

Volatility Indexes and Portfolio Management

September 27, 2007 at the CBOE

QWAFEFW / PRMIA - sponsored Panel Discussion on
Portfolio Management and the Volatility of Volatility Indexes



Overview of Volatility Markets

- \$80 - \$100 MM Vega traded globally each day.
- Vanilla variance swaps most common, but growing interest in variance options, conditional variance, corridor variance, correlation & dispersion and VIX. Some forward starting variance products. Growing demand for long-dated options (>10 yrs.)
- Expiry ranges from 1 month to 10 years. Most activity is 3 months to 1 year.
- Hedge funds, mutual funds, pension funds, insurance companies hedging equity volatility risk. Non-equity & fixed income managers looking for uncorrelated returns. End-user groups slowly broadening, still learning & need to identify risks and benefits. Volatility buyers might become sellers if risk/return is right.

Why Trade Volatility?

- Negative correlation to most equity indexes
- Positive correlation to credit prices
- Efficient way to manage unwanted market risk
- Unique properties of volatility create trading opportunities
 - Historical difference between realized and implied volatility
 - Volatility Term Structure
 - Volatility of Volatility

Volatility Indexes at the CBOE

<u>Index</u>	<u>Index Ticker</u>	<u>Underlying Index</u>	<u>Futures Ticker</u>	<u>Website</u>
CBOE Volatility Index [®]	VIX[®]	SPX	VX	www.cboe.com/VIX
CBOE DJIA Volatility Index	VXD	DJX	DV	www.cboe.com/VXD
CBOE NASDAQ-100 Volatility Index	VXN	NDX	VN	www.cboe.com/VXN
CBOE Russell 2000 Volatility Index	RVX	RUT	VR	www.cboe.com/RVX
CBOE S&P 100 Volatility Index	VXO	OEX	No futures	www.cboe.com/VXO

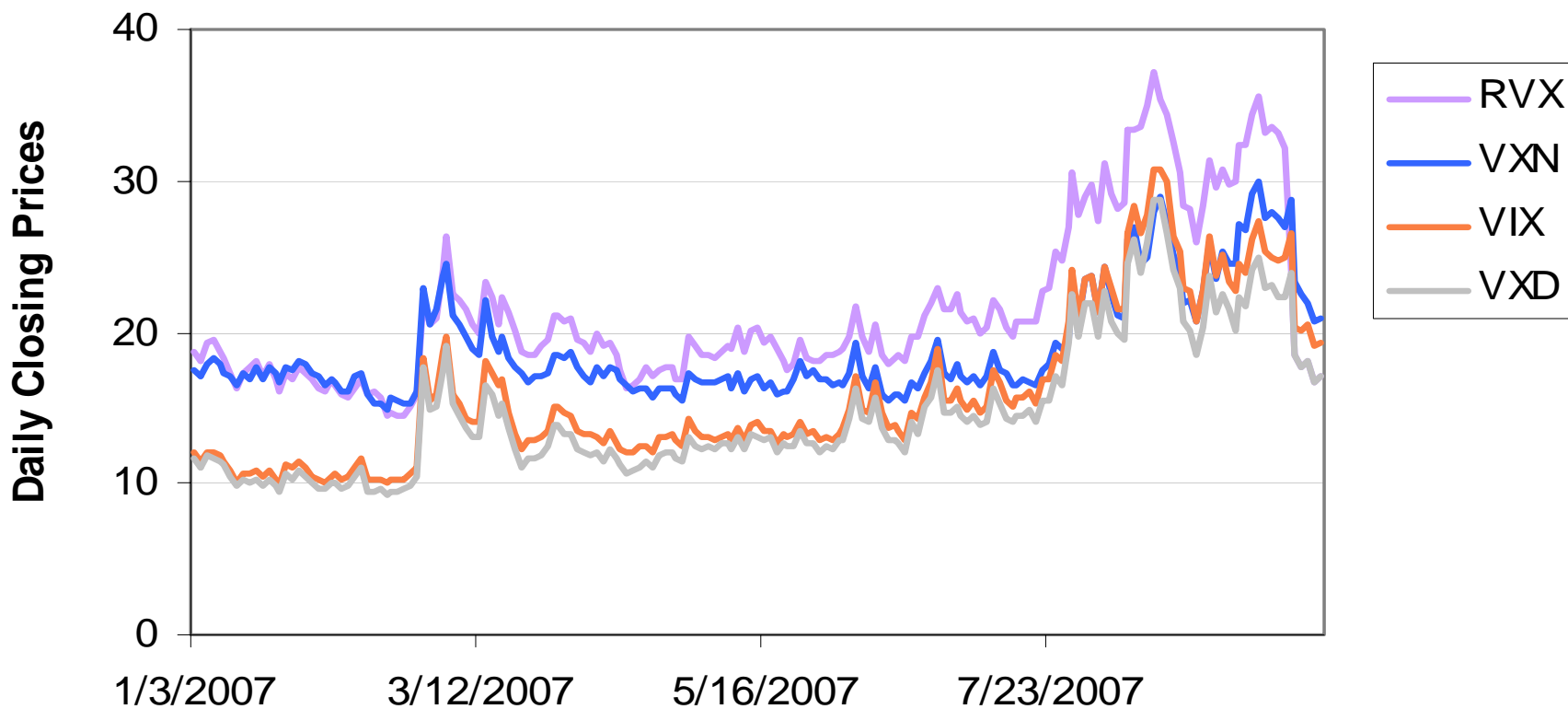
Unique Features of Volatility Index Products

- Futures Pricing Based on Forward Value of Volatility Index
- Pricing Can Be Different for a Number of Reasons
- Wednesday Settlement
- Special Opening Quotation Price
- Negative Correlation to Stock Indexes
- High Volatility of Volatility

VIX and S&P 500 Since 1990

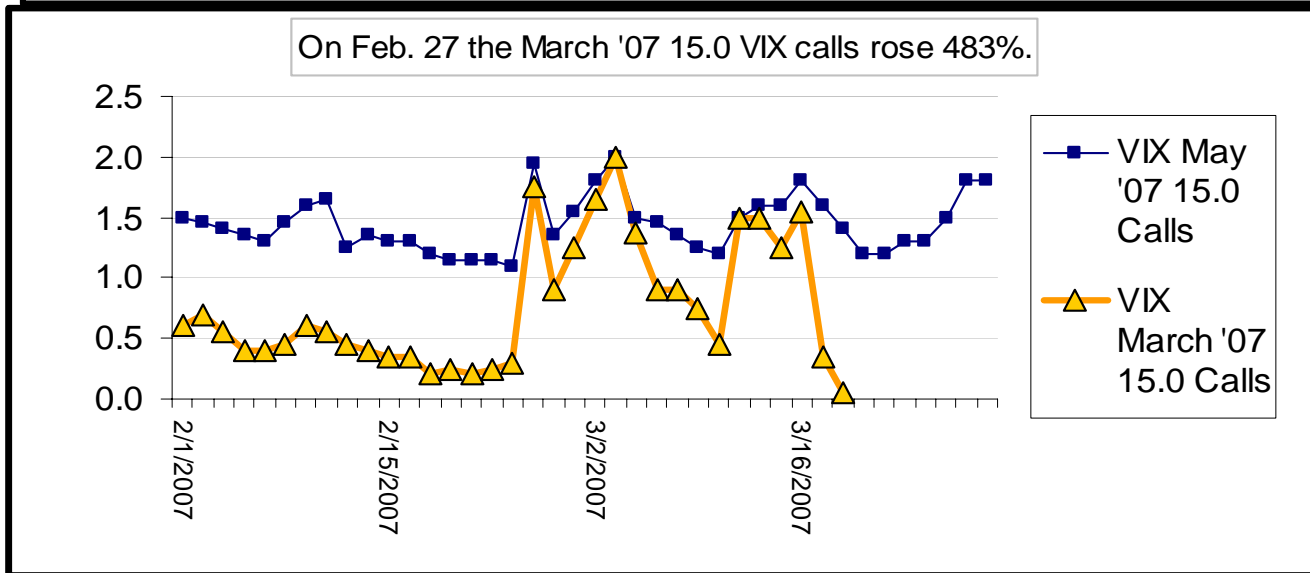
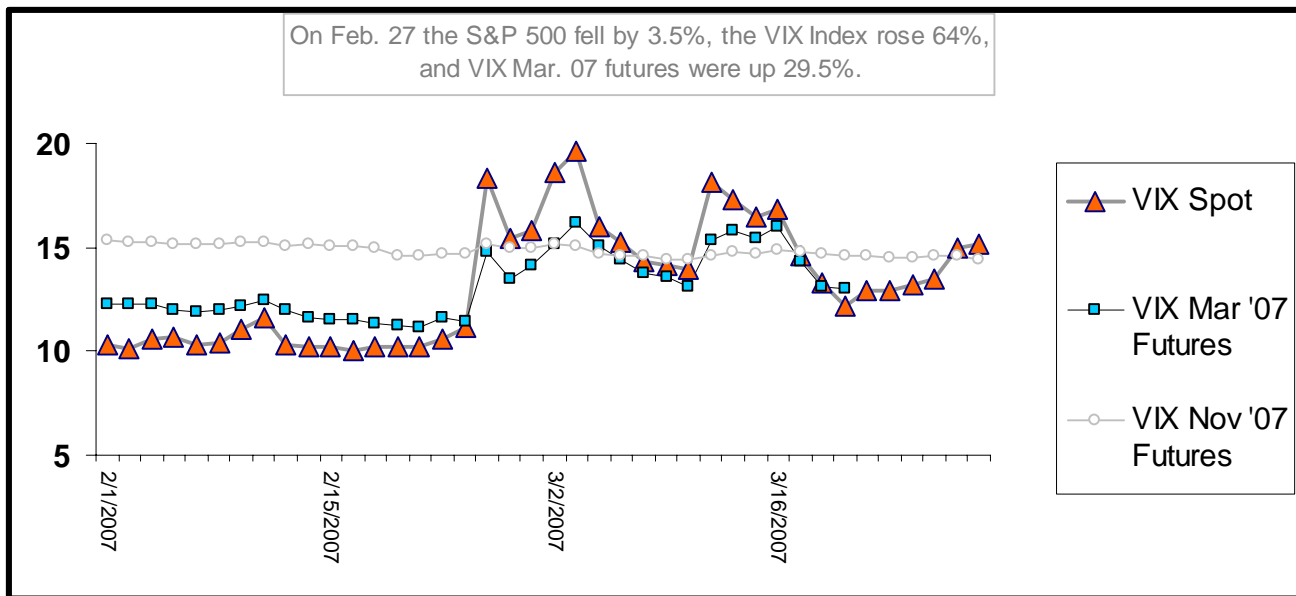


CBOE's Volatility Indexes in 2007

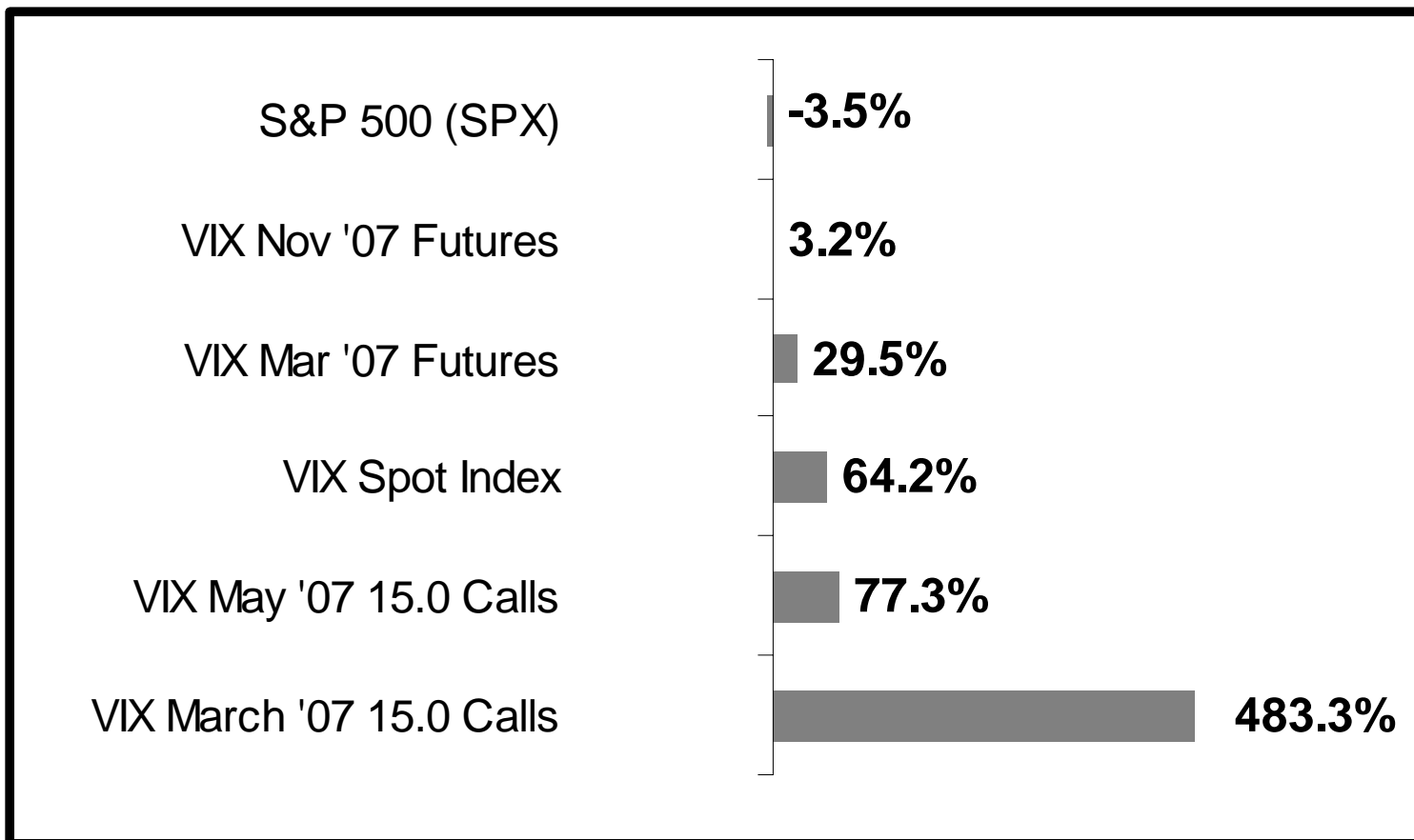


Sources: CBOE and Bloomberg.
(Jan. 3, 2007 - Sept. 24, 2007)

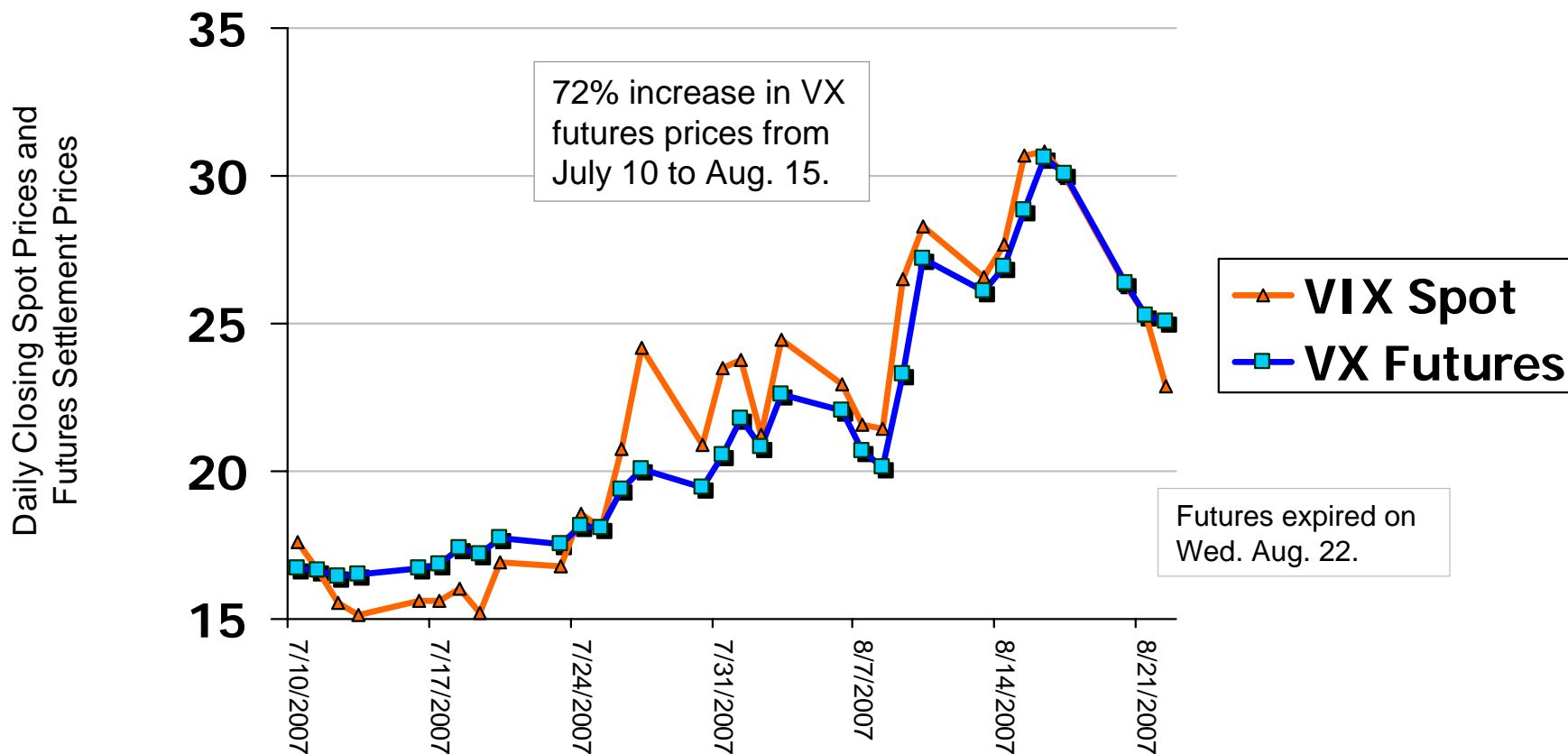
VIX Spot, Futures & Options in Feb.-Mar. 2007



% Change in Prices on 27 Feb. 2007



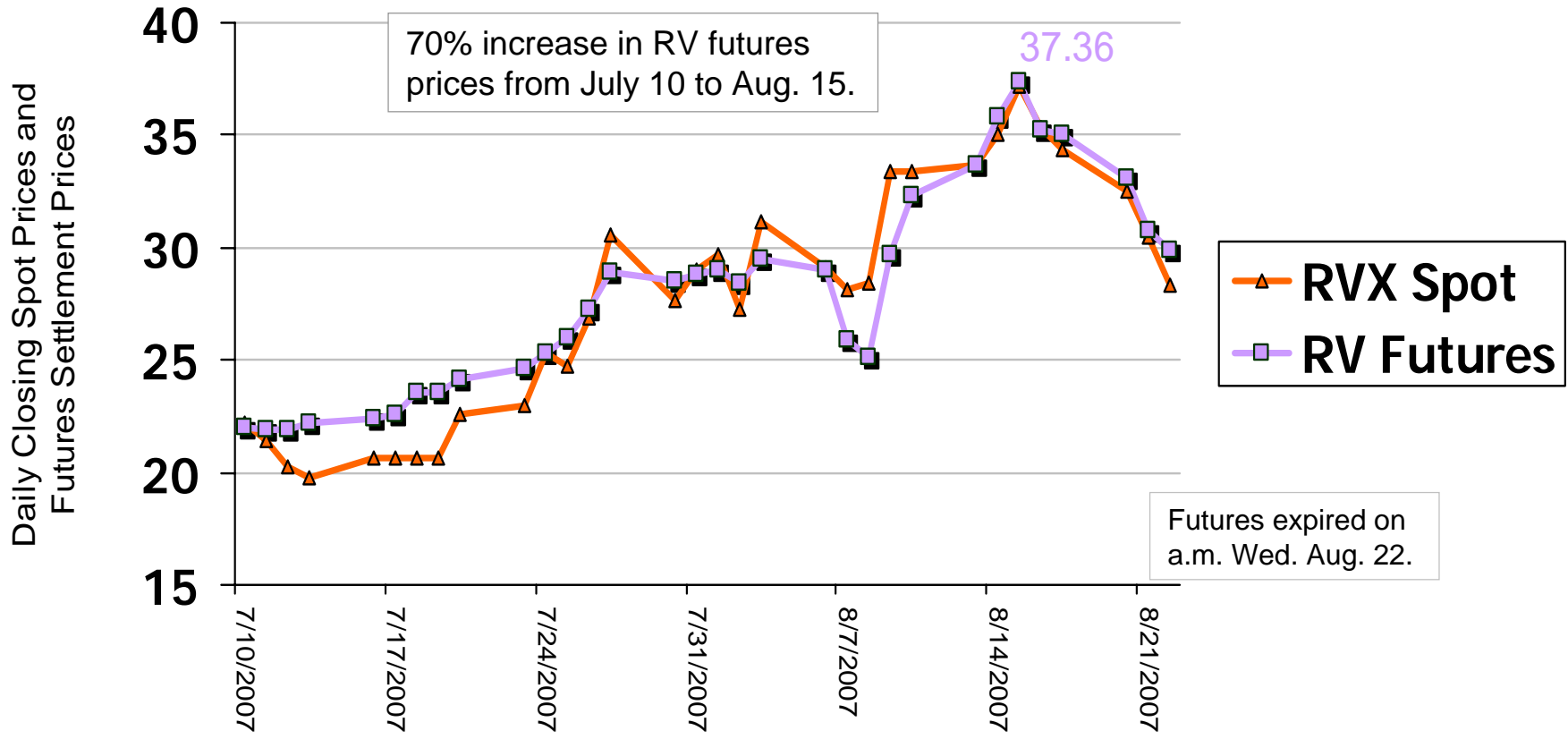
VIX – Futures vs. Spot



(July 10 - Aug. 22, 2007).

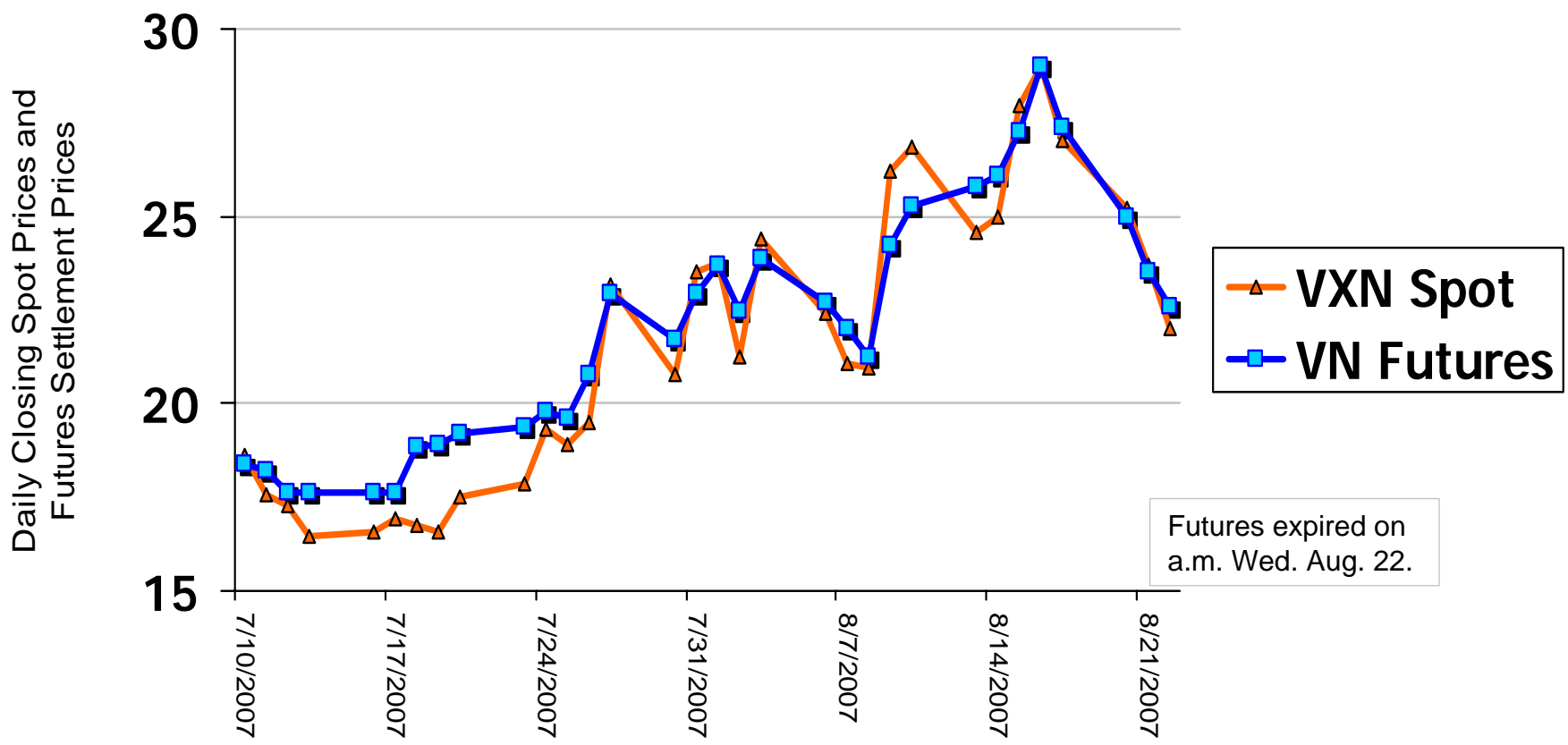
Sources: CBOE and Bloomberg.

RVX – Futures vs. Spot



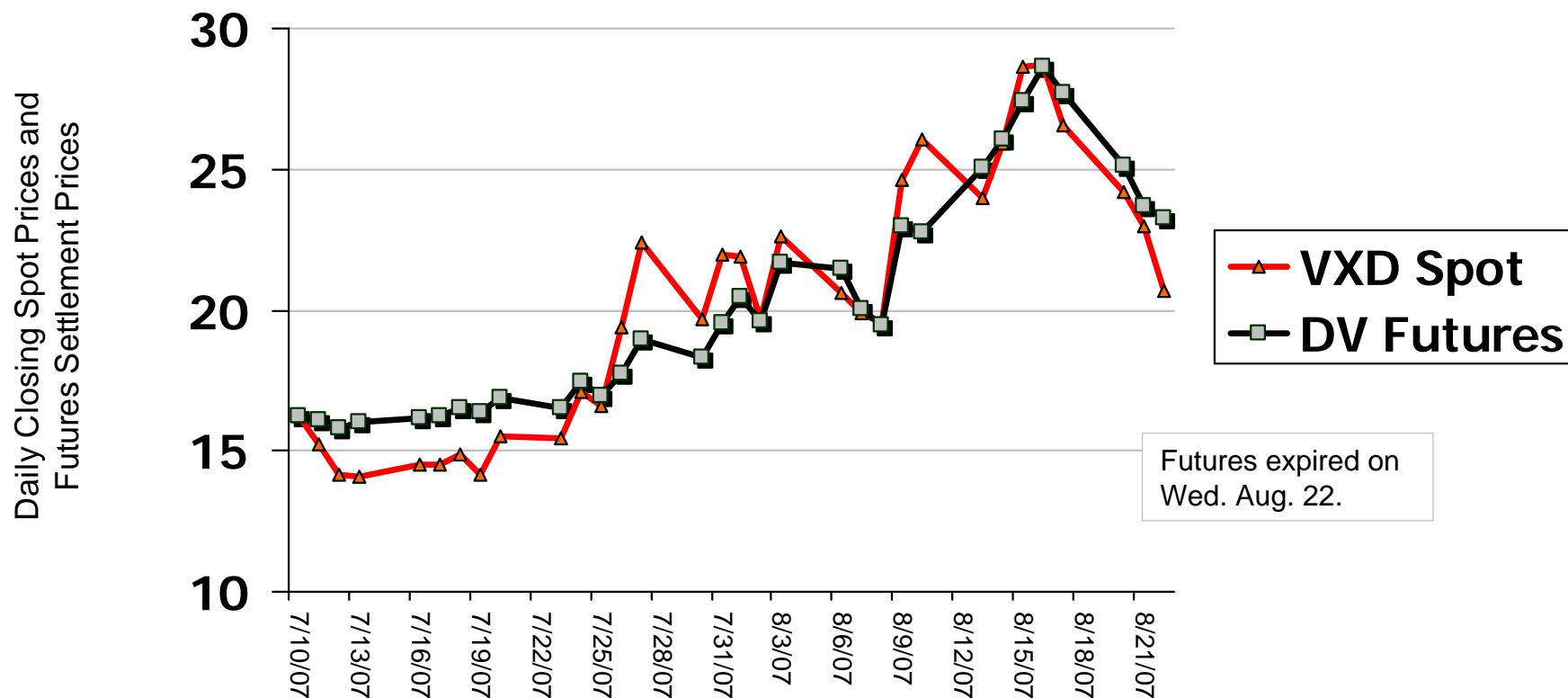
(July 10 - Aug. 22, 2007).
Sources: CBOE and Bloomberg.

VXN – Futures vs. Spot



(July 10 - Aug. 22, 2007).
Sources: CBOE and Bloomberg.

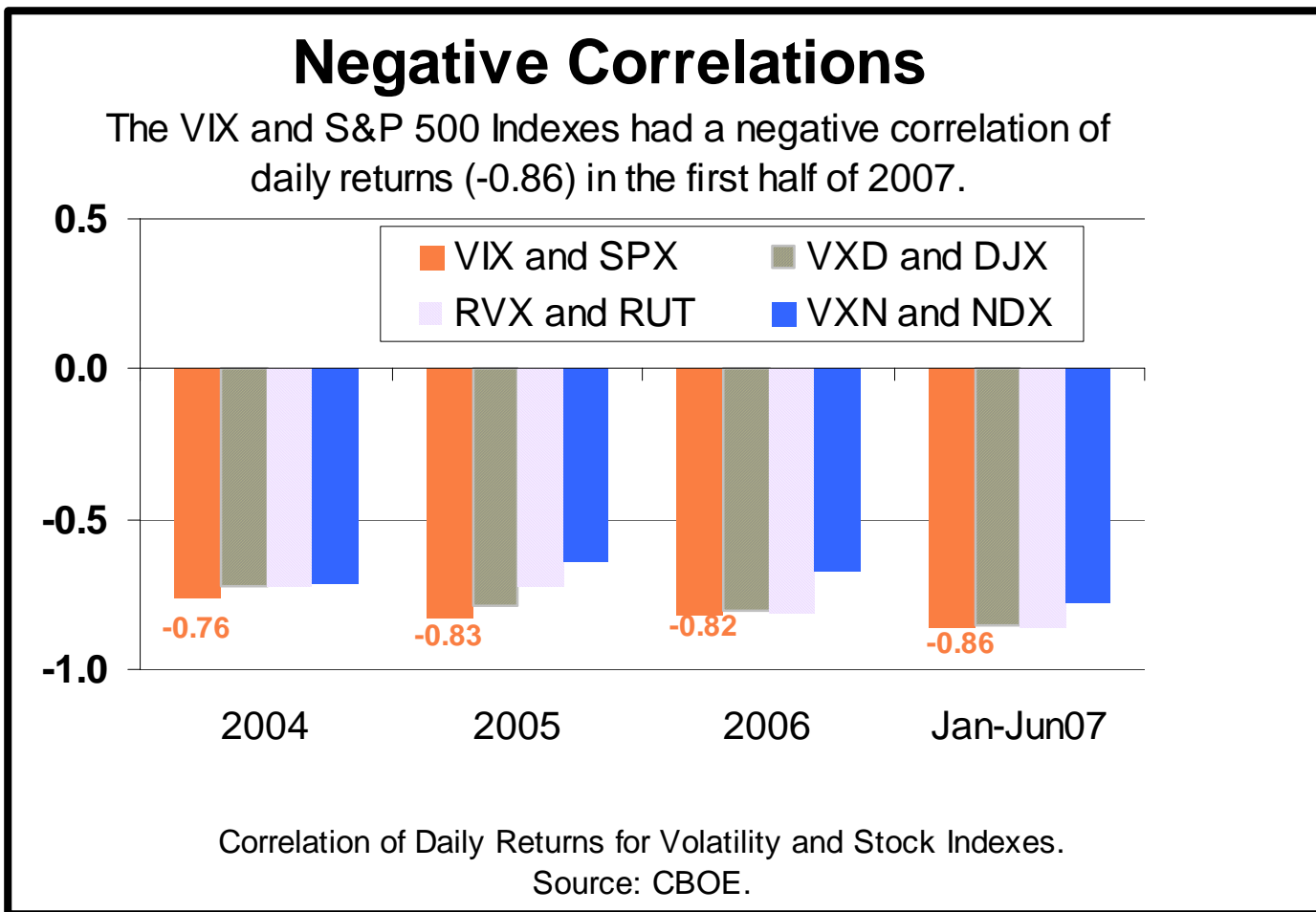
VXD – Futures vs. Spot



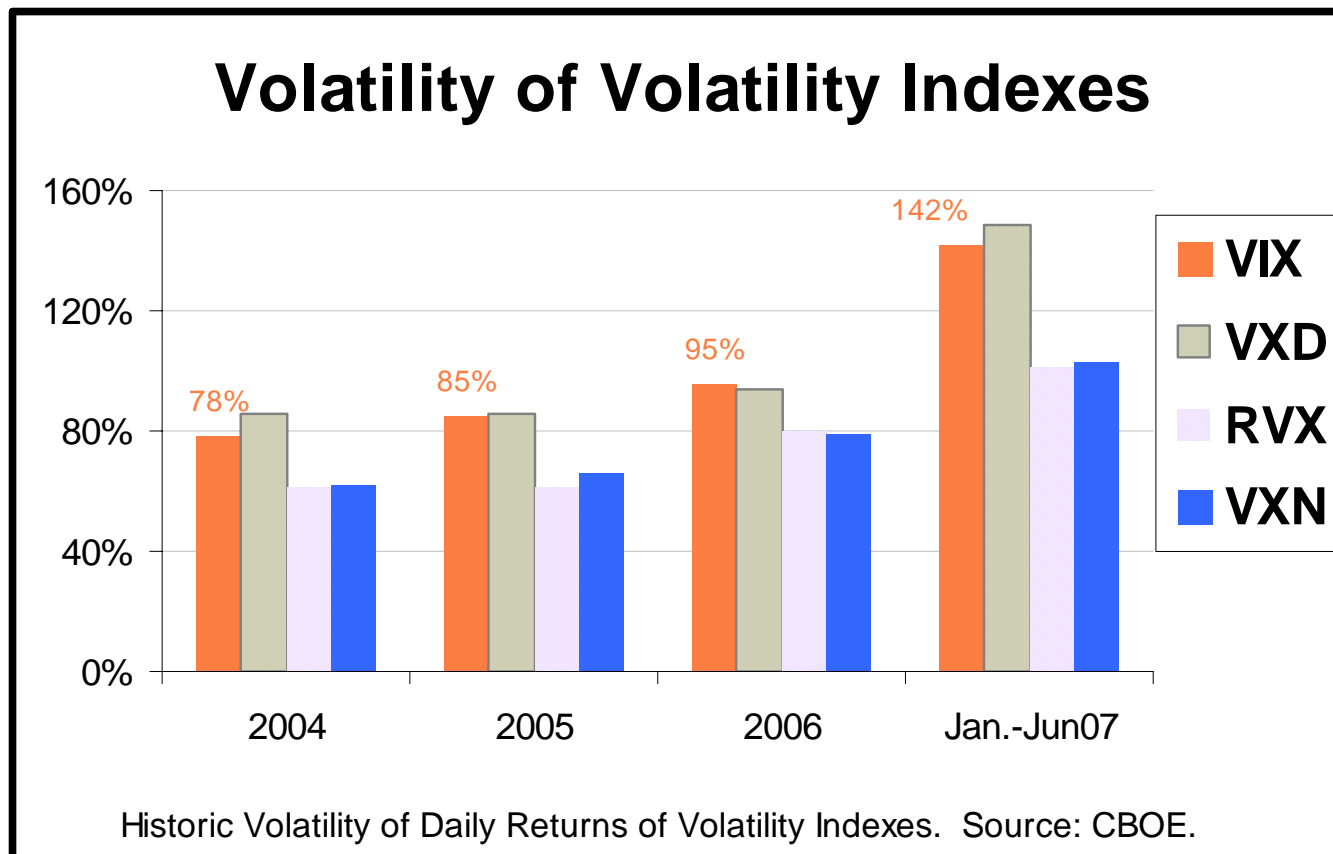
(July 10 - Aug. 22, 2007).

Sources: CBOE and Bloomberg.

Negative Correlations



High Volatility of Volatility



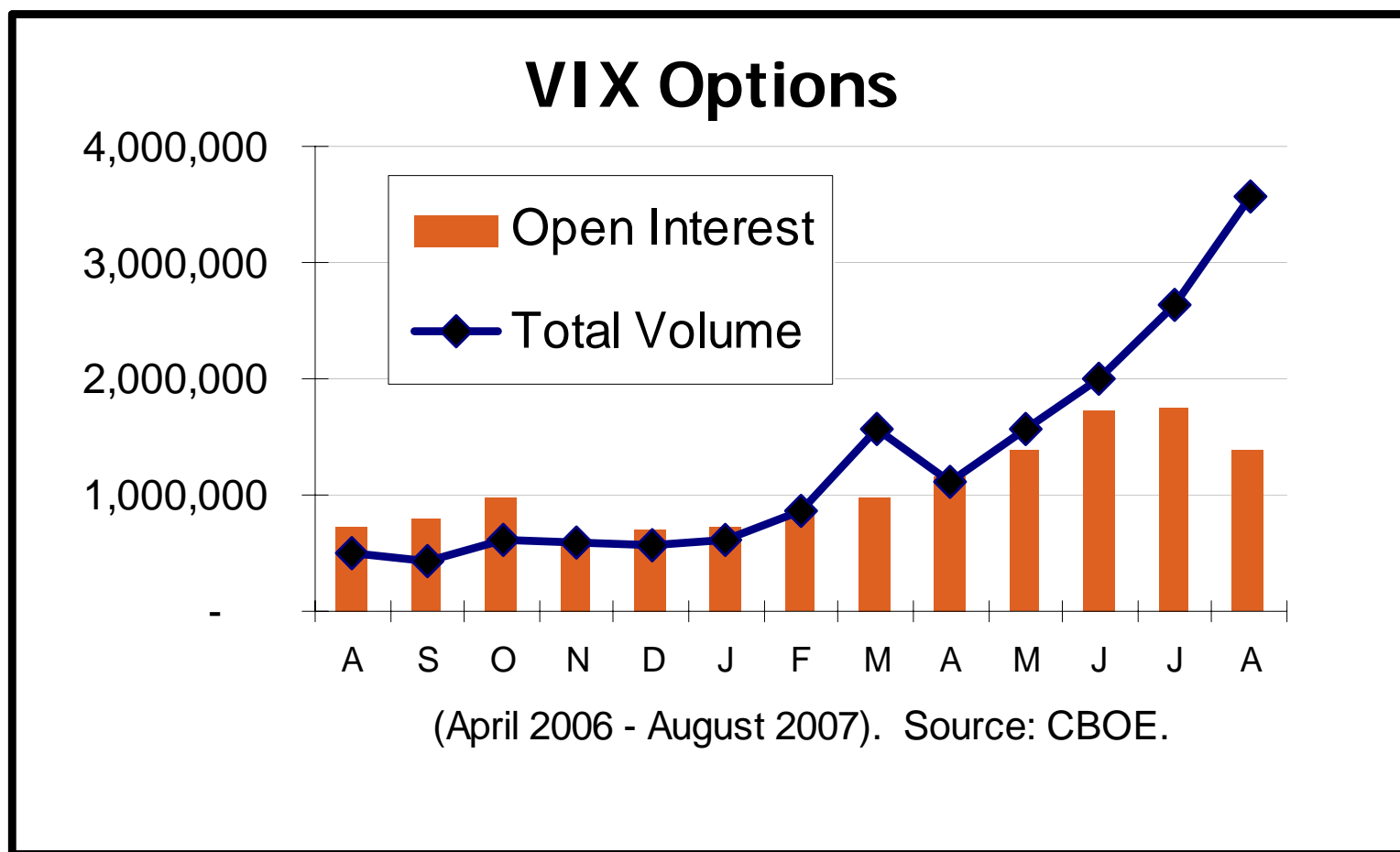
In 2006 the historic volatilities of daily returns were -- 95% for spot VIX, 46% for VIX near-term futures, 32% for Google, and 10% for the S&P 500 Index.

Volatilities of VIX, Stocks, & Stock Index

Historic Volatilities in 2005 and 2006

	<u>2005</u>	<u>2006</u>
VIX Spot Index	83.3%	94.2%
VX Near-Term Futures	45.8%	56.0%
GM	42.6%	41.3%
AAPL	38.8%	38.1%
GOOG	32.1%	34.0%
IBM	17.9%	14.2%
S&P 500 (SPX)	10.3%	10.0%
Source: CBOE Research.		

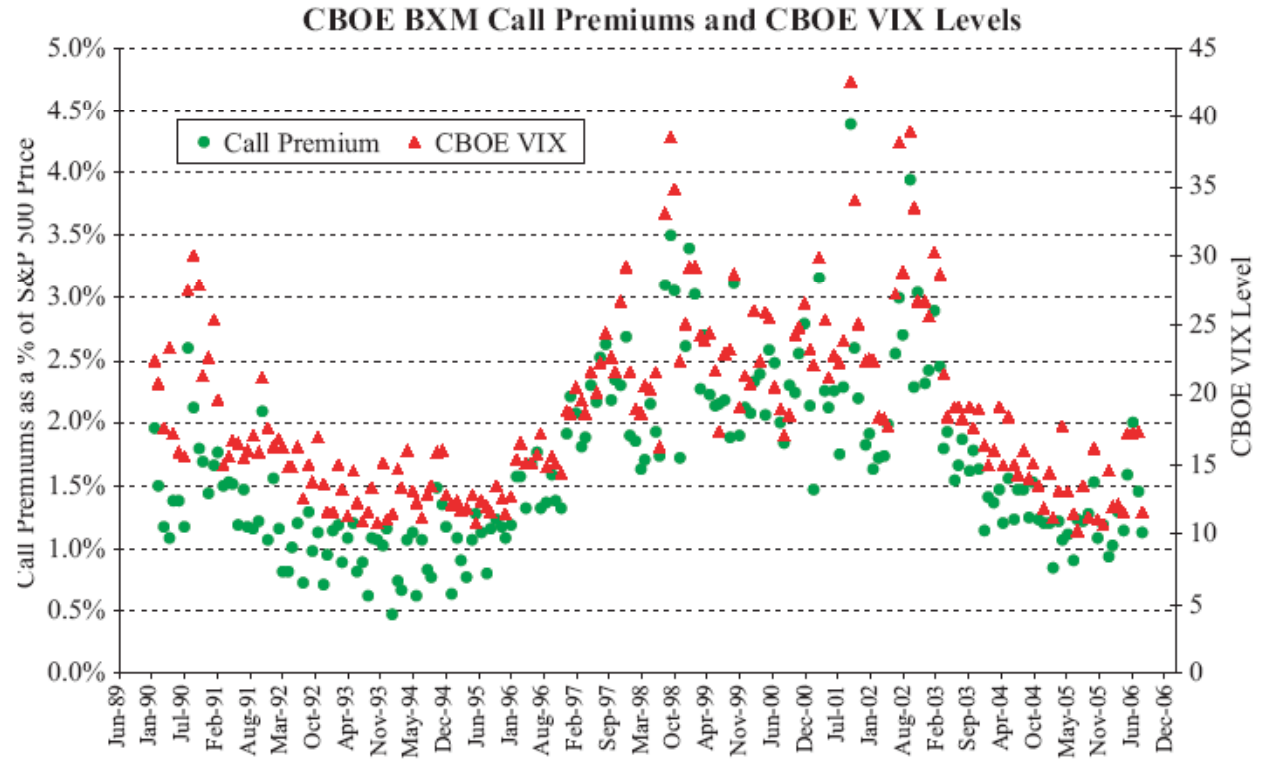
VIX Options Volume and Open Interest



Premiums Received in a BuyWrite Program

Often Rise When VIX Rises

Exhibit 14



The CBOE BXM call premiums earned as a percentage of underlying value, January 1, 1990 to August 31, 2006, plotted against the CBOE Volatility Index

Excerpted from BXM study by Callan Associates (available at www.cboe.com/BXM).

Other Volatility-related Indicators

- CBOE S&P 500 3-month (and 12-month) Variance Futures based on the realized, or historical, variance of the S&P 500 Index.
- RUG: An indication of the realized variance of the S&P 500 Index that has been accumulated so far in the life of the front-month futures contract.
- IUG: An indication of the future variance of the S&P 500 Index that is implied by the daily settlement price of the front-month variance futures contract.
- CBOE S&P 500[®] VARB-X[™] Strategy Benchmark tracks the performance of a hypothetical volatility arbitrage trading strategy designed to capitalize on the historical difference between SPX option implied volatility and the realized, or historical, volatility of the S&P 500 Index.

Papers on Volatility

- Antognelli, Ferreira, McArdle, and Traub. "Fear and Greed in Global Asset Allocation." The Journal of Investing. (Spring 2000), pp. 27 - 32. VIX "is a good indicator of the level of fear or greed in U.S. and global capital markets. When investors are fearful, the VIX level is significantly higher than normal. Market participants require additional compensation in the form of above-average excess returns for riskier assets. ... Using implied volatility as an asset allocation factor would have added significant value over the last thirteen years."
- Rattray and Balasubramanian. "The New VIX[®] as a Market Signal – It Still Works!" Goldman Sachs Options and Volatility Report. (Sept. 5, 2003). (1) A high level of the New VIX has a similar power in predicting the market's subsequent direction as the Old VIX. On average, the S&P 500 has risen after the New VIX reached extreme levels, with a more frequent positive return the more extreme the New VIX level. (2) A low level of the New VIX has not been a consistently successful indicator of subsequent market weakness. (3) A reversion of the New VIX occurs both after upside and downside extremes. ...

Recent 10-Page Paper

- Goldman Sachs US Options Research (Aug. 14, 2007). "... Investors have been turning to VIX futures and VIX options to position long volatility during the recent pullback. VIX options were the 2nd most liquid index options contract in July behind the S&P 500. We compare the recent performance of SPX puts versus VIX call options and find that VIX calls offered a superior return per dollar invested. ..."

Topics for Discussion

- -- In light of the fact that the volatility indexes already have experienced greater-than-ten-percent daily moves in more than thirty days in 2007, how can investors and traders benefit from these big moves?
- -- How are the futures and options on the volatility indexes priced?
- -- Have the volatility indexes seen explosive upside moves when stock prices recently declined?
- -- Is volatility a powerful unique new asset class?
- -- Is a high VIX level a bullish signal and a low VIX bearish for stocks?
- -- Can the volatility index products be used as tools for diversification, asset allocation, and/or market forecasting?

The prices for the futures and options on volatility indexes have some **unique features**; please visit www.cboe.com/volatility for more details.

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