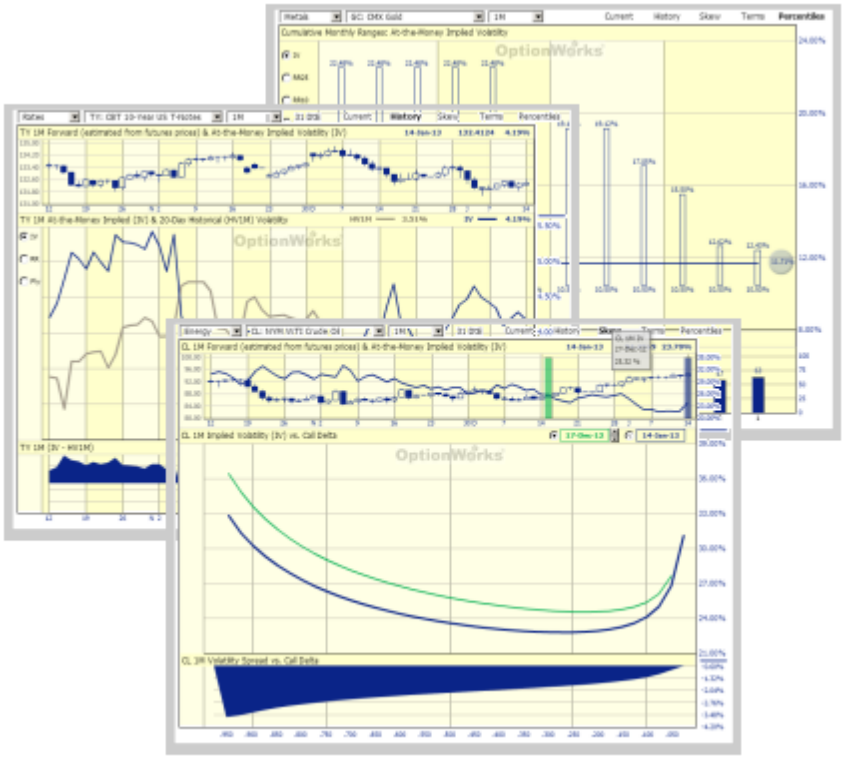
OptionWorks®

Research on Futures Options

The OptionWorks® Volatility Dashboard provides unique market insights available nowhere else



The OptionWorks® Volatility Dashboard is a cloud-based collection of research on futures options. For each of 42 major markets at CME and ICE, OptionWorks® displays these volatility-related indicators based on end-of-day pricing:

- **At-the-Money Implied Volatility** with daily net change
- 10-delta and 25-delta **Risk Reversals** with daily net change
- 10-delta and 25-delta **Butterflies** with daily net change
- **Historical Charts**
  - Implied Volatility vs. Historical Volatility
  - Risk Reversals and Butterflies
  - Implied Volatility Skew
- **Terms Structure Charts** of Volatility, RRs, and 'Flies
- **Percentile Charts** of Volatility, RRs, and 'Flies

Each of these indicators are available for every option contract expiration and the standard **OTC tenors** of 1-week, 1-, 2-, 3-, 6-, 9-month, and 1-year (based on futures results). The Dashboard is updated daily and is accessible via any standard web browser.[1]

Contracts covered include all major Stock Index, Agricultural, Energy, Metals, Interest Rate and FX markets at CME and ICE.[2]

[1] The OptionWorks® Volatility Dashboard is an Adobe® Flash® Technology application.

[2] Neither OptionWorks® Research nor The Applied Research Company is affiliated with CME Group Inc. or IntercontinentalExchange, Inc. Calculations are performed using data in the public domain.

How the OptionWorks® Volatility Dashboard provides option market insight for trading decisions

OptionWorks® produces and displays various results centered around **Implied Volatility** (**IV**). Market volatility is one of the factors that influence option prices. The implied volatility of an option is that level of market volatility that makes the option worth its current price. Changes in implied volatility drive changes in option prices. Implied volatility often moves independently of the underlying market price.

The OptionWorks® Volatility Dashboard provides answers to three basic questions regarding any potential option trade:

1. ***Compared to historical levels, are current option prices relatively cheap or expensive?***

   The **At-the-Money Implied Volatility** (**AtM IV**) is a measure of the option market's expectation of how much the underlying market will rise and fall in the future. For each option contract, OptionWorks® charts AtM IV over time, displays monthly ranges, and calculates percentiles levels. Comparing current IV to past levels shows whether options are cheap or expensive.

2. ***Are puts currently expensive relative to calls, or vice versa?***

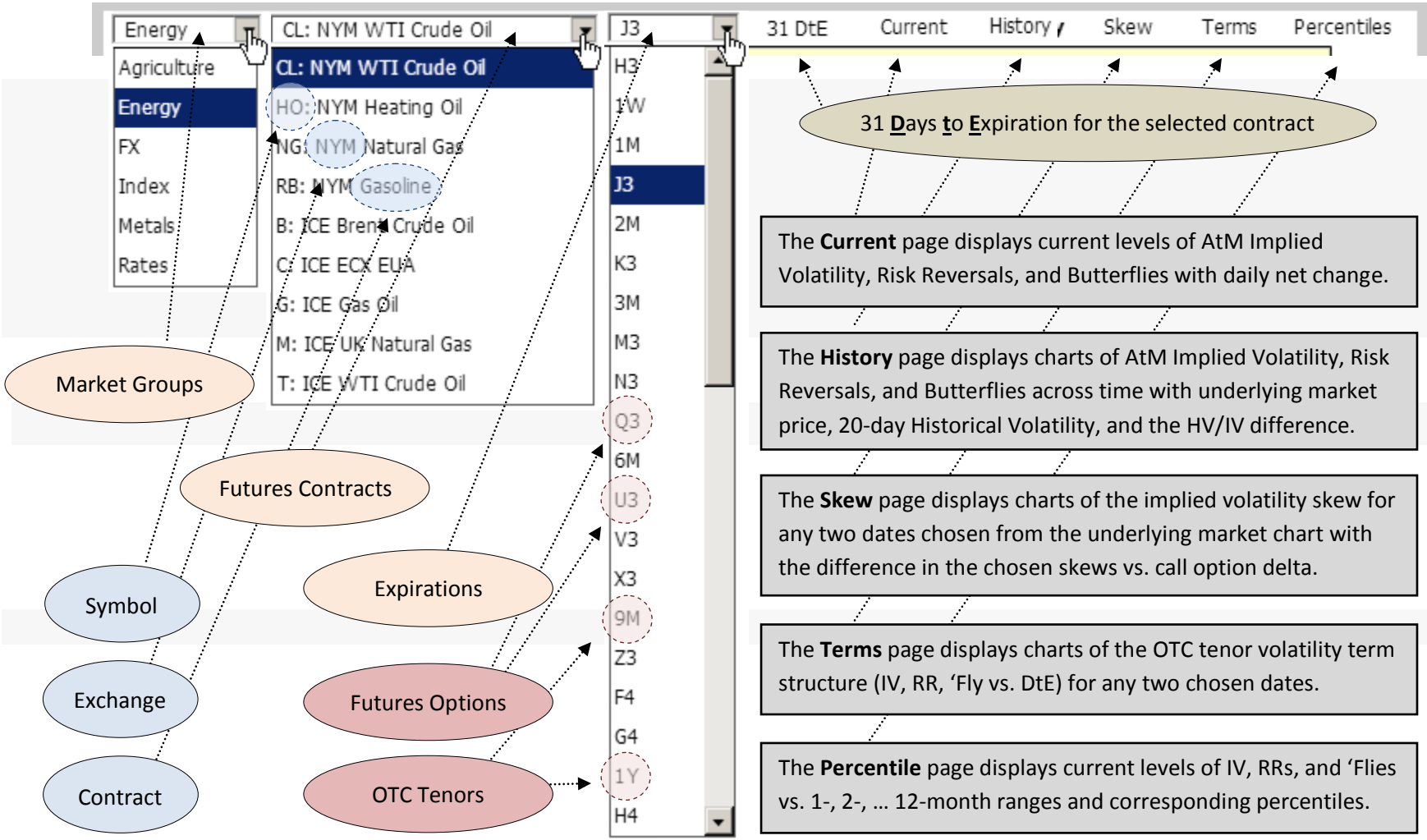
   The **Risk Reversal** (**RR**) is the difference between the call IV and the put IV for options having the same delta. It is a measure of the option market's demand for puts vs. calls. For each option contract, OptionWorks® charts 25 and 10-delta RR over time, displays monthly ranges, and calculates percentiles levels. Comparing current RRs to past levels shows if the premium of puts over calls (or vice versa) is cheap or expensive. The RR is a measure of the "tilt" in the volatility skew.

3. ***Are out-of-the-money (OtM) options expensive relative to at-the-money (AtM) options?***

   The **Butterfly** (**'Fly**) is the average IV of a call and a put having the same delta less half the AtM IV. It is a measure of the option market's demand for OtM vs. AtM options. For each option contract, OptionWorks® charts 25 and 10-delta 'Flies over time, displays monthly ranges, and calculates percentiles levels. Comparing current 'Flies to past levels shows if OtM options are cheap or expensive relative to AtM options. The 'Fly is a measure of the "height" of the volatility skew.

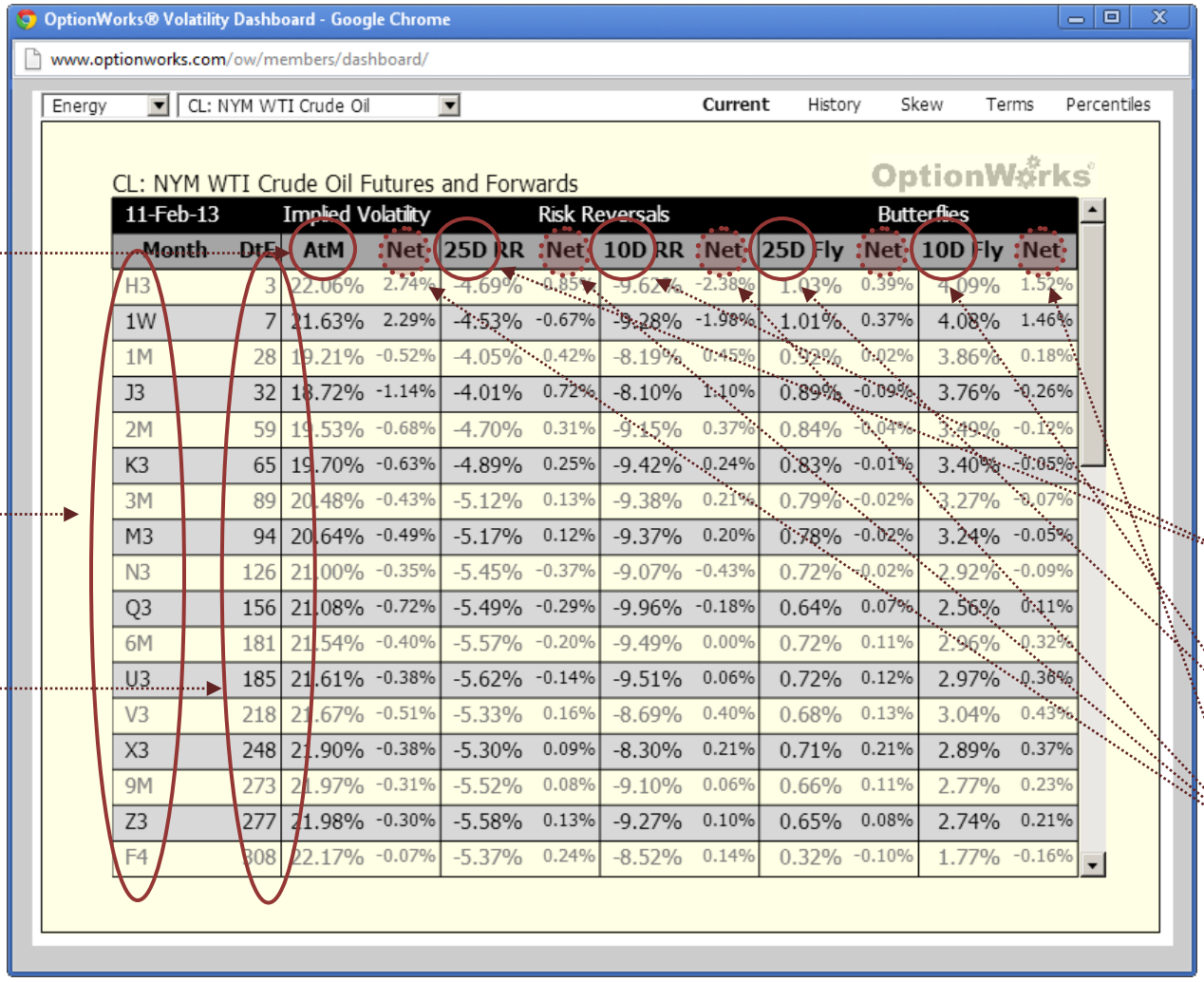
In addition to AtM IV, RRs and 'Flies for each traded option contract, OptionWorks® displays these results for the standard OTC tenors of 1-week, 1-, 2-, 3-, 6-, 9-month, and 1-year (based on futures results). Historical charts of the implied volatility skew are also available.

The OptionWorks® Volatility Dashboard Navigation Bar



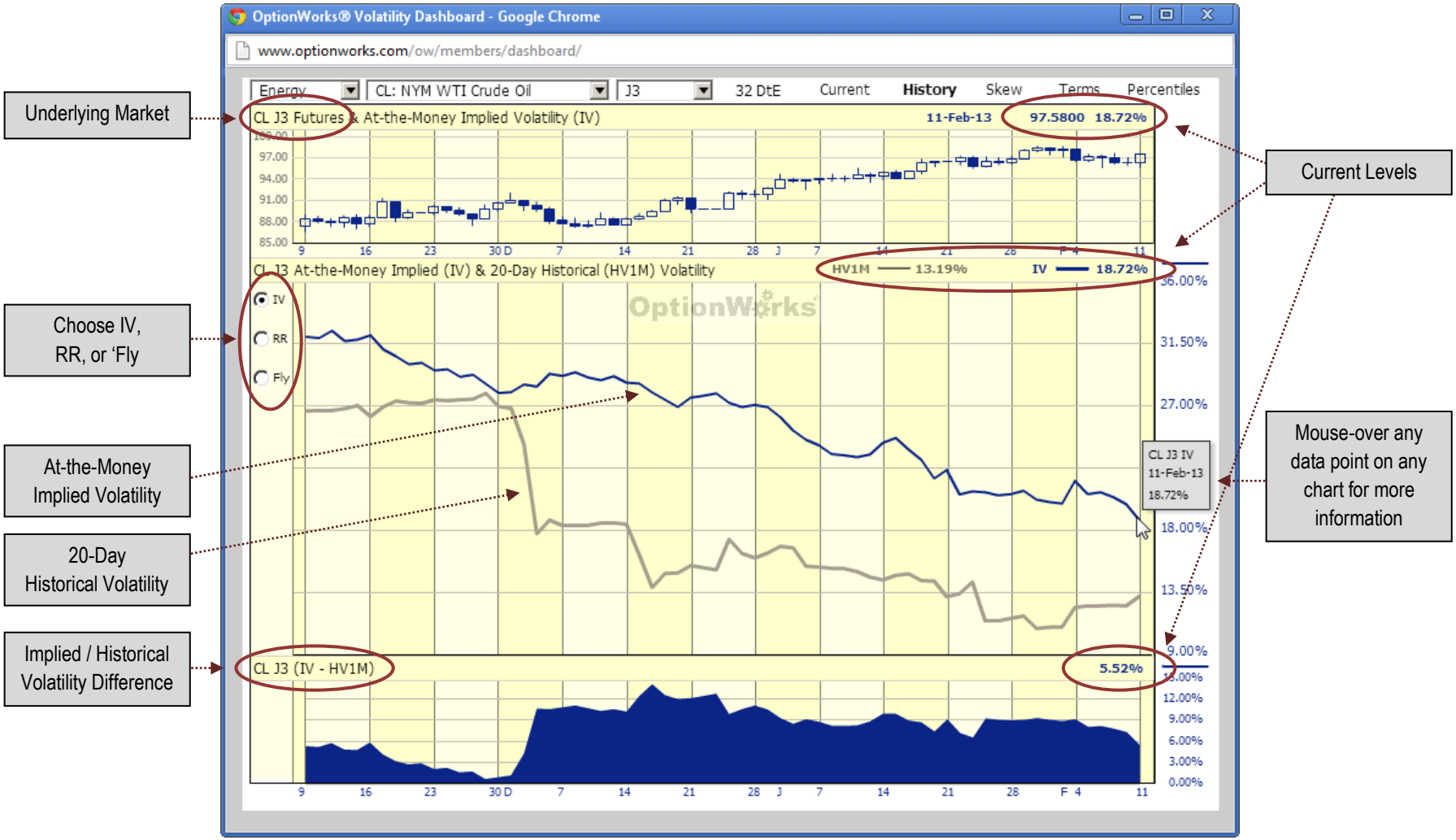
The OptionWorks® Volatility Dashboard — **Current**

The **Current** page displays current levels of At-the-Money Implied Volatility, Risk Reversals, and Butterflies with daily net change.



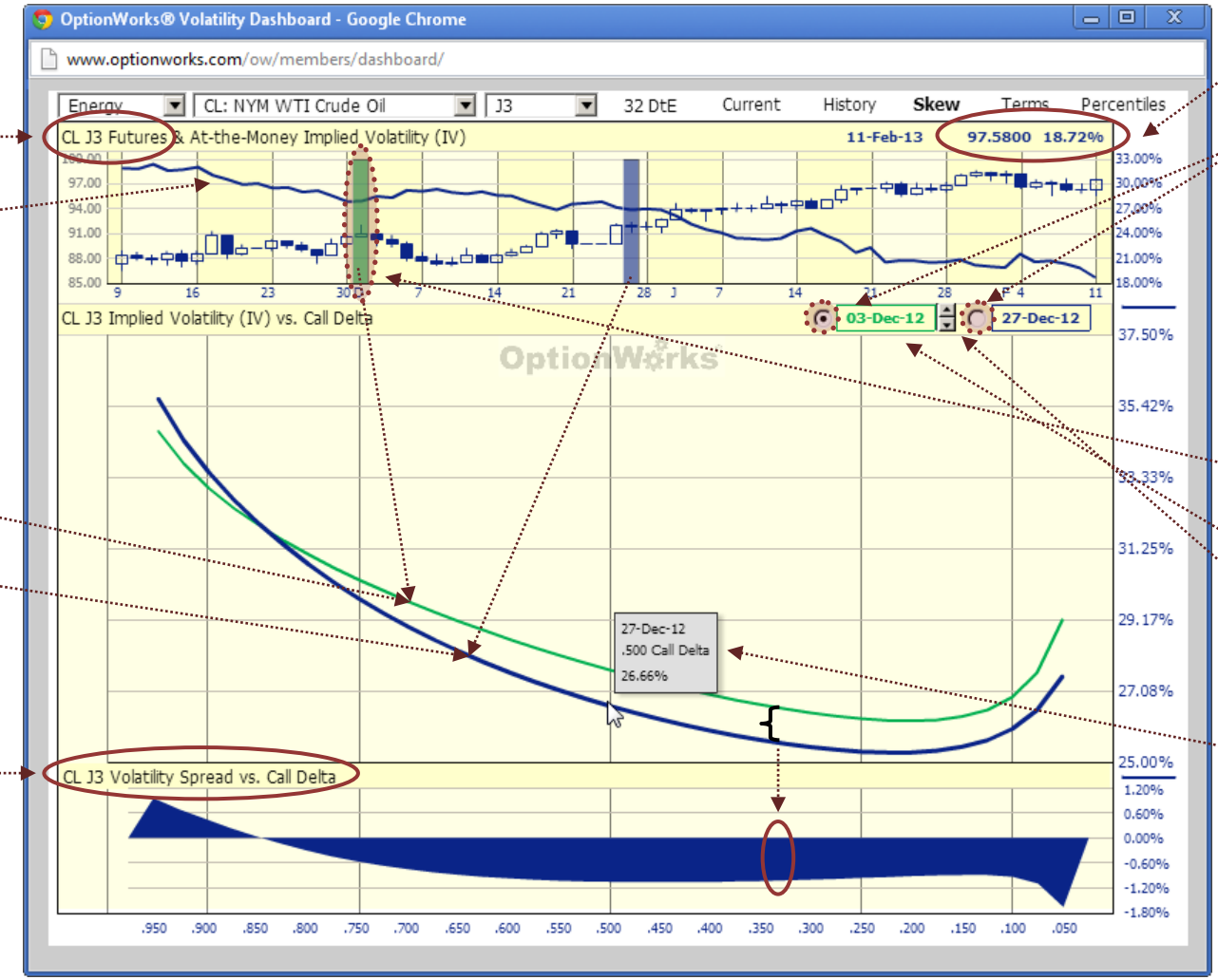
The OptionWorks® Volatility Dashboard — **History**

The **History** page displays charts of At-the-Money Implied Volatility, Risk Reversals, and Butterflies across time with underlying market price, 20-day (1-Month) Historical Volatility, and the Historical / Implied Volatility difference.



The OptionWorks® Volatility Dashboard — **Skew**

The **Skew** page displays charts of the implied volatility skew for any two dates in history chosen from the underlying market chart. AtM Implied Volatility is overlaid on the underlying market price and the difference in the chosen skews is charted versus the call option delta.



The OptionWorks® Volatility Dashboard — **Terms**

The **Terms** page displays charts of the Over-The-Counter tenor volatility term structure (At-the-Money Implied Volatility, 25- and 10-delta Risk Reversals, 25- and 10-delta Butterflies vs. Days to Expiration) for any two dates chosen from the underlying market price chart.

Underlying Market

At-the-Money Implied Volatility

Choose IV, RR, or 'Fly

Term Structure for Date #1

Term Structure for Date #2

Difference in Term Structure for Chosen Dates vs. Tenor (DtE)

Current Levels

"Activate" a date to change it.

Choose dates by:

- clicking on the price chart
- entering a date
- using the spinner

Mouse-over any data point on any chart for more information

The OptionWorks® Volatility Dashboard — **Percentiles**

The **Percentile** page displays current levels of Over-The-Counter tenor volatility (At-the-Money Implied Volatility, 25- and 10-delta Risk Reversals, 25- and 10-delta Butterflies) vs. 1-, 2-, … 12-month ranges with corresponding percentile level for each range.