

What are S&P 500 Variance Futures?

S&P 500 Variance futures, traded exclusively at Cboe Futures Exchange, are exchange-traded futures contracts based on the realized variance of the S&P 500 Stock Index. S&P 500 Variance futures measure the difference between the initial variance level and the actual realized variance level over a specific amount of time.

Specifications of Variance Futures Contracts:

Trading Hours:	8:30 a.m. – 3:15 p.m. (Chicago Time).
Contract Size:	\$1 per variance unit. One contract equals one variance unit.
Minimum Price Intervals:	0.05 volatility points.
Quote Expression and Display:	S&P 500 Variance futures are quoted in terms of volatility points (e.g., 25.64) and vega notional equivalent units (e.g., a quote, order or trade of 1 equates to 1,000 vega notional and a quote, order or trade of 100 equates to 100,000 vega notional).
Minimum Quote and Order Sizes:	1,000 vega notional (expressed and displayed as 1) and all quotes and orders must be in multiples of 1,000 vega notional.
Last Trading Day:	The close of trading on the day before the Final Settlement Date.
Final Settlement Date:	The 3rd Friday of calendar month.
Final Settlement Value:	Determined according to the following formula and rounded to the nearest 0.0001: $F_T = \text{Realized Variance} - k_0 - \text{ARMVM} + 1,000$
Delivery:	Cash settled.

The quoting conventions for S&P 500 Variance futures closely align with the conventions for over-the-counter (OTC) Variance swaps but offer the advantages of exchange-traded contracts: transparency, efficient price discovery and the benefits of centralized clearing through The Options Clearing Corporation (OCC).

S&P 500 Variance futures are quoted in terms of volatility points (i.e., 25.65) and vega notional (i.e., 100,000 vega).

Variance is equal to volatility squared. While Variance is the sum of all price moves over a fixed period of time, volatility equals one standard deviation move in the price of an asset over one year.

The minimum quote and order size for the S&P 500 Variance futures contract is 1,000 vega notional and all quotes and orders must be in multiples of 1,000 vega notional. The sizes of quotes and orders are expressed and displayed in notional equivalent units of 1,000 vega notional. For example, a quote of 1 has a size of 1,000 vega notional and an order of 3 has a size of 3,000 vega notional. Trade expression and display in notional equivalent units of 1,000 applies to all Variance futures, including Block Trades and Exchange of Contract for Related Position (ECRP) transactions.

- The minimum Block trade size is 50,000 vega notional.
- ECRP transaction must be for a minimum order size of 1,000 vega notional (expressed and displayed as 1).

Post Trade

- ▶ Execution reports are sent to market participants – not to CFE Trade Match.
- ▶ Execution reports will state traded quantity in vega notional and traded price in volatility points.
- ▶ Extension fields will include trade quantity converted from vega notional to variance units.
- ▶ Trade price in the extension field will be 0.

Post Close

- ▶ S&P 500 Variance trade prices are converted from volatility points to an adjusted futures price, and the quantity is converted from vega notional to variance units.
- ▶ Secondary execution reports will be sent with the volatility points converted to the futures price.
- ▶ Clearing and CFE Trade Match will only receive futures prices, and quantity in variance units.

There are two main components to the total profit/loss (P&L) of a S&P 500 Variance futures contract, a realized component and an implied component. The below example illustrates the effect each component had on the P&L of an Oct13 S&P 500 Variance future as of Friday, August 16, 2013:

Suppose an investor purchased 100,000 vega (quoted size of 100 with a 1,000 multiplier) of Oct13 variance futures on June 24th at an implied volatility of 19.50. This would result in 2,564 variance units through the following calculation:

$$\text{Variance Units} = 100,000 / (2 \times 19.50) = 2,564^2$$

At the close on Friday, August 16th, the following market conditions are observed:

Realized volatility to date (σ_r)	9.01%
Market implied volatility (σ)	15.4
Number of expected Prices (N_e)	83
Number of returns elapsed (N)	38
Discount Factor	0.999834

$$\text{Total P\&L} = \text{Discount Factor} \times (\text{Realized P\&L} + \text{Implied P\&L})$$

$$\begin{aligned} \text{Realized P\&L} &= \text{Variance Units} \times (N/N_e - 1) \times (\sigma_r^2 - \text{implied volatility}^2) \\ &= 2,564 \times (38/83 - 1) \times (9.01^2 - 19.5^2) \\ &= -\$355,353.40 \end{aligned}$$

$$\begin{aligned} \text{Implied P\&L} &= \text{Variance Units} \times ((N_e - N - 1/N_e - 1) \times (\sigma^2 - \text{implied volatility}^2)) \\ &= 2,564 \times (83 - 38 - 1/83 - 1) \times (15.4^2 - 19.5^2) \\ &= -\$196,863.92 \end{aligned}$$

$$\begin{aligned} \text{Total P\&L} &= 0.999834 \times (-\$355,353.40 + (-\$196,863.92)) \\ &= -\$552,125.65 \end{aligned}$$

¹ For the sake of simplicity, this example excludes the Accumulated Return on Modified Variation Margin (ARMVM), which is also part of the settlement value of an S&P 500 Variance future. For a definition of ARMVM and its effect on the settlement value and/or the converted futures price and for further information regarding S&P 500 Variance futures please refer to the S&P 500 Variance future product specification available at: http://cfe.cboe.com/Products/Spec_VA.aspx.

² Variance units are rounded to the nearest whole number when converting from quoted Vega notional.

Futures trading is not suitable for all investors, and involves risk of loss. In order to simplify the computations, transaction costs have not been included in the example used in this document. These costs will impact the outcome of all transactions and must be considered prior to entering into any transactions. The information in this document is not intended and should not be construed to constitute investment advice or recommendations to purchase or sell futures. CFE® is a registered trademark and Cboe Futures Exchange and Execute Success are service marks of Chicago Board Options Exchange, Incorporated (Cboe). S&P® and S&P 500® are registered trademarks of Standard & Poor's Financial Services, LLC and have been licensed for use by Cboe and CFE.