%	26.73%
180 Days	28.57%	-0.30%	28.16%	-0.63%	28.57%	28.84%	27.45%	27.20%

For those who may be interested in longer-term strategies, six different IV Indexes are shown from 30 days to 180 days.

## 4.1 Implied Volatility Description

The Implied Volatility (IV) of a stock, index or ETF is a derived value, computed with an option-pricing model (such as the Black-Scholes). Since the actual options prices are an input into the model Implied Volatility reflects expectations regarding future volatility of the underlying stock, index or ETF. It can also be used to help gauge if options are cheap or expensive. In addition, each option contract has a unique level of Implied Volatility, which will change over time as demand for each option rises or falls. For reference purposes, an Implied Volatility Index can be created by merging individual implied options prices. By merging the individual prices of several different periods, we create the IV Index values for 30, 60, 90, 120, 150 and 180 (calendar) days as shown above. However, disparities in the actual values from those derived by the options pricing model arise as the market adjust the options prices to reflect perceived changing risk, referred to as the “volatility smile.”

In the table above, there are three different Implied Volatility Indexes (IV Indexes or IVX):

IVX Call (calculated using call options only)  
IVX Put (using only put options)  
IVX Mean (using an average of the call and puts)

For example, IVX Call 30 value shows the merged implied volatility of a hypothetical Call option with 30 days to expiration. This call value is adjusted to give more weight to the relatively liquid calls with their strike prices near the current price of the underlying. In the appendix, we have an example of the calculation methodology.

## 5. Historical Volatility Table

The table below is an example of the Historical Volatility table with values computed for five different Historical Volatility periods from 10 to 180 days.

Historical Volatility (HV), also called Statistical Volatility (SV) or Realized Volatility, refers to the past price movements of the underlying. Historical Volatility is defined as a one standard deviation price change, computed from close-to-close price data, annualized.

### Historical Volatility

Term	HV	1 Week ago	1 Month ago	52-Week High		52-Week Low	
10 Days	40.40%	40.65%	31.63%	55.69%	07/21/2010	9.16%	11/17/2009
20 Days	32.84%	32.32%	25.90%	48.83%	05/10/2010	14.51%	11/25/2009
30 Days	32.52%	30.98%	23.31%	43.34%	05/21/2010	17.48%	12/10/2009
60 Days	26.88%	26.04%	29.57%	38.53%	07/21/2010	20.20%	01/27/2010
90 Days	30.88%	30.70%	30.14%	40.69%	10/26/2009	22.58%	03/10/2010
120 Days	32.43%	32.84%	33.23%	39.37%	10/28/2009	23.08%	04/05/2010
150 Days	32.67%	32.36%	31.37%	40.60%	10/28/2009	26.03%	03/24/2010
180 Days	31.16%	31.14%	30.24%	43.85%	10/26/2009	26.17%	04/20/2010

The table above shows the Historical Volatility (HV) along with the comparative data from 1 Week ago, 1 Month ago, and the 52-week High and Low values.

Comparing the Historical Volatility to the Implied Volatility can provide assistance in making estimates about the likely future relationships and preparing trading plans based upon determining if the current option prices are expensive or cheap relative to the past movement in the price of underlying asset.

For a further understanding of Historical Volatility, see the appendix.

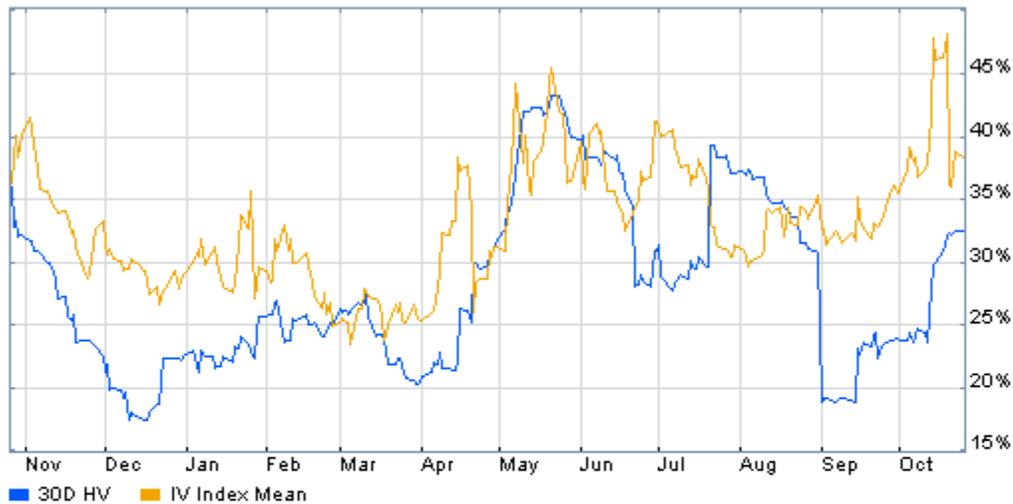
## 6. Volatility Charts

The chart section has two charts. The first compares the 30-day Historical Volatility and the IV Index Mean for the last year. For a closer look, the chart period can be changed to three months or six months for an intermediate view. The percentage annual rate of change is displayed in the right margin.

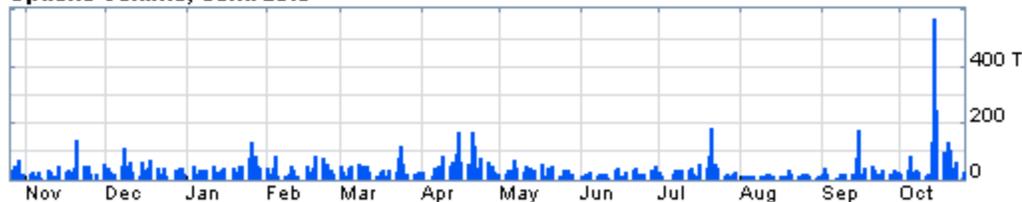
The Implied Volatility selection may also be changed to view the calls by selecting IV Index Call, or puts by selecting IV Index Put, or IV Index Call and Put (both charts) or IV Index mean (average for the calls and puts).

The second chart shows options volume change in thousands of shares for the same period.

**YHOO: Volatility Chart** ( 3 months | 6 months | 1 Year )  
IV Index Call | IV Index Put | IV Index Call & Put | IV Index Mean



**Options Volume, Contracts**



Provided by: IVolatility.com

Using the volatility chart is a quick way to find opportunities when the volatility measures are at extremes and may likely revert to their mean values. Often quarterly reporting dates can be quickly associated with Implied Volatility spikes using the chart.

## 7. Appendix

### 7.1 IV Index Calculation Methodology

To see the calculation for the IV Index, let's use an example of "IVX Call 30." Suppose today is 04/05/2004, and there are 12 days until the front month (April) expires - and 47 days until the next month expiration (May). Options using these two expirations will be used for the IV Index calculation of term 30 - as they are the 2 expirations closest to 30-day virtual expiration.

First, we take four April call options contracts with strikes nearest to current stock price to calculate IV Index for April, or "IVX Call 12". "IVX Call 12" is their weighted average, where weighting is by Vega (option price sensitivity to a change in Implied Volatility).

In the same manner, the IV Index for May expiry is calculated, "IVX Call 47". Now, we interpolate these two values to get "IVX Call 30"; the interpolation is linear by square root of days to expiry, that is,

$$\text{IVX Call 30} = \text{IVX Call 12} * (\sqrt{47} - \sqrt{30}) / (\sqrt{47} - \sqrt{12}) + \text{IVX Call 47} * (\sqrt{30} - \sqrt{12}) / (\sqrt{47} - \sqrt{12})$$

Or

$$\text{IVX Call 30} \approx 0.4 * \text{IVX Call 12} + 0.6 * \text{IVX Call 47}$$

This particular interpolation is commonly used when dealing with volatilities, as it better describes the behavior of volatility compared to using days to expiration interpolation.

### 7.2 What is the Best IV Index?

There are several different IV Indexes with call, put, and mean values, with terms from 30 to 180 days. If one single value is chosen as the best representative value for implied volatility it would be IVX 30, since they are nearest to expiration and the most liquid, making their implied volatilities the most relevant. However, using the mean between calls and puts, as a reference value, may not highlight important differences, called the skew, between calls and puts.

### 7.3 Historical Volatility (HV)

Historical Volatility reflects the past price movements of the underlying asset, while implied volatility is often used as measure of market expectations regarding future Historical Volatility.

To calculate a one standard deviation, closing stock prices are observed over different time frames using five of the most popular terms: n=10, 20, 30, 60, 90, and 360 days on a daily basis. Thus, historical volatility can be calculated by the following way.

$$\text{Return } x_t = \ln \frac{P_t}{P_{t-1}}, \text{ where } P_t \text{ is close price on day } t.$$

Average day-to-day changes over n-day period can be calculated as sum of returns divided on the number of days.

Daily historical volatility calculated or  $\bar{x} = \frac{1}{n} \sum_{t=1}^n x_t$  if n days is estimated as

$$HV_{daily} = \sqrt{\frac{1}{n-1} \sum_{t=1}^n (x_t - \bar{x})^2}$$

Note: In denominator, we use n-1 instead of n to receive unbiased estimate of general dispersion (a square of a standard deviation). This adjustment is essential when estimating standard deviation based on a small number of observations.

Choosing the appropriate Historical Volatility period is often a question. More data generally leads to more accuracy, however Volatility changes over time and data from the far past may not be relevant for estimating the future. When the Historical Volatility is high, it says the underlying has been experiencing extreme fluctuations in price. When it is low, it suggests less price fluctuation perhaps associated with a trend.

Although volatility constantly changes, average values can often be assigned, since their volatility tends to fluctuate around some normal or average value over long periods. To determine what volatility level is normal for a particular stock or index, strategist should consider Historical Volatility using different periods. Using volatility charts is very helpful.

Furthermore, viewing the Historical Volatility of a stock, index or ETF over different periods can help to determine whether it is rising or falling. For example, if the 10-day Historical Volatility of a stock is 15% and the 120-day is 45%, the underlying has recently experienced a sharp decline in Historical Volatility and regression to the mean suggests it may have a tendency rise.

## 7.4 Volatility Forecasting

From the perspective of an options trader or strategist, forecasted Implied and Historical Volatilities are the most important and the least publicized. Option premiums rise when market participants expect greater underlying price movement. When the Historical Volatility of a stock, index or ETF is high, there is a tendency for the market to drive option premiums high as well. Since Implied Volatility is forecasting the expected future Historical Volatility and like many other forecasts it can be wrong due to unforeseen or changed circumstances. However, some useful observations can be helpful when attempting forecast volatility, one of the most important is that volatility is mean reverting, both measures tend to return to "normal" levels after reaching extremes, either high or low. Therefore, a strategist will look to sell volatility when it is perceived to be high and buy volatility when it is perceived to be low.

## 8. Glossary of Terms

### **% Change vs. yesterday**

The IV Index % Change is derived by comparing the current implied volatility against the previous night's value, expressed as a percentage. HV % Change is calculated as the difference between the current historical volatility and the previous night's value, expressed as a percentage.

### **Call Bid/Ask Mean**

This number is calculated by finding a simple average of the market maker's bid and ask price for call options only.

### **Correlation**

Correlation is a statistical measure of how movement in one market reflects movement in another. The measure ranges from a -1 to +1 (or from -100% to +100%), with a measure of +1 indicating that the two markets move together 100% of the time. A high correlation between two markets means that they will move in a similar fashion; however, the magnitude of their moves may not be identical. A measure of +0.5 reflects two markets moving together approximately 75% of the time, a reading of 0.0 reflects the two markets moving together only 50% of the time, while readings of -0.5 and -1.0 reflect two markets that move together 25% and 0% of the time respectively.

By contrast, a correlation coefficient measure uses positive numbers to show the degree of positive relationship between two markets and negative numbers to show the degree of negative relationship between two markets. A zero indicates that there is no relationship between the two markets being compared.

Correlation studies sometimes reveal superior trading characteristics in comparison with more traditional hedges.

### **Delta**

Delta can be defined in several different ways.

First, delta can be thought of as a percentage change in the option's price given a one point change in the underlying stock's price. For example, a delta of 50% indicates that the option will move up (or down) by one half point for each one point rise (or decline) in the underlying stock. Call options have positive delta values, while put options have negative delta values. Thus, call deltas increase as the stock price rises, and decrease as the stock price declines, and put deltas increase as the stock price declines, and decrease as the stock price rises.

The second way to view delta is as an approximation of the probability that an option will finish in-the-money. An option with a delta of 50% has an approximately 50% chance of finishing in-the-money, while an in-the-money option with a delta of 85% has an 85% chance of finishing in-the-money at expiration. Similarly, an out-of-the-money option with a delta of 20% has an approximately 20% chance of ending in-the-money at expiration.

## **Expiration**

This is the last day (in the case of American-style option) or the only day (in the case of a European-style option) in which the option may be exercised. For U.S. stock options, this date is the third Friday of the expiration month. Brokerage firms may set an earlier deadline for notification of an option buyer's (holder's) intention to exercise. If the third Friday of the expiration month is a holiday, the last trading day will be the preceding Thursday.

## **Historical Volatility (HV)**

Historical Volatility is the actual volatility experienced by the underlying stock over some previous time period. The most common way to calculate historical volatility is to compare daily closing prices over some past time period. .

Additional methods for calculating historical volatility involve using the day's high and low values, or the daily high, low, and closing prices.

A final note: Market convention dictates that historical volatility, as well as all other types of volatility data, are always quoted on an annualized basis.

## **Implied Volatility (IV)**

Implied Volatility is the market's best guess of future volatility, and it is obtained by entering the current option price into an option pricing model and finding this unknown volatility on an iterative basis. Volatility is the only unknown factor in traditional option pricing models like the Black-Scholes model and therefore must be estimated. Implied Volatility is calculated by determining the amount of volatility that would result in the current option price given the current time until expiration, interest rates, dividends, stock price, and strike price.

## **Implied Volatility as a % of the latest 30 day HV**

This figure is calculated by taking the current implied volatility and dividing it by the 30 day historical volatility level. The resulting figure is then expressed as a percentage.

## **Volatility within a scaled range of its 52 week hi/low**

This figure is calculated by taking a volatility measure and dividing it by its 52 week hi/low range. The result will lie within a scaled range of 0 to +1, with 0 indicating that a new volatility low has been set, while a maximum reading of +1 means that a new high in volatility has just been established. We produce scaled calculations for both the 30-day historical and 30-day implied mean volatility. This measure can be used to identify option values and underlying stock price movements that are near high or low extremes relative to a 52 week range.

## **IV Index Call**

This is a specially designed, vega-weighted average of implied volatility using only call options.

## **IV Index Put**

This is a specially designed, vega-weighted average of implied volatility using only put options.

## Open Interest

Open interest is defined as the number of outstanding contracts on a particular option class (all put or call contracts on the same underlying stock or index) or series (all options on the same underlying stock or index with the same strike price and expiration date) that are still open. As of the reporting date, the options included in the open interest measure have not been exercised, closed out or allowed to expire. The level of open interest for option contracts is reported in the financial section of most newspapers. Open interest measures may sometimes be adjusted to show only open interest related to calls or only open interest related to puts. Traders use these numbers as a measure of market sentiment.

Open interest changes as new option positions are established and existing options positions are closed.

Examples:

- Open interest will increase by one contract when a buyer is entering a new long position and the seller is entering a new short position.
- When a buyer is entering a new long position but the seller is simultaneously closing an old long position, open interest remains the same.
- Open interest also remains the same when the seller is establishing a new short position while the buyer is closing an old short position.
- Finally, if the buyer is closing an old short position and the seller is closing an old long position, open interest will decrease by one contract.

## Option Pricing Model

An option model is used to assess an option's price. The first model of this type was the Black-Scholes model, developed in 1973. As options trading has grown, various refinements to the Black-Scholes model have been introduced. Nevertheless, most models still incorporate the following factors into their pricing assumptions: underlying security price, strike price, time until expiration, dividends to be paid, interest rates, and volatility of the stock.

## Option Value

This is the option's price as determined by the parameters considered in the option model. Common parameters include: underlying security price, strike price, time until expiration, dividends to be paid, interest rates, and volatility of the stock. Please note that our site uses a proprietary database to determine the correct interest rate and dividend schedule (if any) for calculating the option price.

## Put Bid/Ask Mean

This number is a simple average of the market maker's bid and ask spread for put options only.

## Strike Price

The stated price per share for which the option holder may purchase (in the case of a call) or sell (in the case of a put) the underlying stock upon exercise of the option contract.

## Volatility

Volatility can be defined as the tendency of the underlying security's market price to change. The measure is based on the standard deviation of the asset's return and is expressed annualized percentage rate. Volatility is one of the factors that influences option pricing formulas; the greater the volatility, the

greater the premium of an option. Different measures of volatility include historical volatility, implied volatility, actual volatility, seasonal volatility, and forecasted volatility.

### **Volume**

Volume is defined as the number of stock shares or option contracts that were traded over a given day.