Diversification, Portfolio Management and Use of New Volatility-based Index Products

VIX and VIX Futures and VIX Options

Panel at CBOE on Feb. 25, 2009

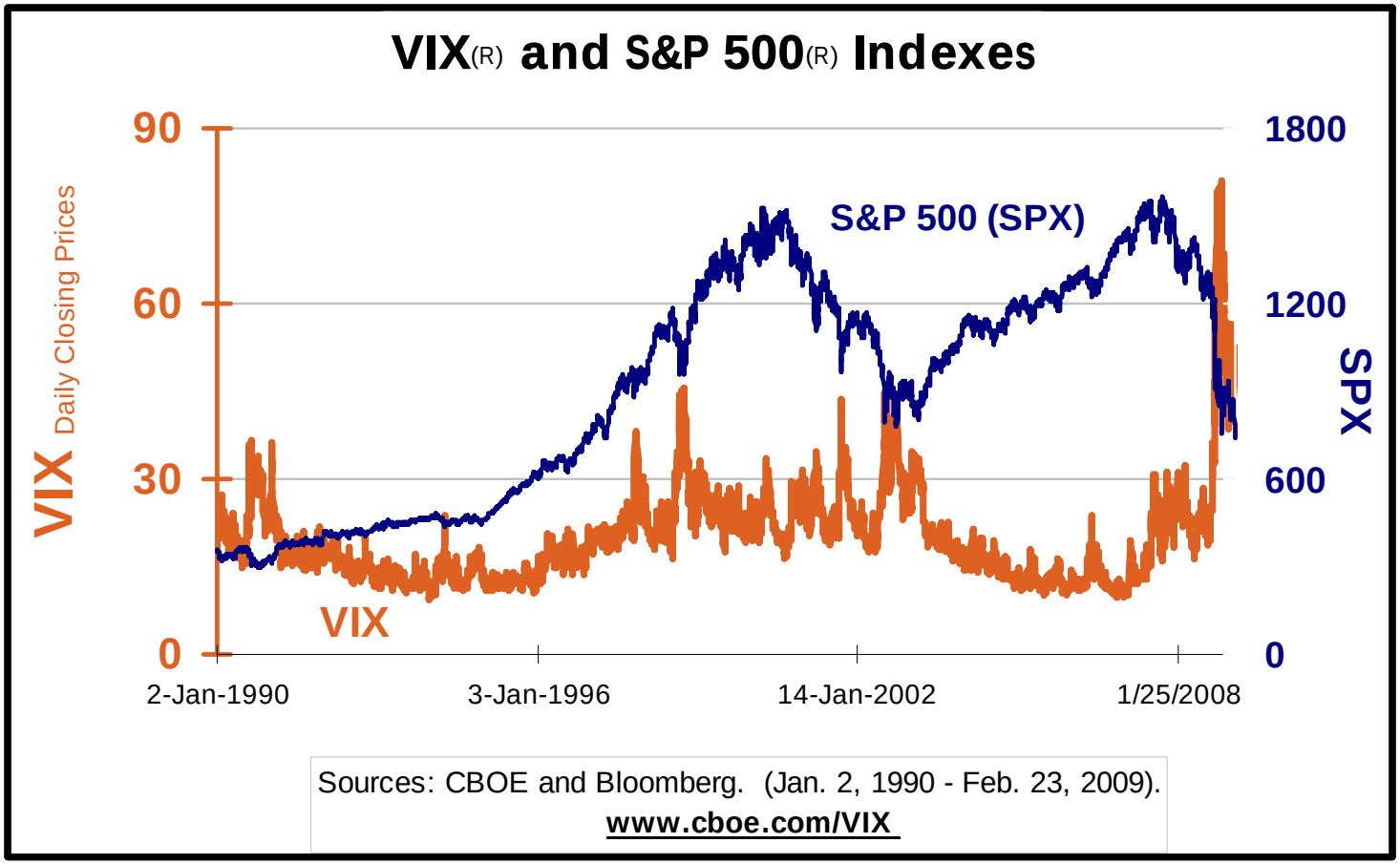
CBOE Volatility Index® (VIX®)

- Since 1993 a premier barometer of investor sentiment and market volatility.
- In Sept. 2003 new VIX methodology.
- Implied volatility index -- measures the market's expectation of 30-day volatility implicit in the prices of near-term S&P 500 (SPX) options. VIX is quoted in percentage points, just like the standard deviation of a rate of return, e.g. 23.26.
- The SPX options used in the VIX calculation are –
  - O-T-M puts and call covering the entire range of strike prices (the “ volatility skew”)
  - From the nearby and next-to-nearby expiration months for a constant 30-day volatility measure
- VIX futures in 2004 and VIX options in 2006, with settlement date on Wednesday (30 days before SPX expiration)
- www.cboe.com/VIX

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
  - High Volatility of Volatility

CBOE Volatility Index (VIX)

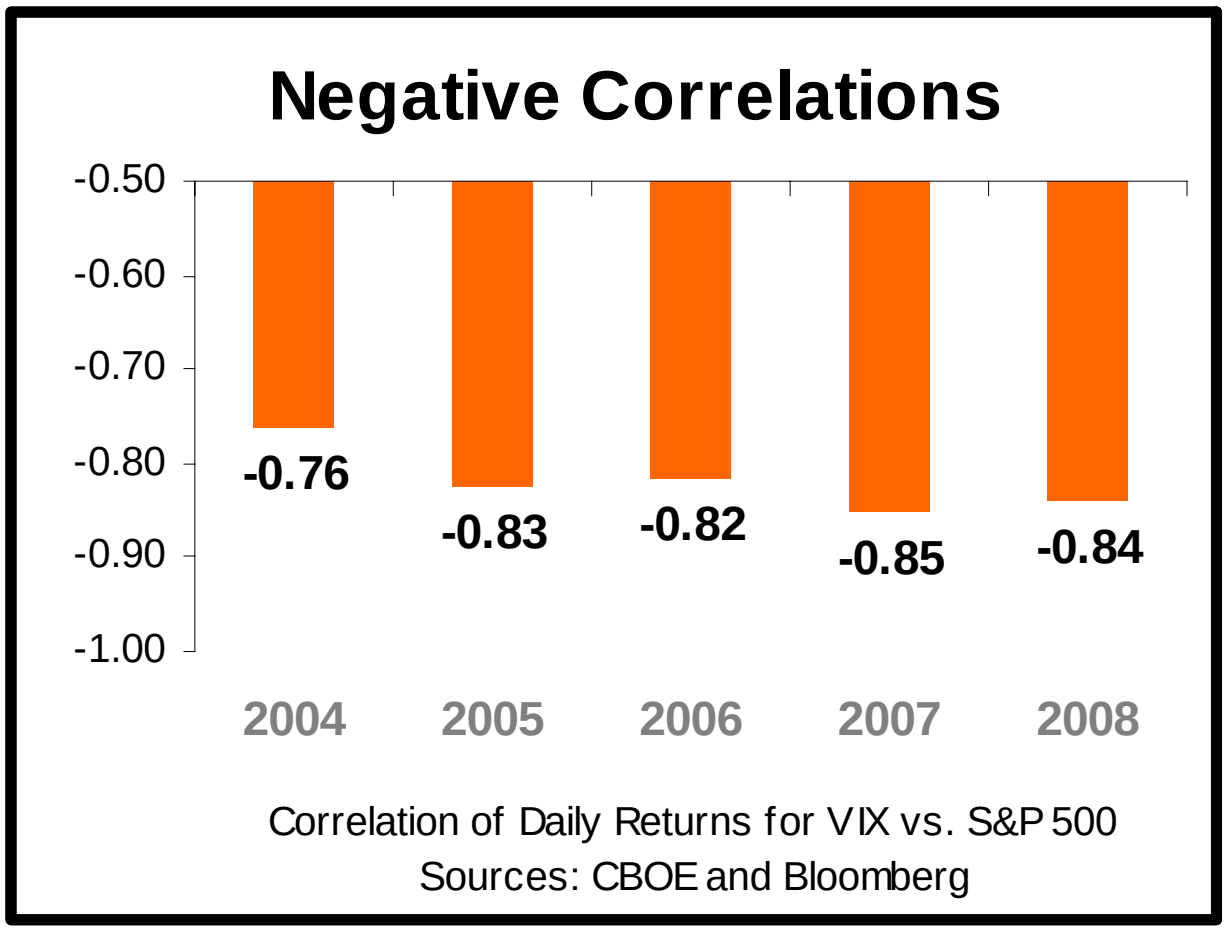


High and Low Daily Closing Prices for Annual Time Periods

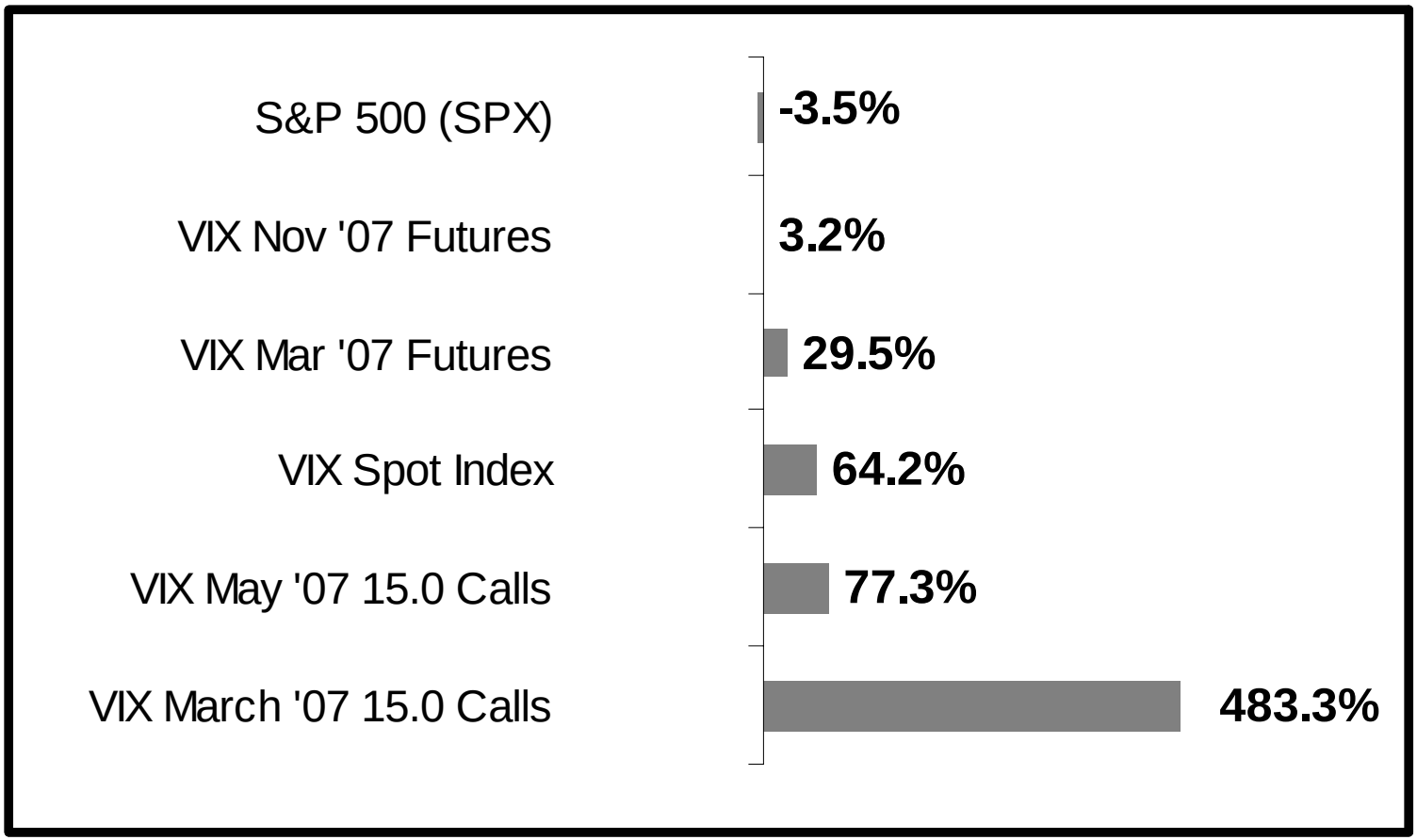
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
VIX HIGH	36.47	36.20	20.51	17.30	23.87	15.74	21.99	38.20	45.74	32.98	33.49	43.74	45.08	34.69	21.58	17.74	23.81	31.09	80.86
VIX LOW	14.72	13.95	11.51	9.31	9.94	10.36	12.00	17.09	16.23	17.42	16.53	18.76	17.40	15.58	11.23	10.23	9.90	9.89	16.30

Sources: CBOE, Bloomberg and S&P

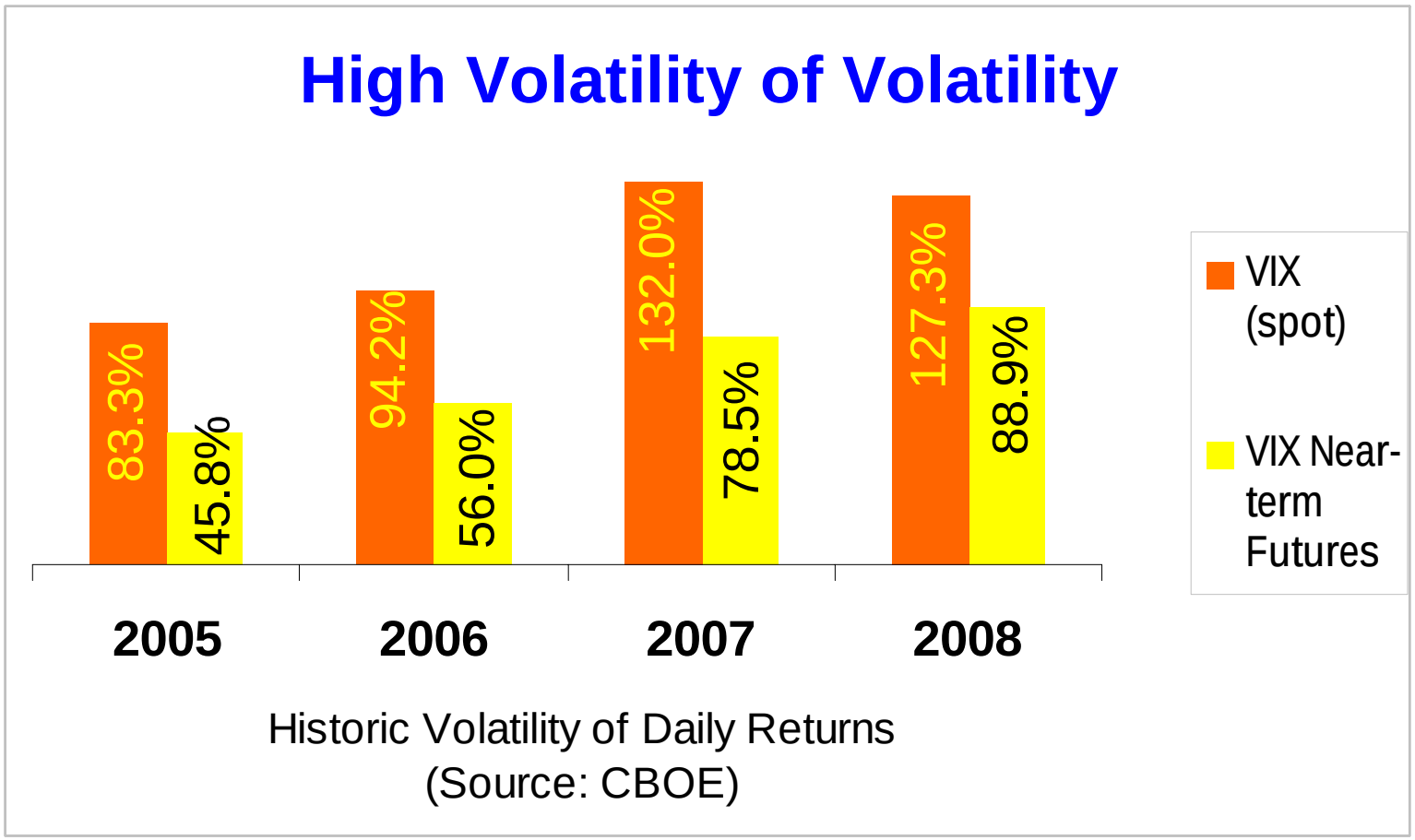
Negative Correlations



% Change in Prices on 27 Feb. 2007



High Volatility of Volatility



Records for VIX in 2008

The CBOE Volatility Index® (VIX®) now has 19 years of price history, and in 2008 several new records were set for VIX and other CBOE index products, including the following --

- **1. Highest VIX Level**. The VIX Index reached its all-time intraday high of 89.53 on October 24, 2008. (Prior to 2008, the highest VIX level was 49.53 on October 8, 1998.)

- **2. Highest Daily Closing VIX Level**. The VIX Index closed at a record 80.86 on November 20, 2008. (The highest daily closing VIX price in previous years was 45.74 on October 8, 1998.)

- **3. Highest Premiums for Index Options Strategy**. On November 21, 2008 the CBOE S&P 500 BuyWrite Index (BXM) generated a record high 8.1% gross monthly premium. The highest BXM gross monthly premium generated in the previous twenty calendar years was 4.4% on September 21, 2001.

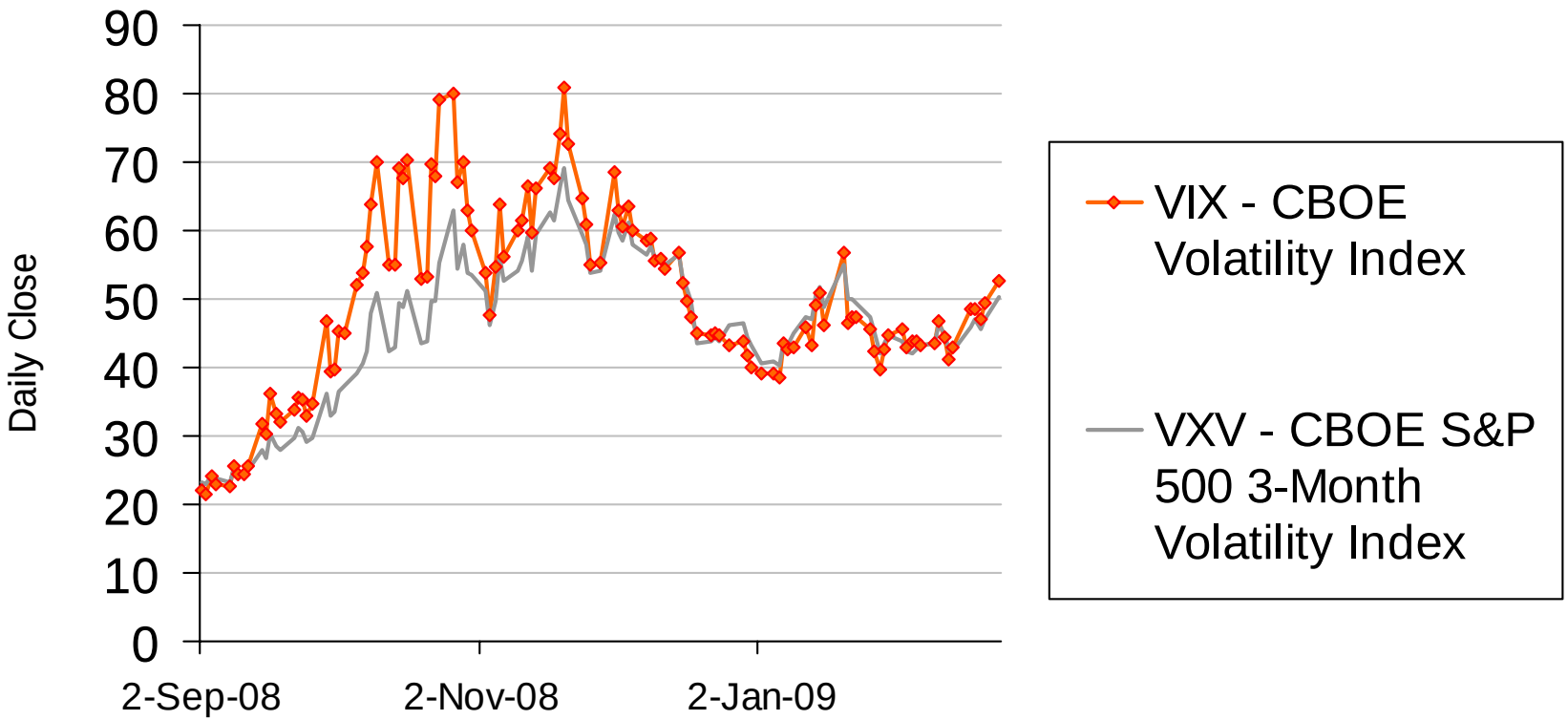
- **4. Highest Average Level**. The VIX Index had its highest average daily closing price of **32.65** for the year of 2008, surpassing its previous high average daily closing price of 27.3 in 2002.

- **5. Sustained High Volatility**. The VIX Index closed above 50 on fifty trading days in 2008. (The VIX had never reached 50 before 2008.)

- **6. Record Volatility of Volatility**. The VIX Index had daily movements of 10 percent or more (up or down) on a record high 45 days in 2008 (the previous record was 42 days in 2007).

www.cboe.com/VIX

VIX and VXV Since Sept. 2008

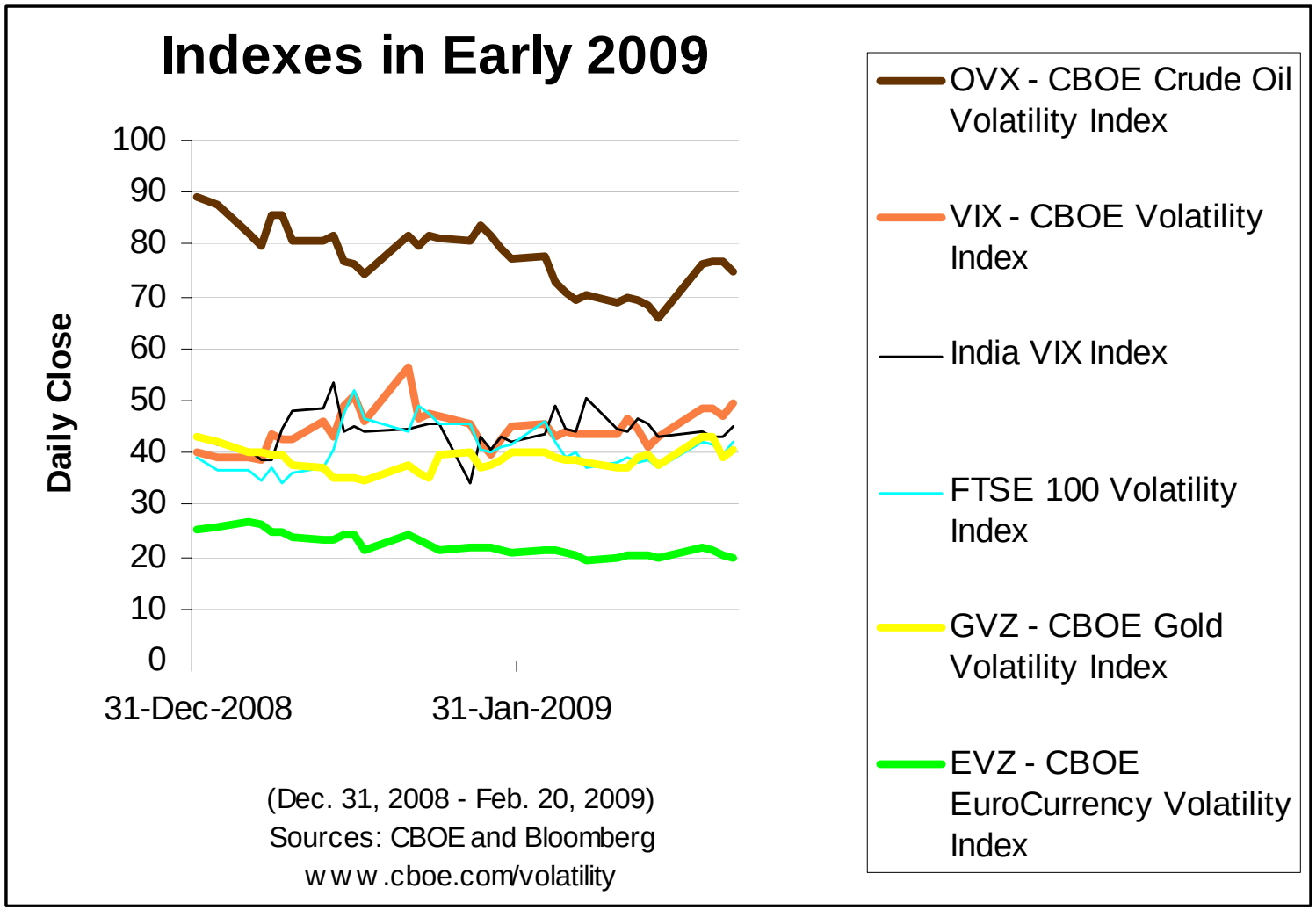


(Sept. 2, 2008 - Feb. 20, 2009) Sources: CBOE and Bloomberg

News Clip Barron's 21st July 2008

- "… the current financial crisis has made CBOE's VIX a market darling …
- … In May, the Mumbai-based National Stock Exchange licensed VIX to create India VIX. CBOE also has agreements with the Taiwan Futures Exchange, Germany's Eurex, and Euronext. VIX indexes will be listed on London's FTSE 100, Amsterdam Exchange Index (AEX), France's CAC 40 and Belgium's BEL20 Index. …
- Last week, VIX was applied to crude oil, marking the start of a series of non-stock VIX indexes. By year's end, CBOE will introduce VIX indexes on gold, foreign currencies …"

Worldwide Indexes

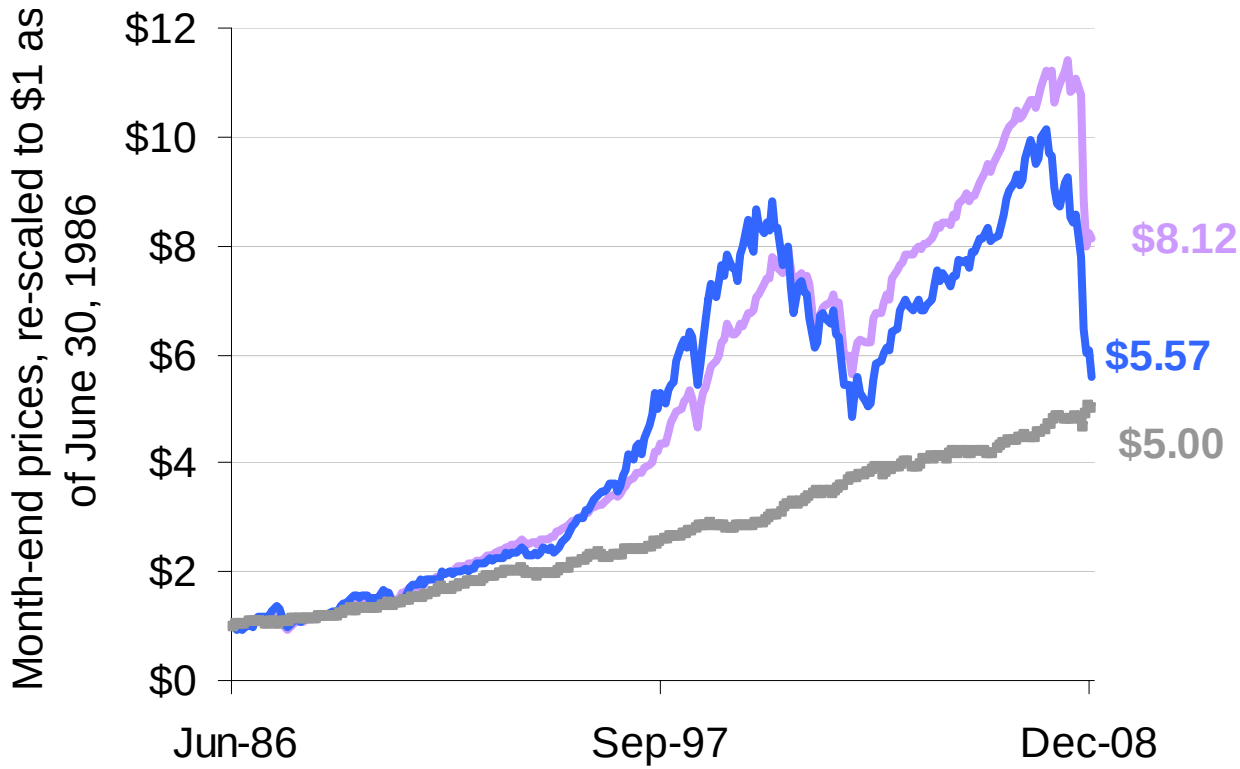


CBOE Performance Benchmark Indexes

Index	Ticker	Introduced	Data beginning	Website
CBOE S&P 500 BuyWrite	**BXM**SM	2002	June 30, 1986	www.cboe.com/**BXM**
CBOE S&P 500 2%OTM BuyWrite	**BXY**SM	2006	June 1, 1988	www.cboe.com/**BXY**
CBOE Russell 2000 BuyWrite	**BXR**SM	2006	Dec. 29, 2000	www.cboe.com/**BXR**
CBOE DJIA BuyWrite	**BXD**SM	2005	Oct. 16, 1997	www.cboe.com/**BXD**
CBOE NASDAQ-100 BuyWrite	**BXN**SM	2005	Dec. 30, 1994	www.cboe.com/**BXN**
CBOE S&P 500 **95-110 Collar**	**CLL**SM	2008	June 30, 1986	www.cboe.com/**CLL**
CBOE S&P 500 **PutWrite**	**PUT**SM	2007	June 30, 1986	www.cboe.com/**PUT**

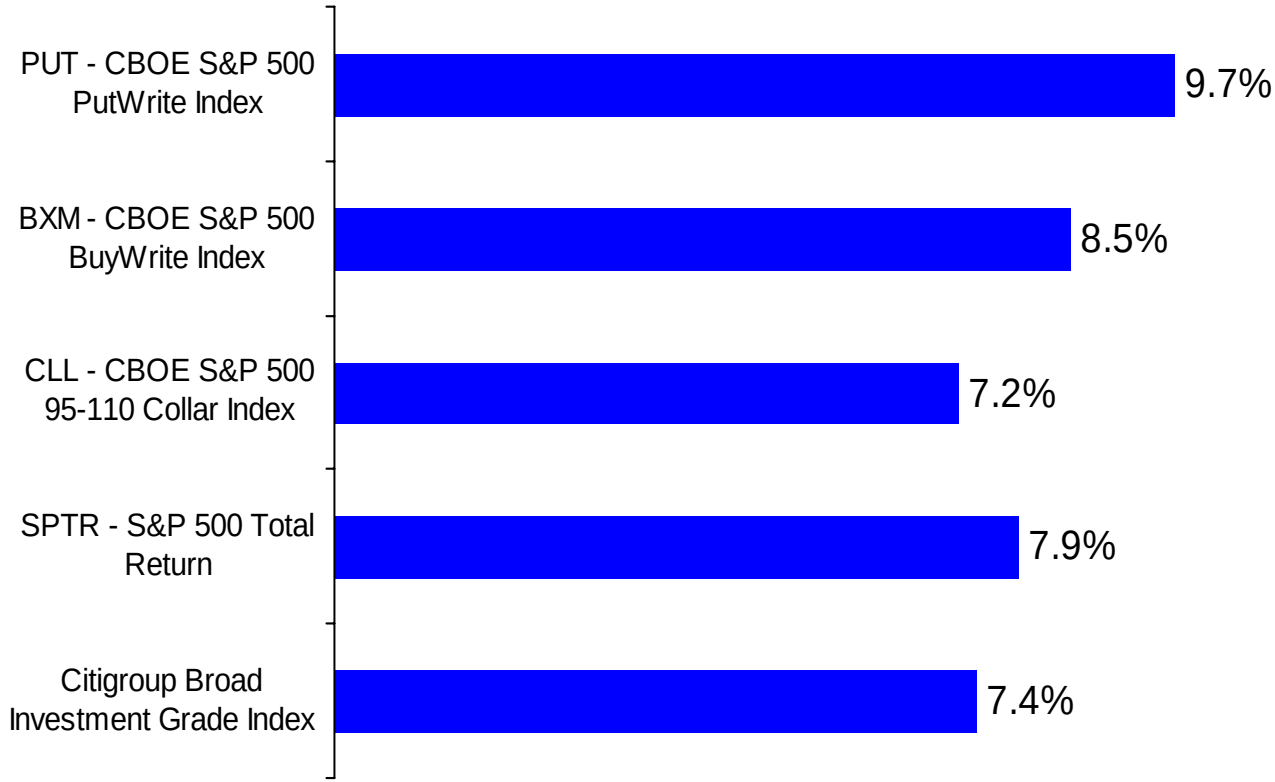
Bloomberg provides historical data for all seven indexes.

Indexes Since Mid-1986



(June 30, 1986 - Jan. 30, 2009) Sources: CBOE and Bloomberg www.cboe.com/PUT

Annualized Returns

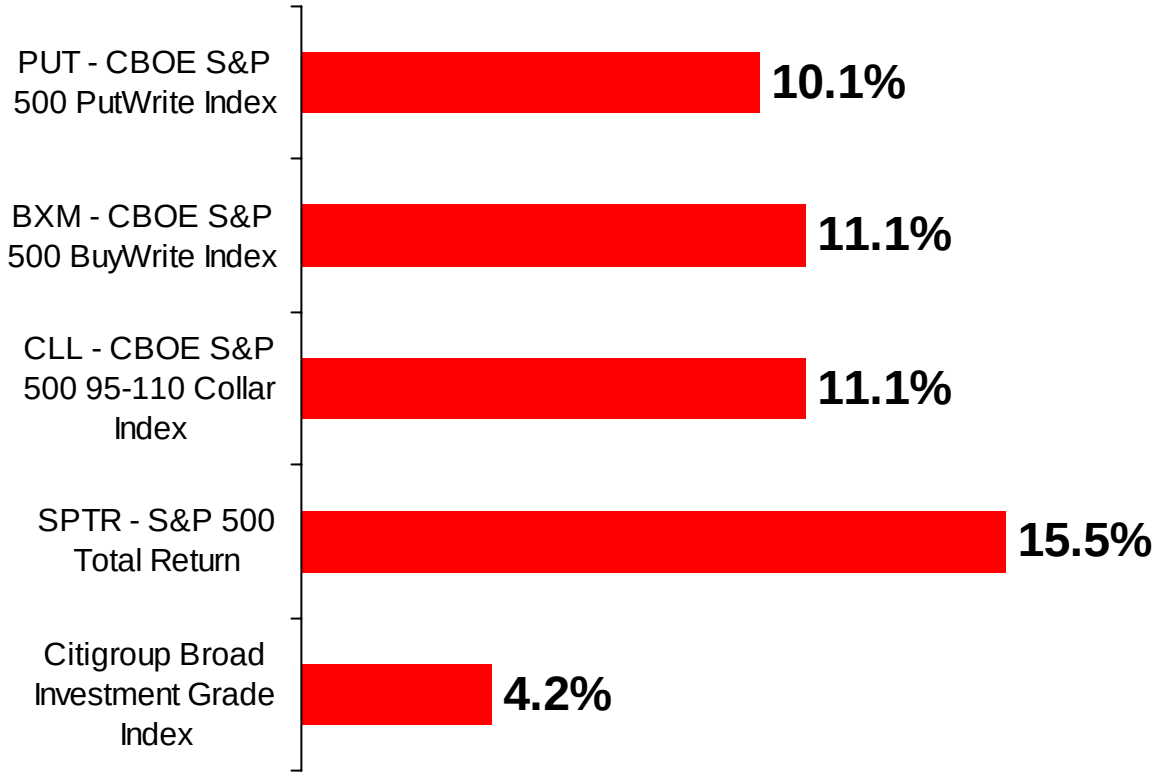


(July 1986 - January 2009) Sources: CBOE and Bloomberg

Annualized

Standard Deviation

of Monthly Returns



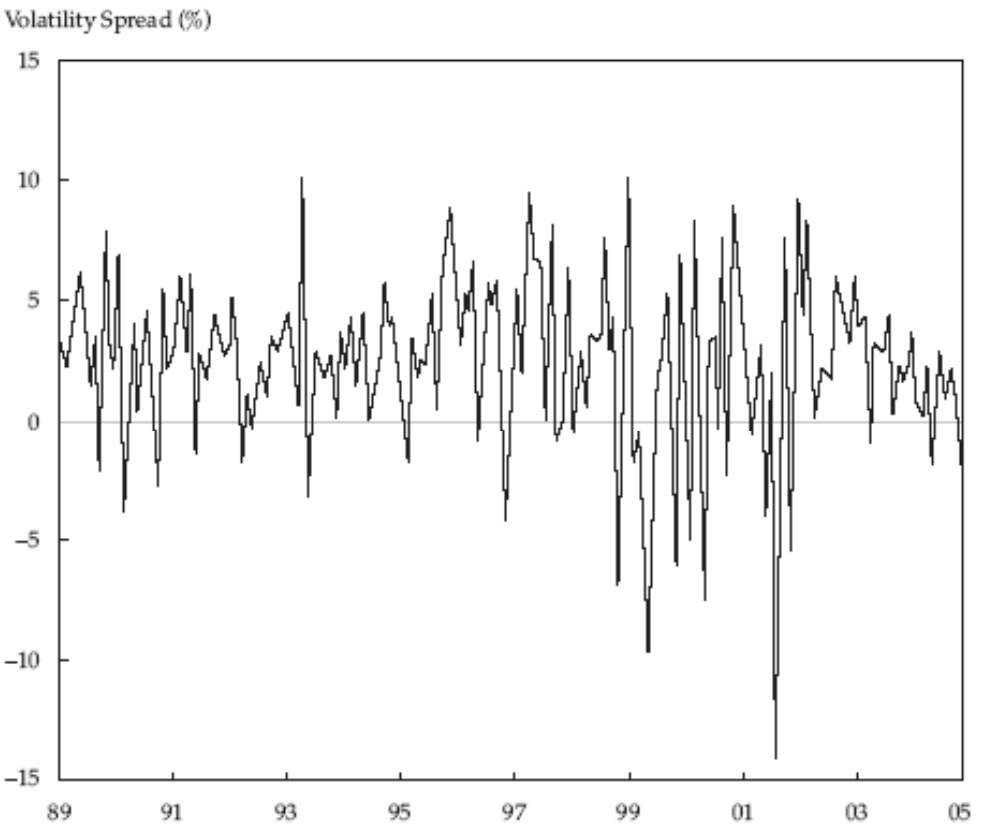
(July 1986 - Jan. 2009).

Sources: Bloomberg and CBOE.

Source of Returns- Sell “Rich” Options

From: Paper by Goldman Sachs. "Finding Alpha via Covered Index Writing," Financial Analysts Journal. (September/October 2006).

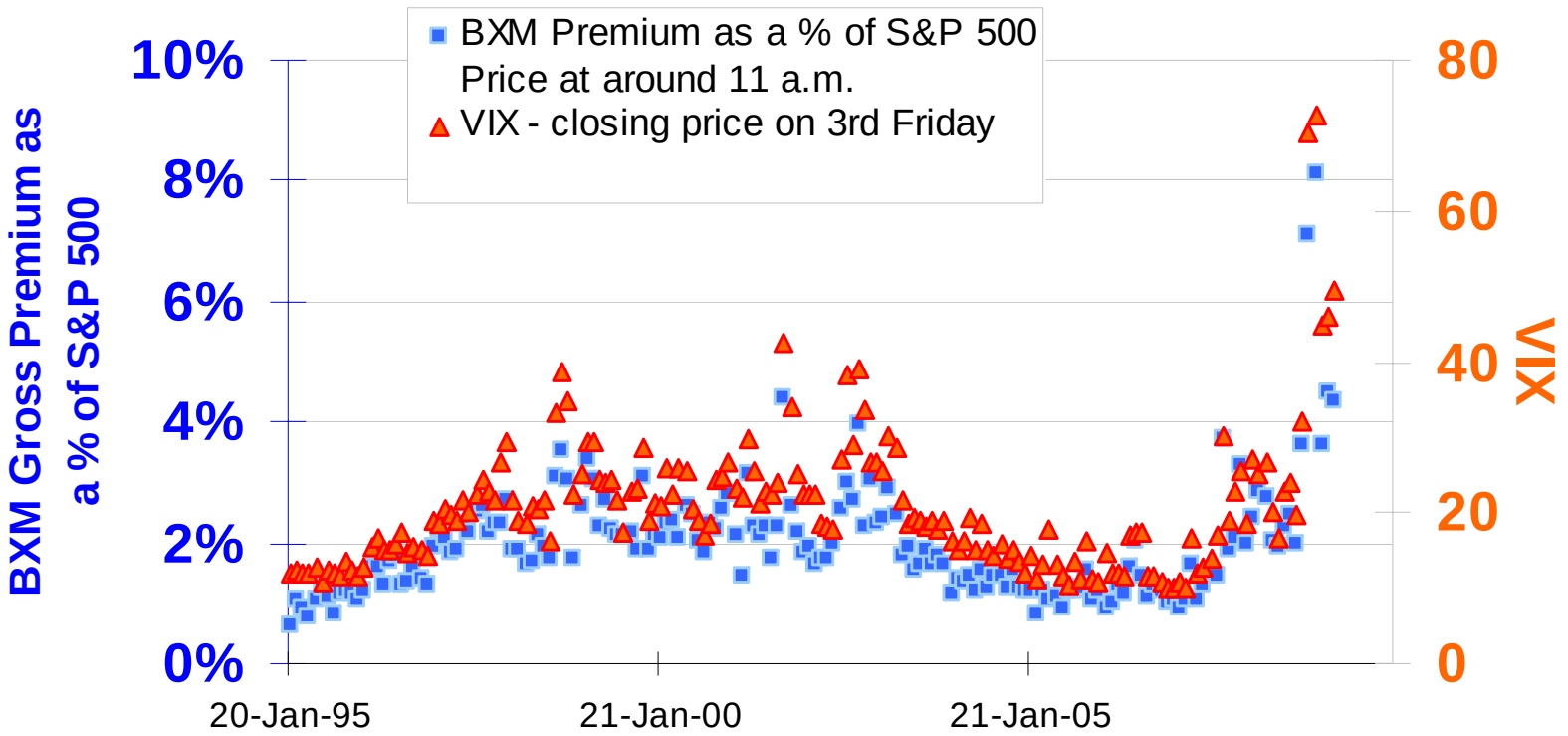
Figure 5. S&P 500 ATM One-Month Option: Implied vs. Realized Volatility Spread, 1 January 1990 to 31 October 2005



Note: The average spread was 2.4 percentage points; the median, 2.7 percentage points.

Source: Goldman Sachs.

BXM Gross Premium % and VIX on Expiration Fridays



Source: CBOE. (Jan 1995 - Feb. 2009)

Please note that the net monthly returns usually are less than the gross premium received.
www.cboe.com/BXM

Key Specifications - VIX® Futures and Options

	Futures	Options
Exchange	CFE	CBOE
Ticker	VX	VIX
Multiplier	$1,000 (and $100 in March 2009)	$100
Last Day of Trading	Generally on Tuesday, the day before expiration date.	
Expiration Date	Generally on Wednesday 30 days prior to the 3rd Friday of calendar month immediately following the expiring month.	
Trading Hours	8:30 a.m. – 3:15 p.m. Chicago Time	
Avg. Daily Volume in 2008	4,589	102,560
Open Interest (Dec 31, 2008)	11,238	555,832
Launch Date	March 26, 2004	Feb. 24, 2006

Sample VIX Strategies*

Investors who are Bullish on VIX, and Bearish on stocks might consider –

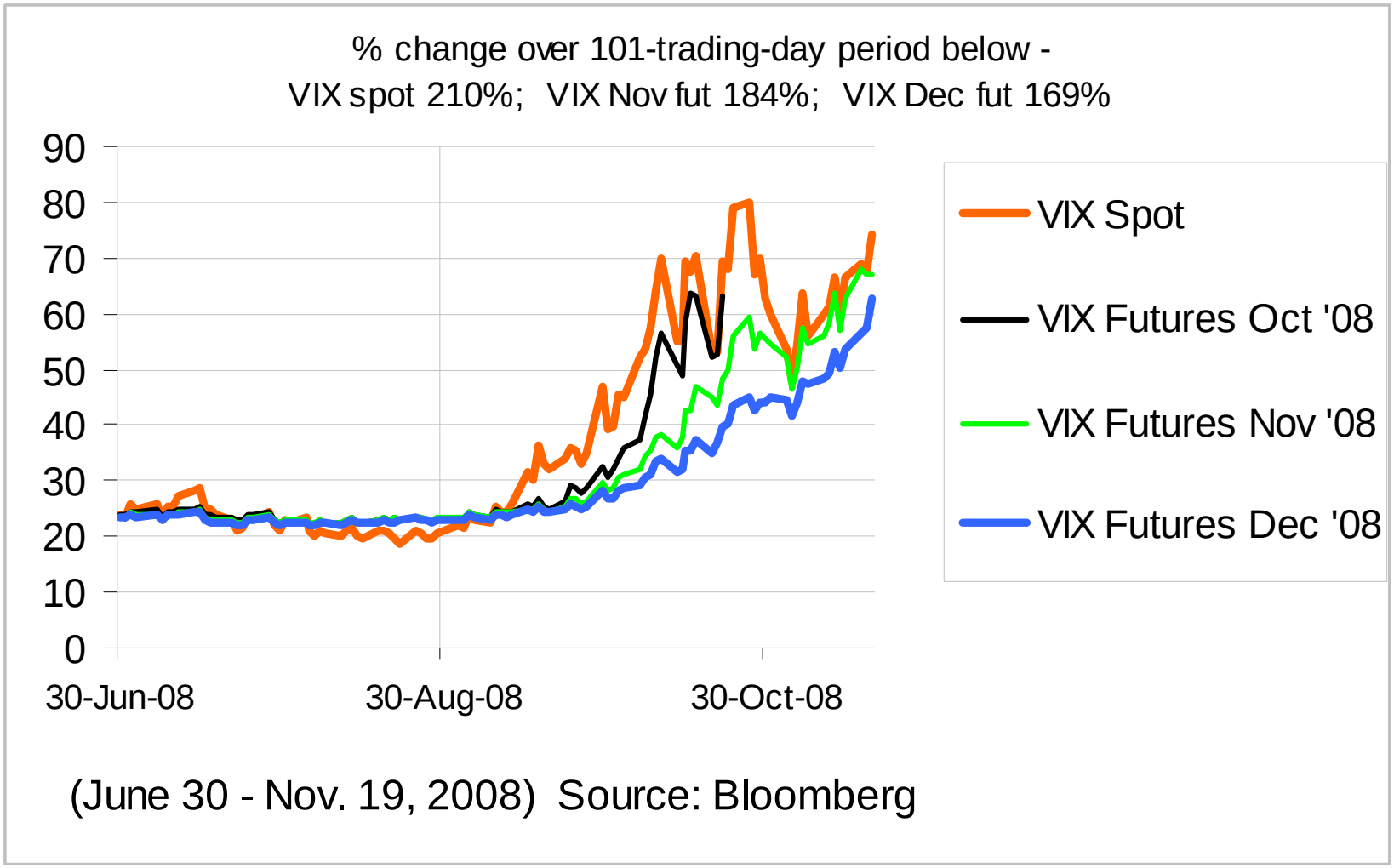
- Long VIX Call Options
- Long VIX Call Spreads
- Short VIX Put Credit Spreads
- Long VIX Futures

Investors who are Bearish on VIX, and Bullish on stocks might consider –

- Long VIX Put Options
- Long VIX Put Spreads
- Short VIX Call Credit Spreads
- Short VIX Futures

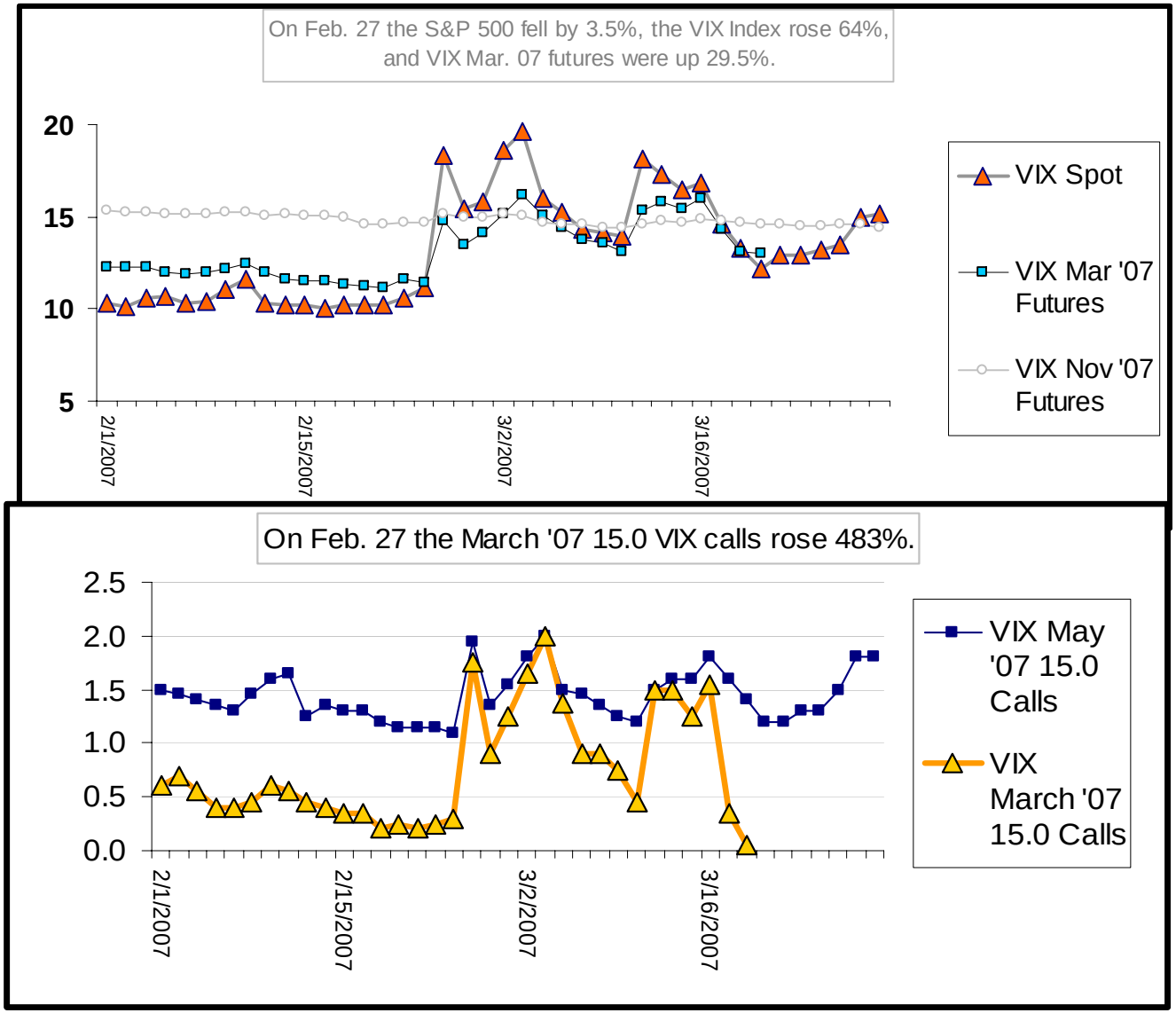
* Caution – sometimes VIX and stock prices move in the same direction. Please visit www.cboe.com/VIX for more information about prices and strategies.

VIX Spot and Futures in 2008

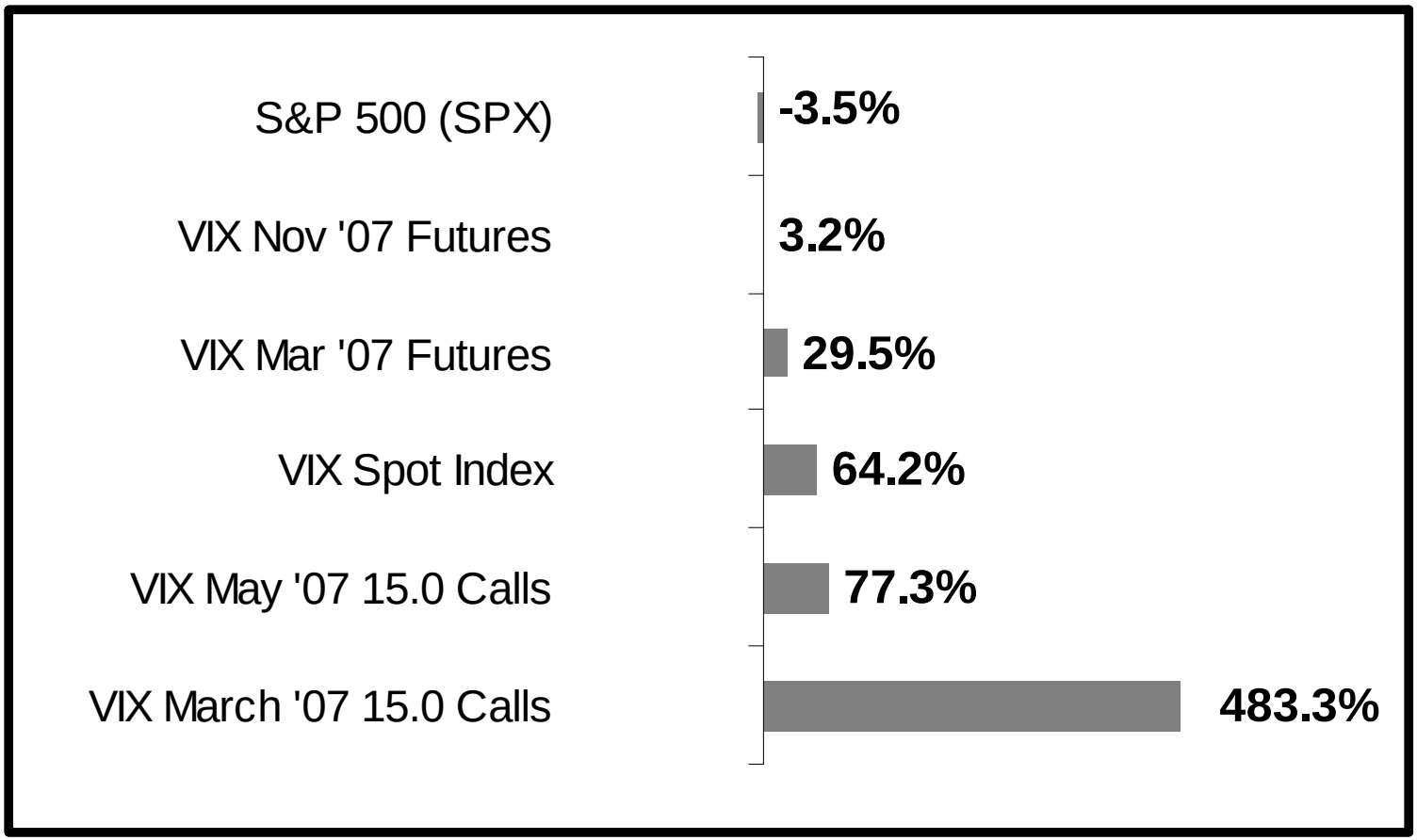


(June 30 - Nov. 19, 2008) Source: Bloomberg

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

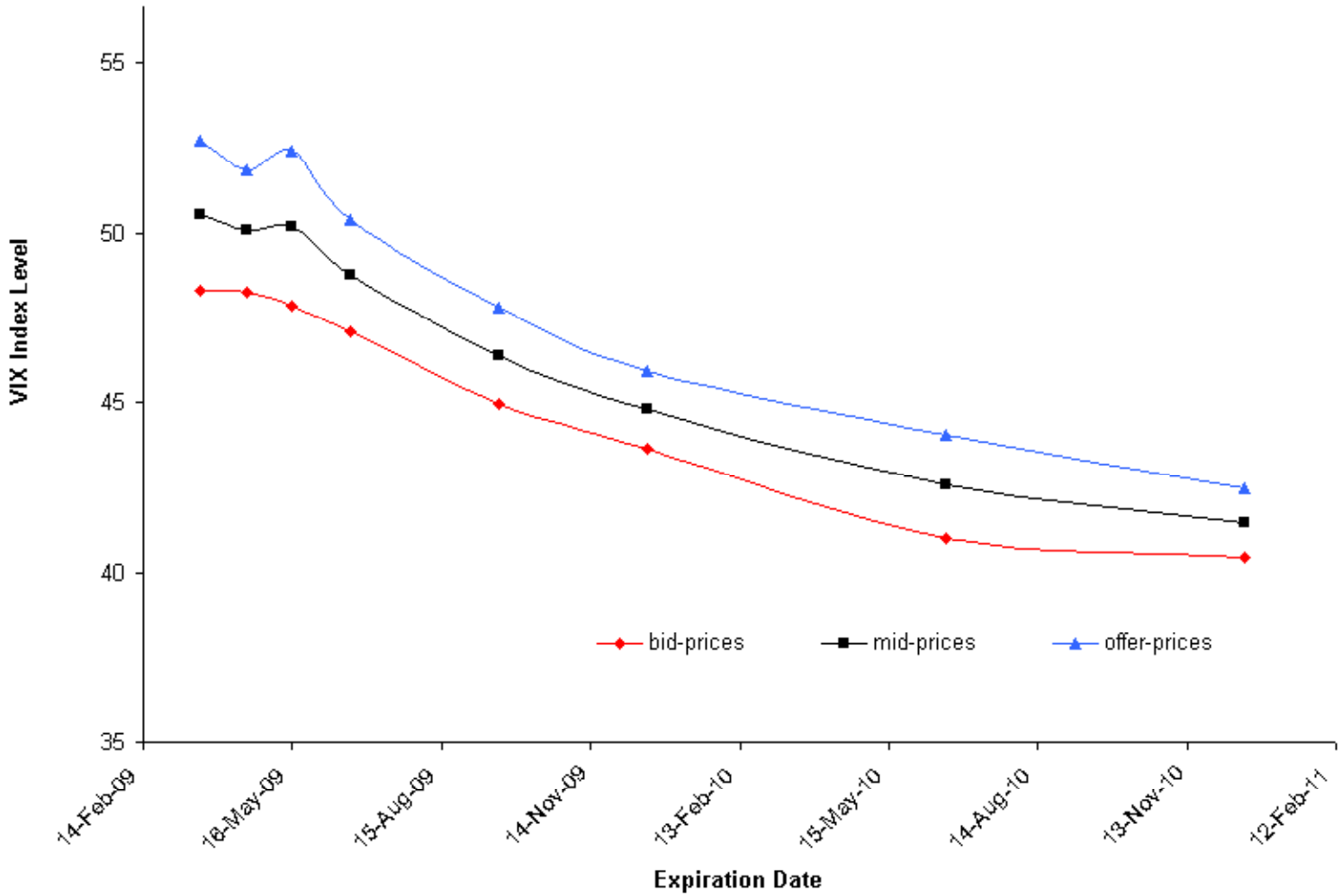


% Change in Prices on 27 Feb. 2007

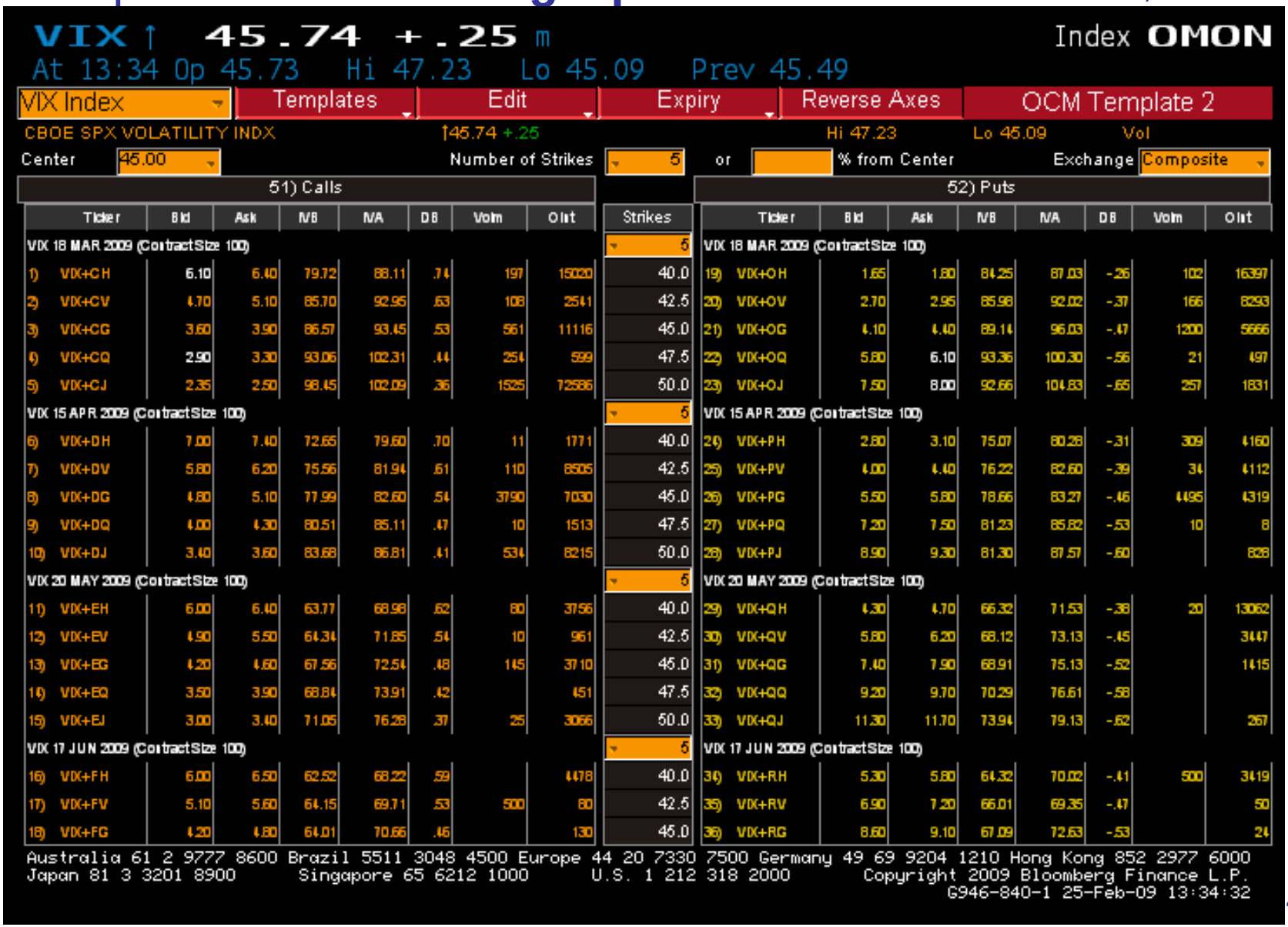


VIX Term Structure

The VIX Term Structure is a representation of SPX option implied volatility that involves applying the VIX formula to particular SPX option expirations to construct a term structure for fair variance. Below is a chart of the VIX Term Structure on Monday, February 23, 2009. The green line represents the VIX Term Structure data calculated using SPX option offer prices, the blue and red lines represent term structure data calculated using SPX option bid and mid-quote prices, respectively. See www.cboe.com/VIX for updates



VIX Options – **Bloomberg Options Monitor** on Feb. 25, 2009



VIX ↑ 45.74 +.25 m — Index OMON

At 13:34 Op 45.73 Hi 47.23 Lo 45.09 Prev 45.49

VIX Index | Templates | Edit | Expiry | Reverse Axes | OCM Template 2

CBOE SPX VOLATILITY INDX ↑45.74 +.25 Hi 47.23 Lo 45.09 Vol

Center 45.00 Number of Strikes 5 or % from Center Exchange Composite

51) Calls

	Ticker	Bid	Ask	IVB	IVA	DB	Volm	Oint	Strikes
VIX 18 MAR 2009 (ContractSize 100)									5
1)	VIX+CH	6.10	6.40	79.72	88.11	.74	197	15060	40.0
2)	VIX+CV	4.70	5.10	85.70	92.95	.63	108	2541	42.5
3)	VIX+CG	3.60	3.90	86.57	93.45	.53	561	11116	45.0
4)	VIX+CQ	2.90	3.30	93.06	102.31	.44	254	599	47.5
5)	VIX+CJ	2.35	2.50	98.45	102.09	.36	1525	72586	50.0
VIX 15 APR 2009 (ContractSize 100)									5
6)	VIX+DH	7.00	7.40	72.65	79.60	.70	11	1771	40.0
7)	VIX+DV	5.80	6.20	75.56	81.94	.61	110	8505	42.5
8)	VIX+DG	4.80	5.10	77.99	82.60	.54	3790	7030	45.0
9)	VIX+DQ	4.00	4.30	80.51	85.11	.47	10	1513	47.5
10)	VIX+DJ	3.40	3.60	83.68	86.81	.41	534	8215	50.0
VIX 20 MAY 2009 (ContractSize 100)									5
11)	VIX+EH	6.00	6.40	63.77	68.98	.62	80	3756	40.0
12)	VIX+EV	4.90	5.50	64.34	71.85	.54	10	961	42.5
13)	VIX+EG	4.20	4.60	67.56	72.54	.48	145	3710	45.0
14)	VIX+EQ	3.50	3.90	68.84	73.91	.42		451	47.5
15)	VIX+EJ	3.00	3.40	71.05	76.28	.37	25	3066	50.0
VIX 17 JUN 2009 (ContractSize 100)									5
16)	VIX+FH	6.00	6.50	62.52	68.22	.59		4478	40.0
17)	VIX+FV	5.10	5.60	64.15	69.71	.53	500	80	42.5
18)	VIX+FG	4.20	4.80	64.01	70.66	.46		130	45.0

52) Puts

	Ticker	Bid	Ask	IVB	IVA	DB	Volm	Oint
VIX 18 MAR 2009 (ContractSize 100)								
19)	VIX+OH	1.65	1.80	84.25	87.03	-.26	102	16397
20)	VIX+OV	2.70	2.95	85.98	92.02	-.37	166	8293
21)	VIX+OG	4.10	4.40	89.14	96.03	-.47	1200	5666
22)	VIX+OQ	5.80	6.10	93.36	100.30	-.56	21	497
23)	VIX+OJ	7.50	8.00	92.66	104.83	-.65	257	1831
VIX 15 APR 2009 (ContractSize 100)								
24)	VIX+PH	2.80	3.10	75.07	80.28	-.31	309	4160
25)	VIX+PV	4.00	4.40	76.22	82.60	-.39	34	4112
26)	VIX+PG	5.50	5.80	78.66	83.27	-.46	4495	4319
27)	VIX+PQ	7.20	7.50	81.23	85.82	-.53	10	8
28)	VIX+PJ	8.90	9.30	81.30	87.57	-.60		828
VIX 20 MAY 2009 (ContractSize 100)								
29)	VIX+QH	4.30	4.70	66.32	71.53	-.38	20	13062
30)	VIX+QV	5.80	6.20	68.12	73.13	-.45		3447
31)	VIX+QG	7.40	7.90	68.91	75.13	-.52		1415
32)	VIX+QQ	9.20	9.70	70.29	76.61	-.58		
33)	VIX+QJ	11.30	11.70	73.94	79.13	-.62		267
VIX 17 JUN 2009 (ContractSize 100)								
34)	VIX+RH	5.30	5.80	64.32	70.02	-.41	500	3419
35)	VIX+RV	6.90	7.20	66.01	69.35	-.47		50
36)	VIX+RG	8.60	9.10	67.09	72.63	-.53		24

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
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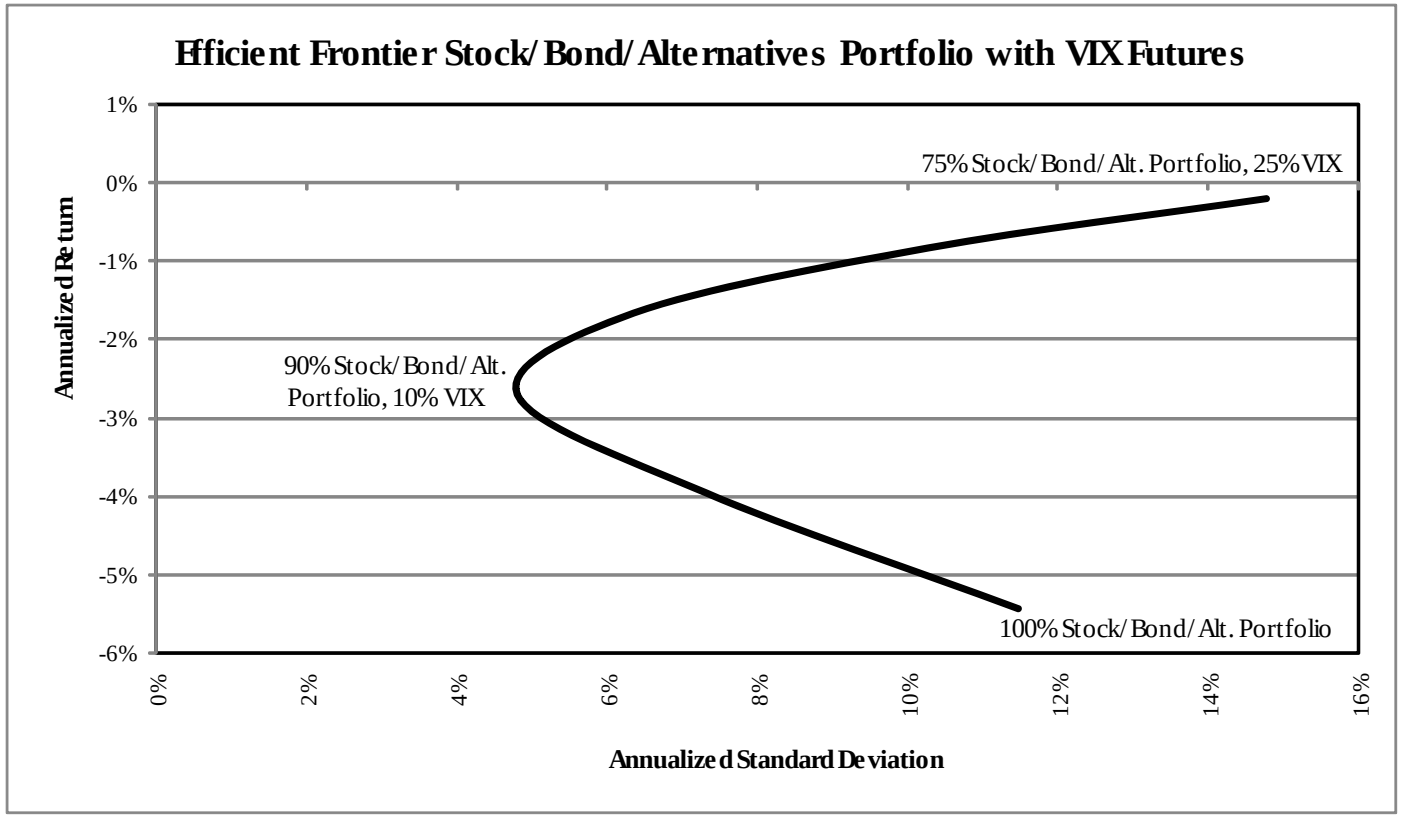
Add Long VIX Futures to a "Traditional" Portfolio

With a 10% allocation to VIX futures, the portfolio's standard deviation was reduced by about 56%

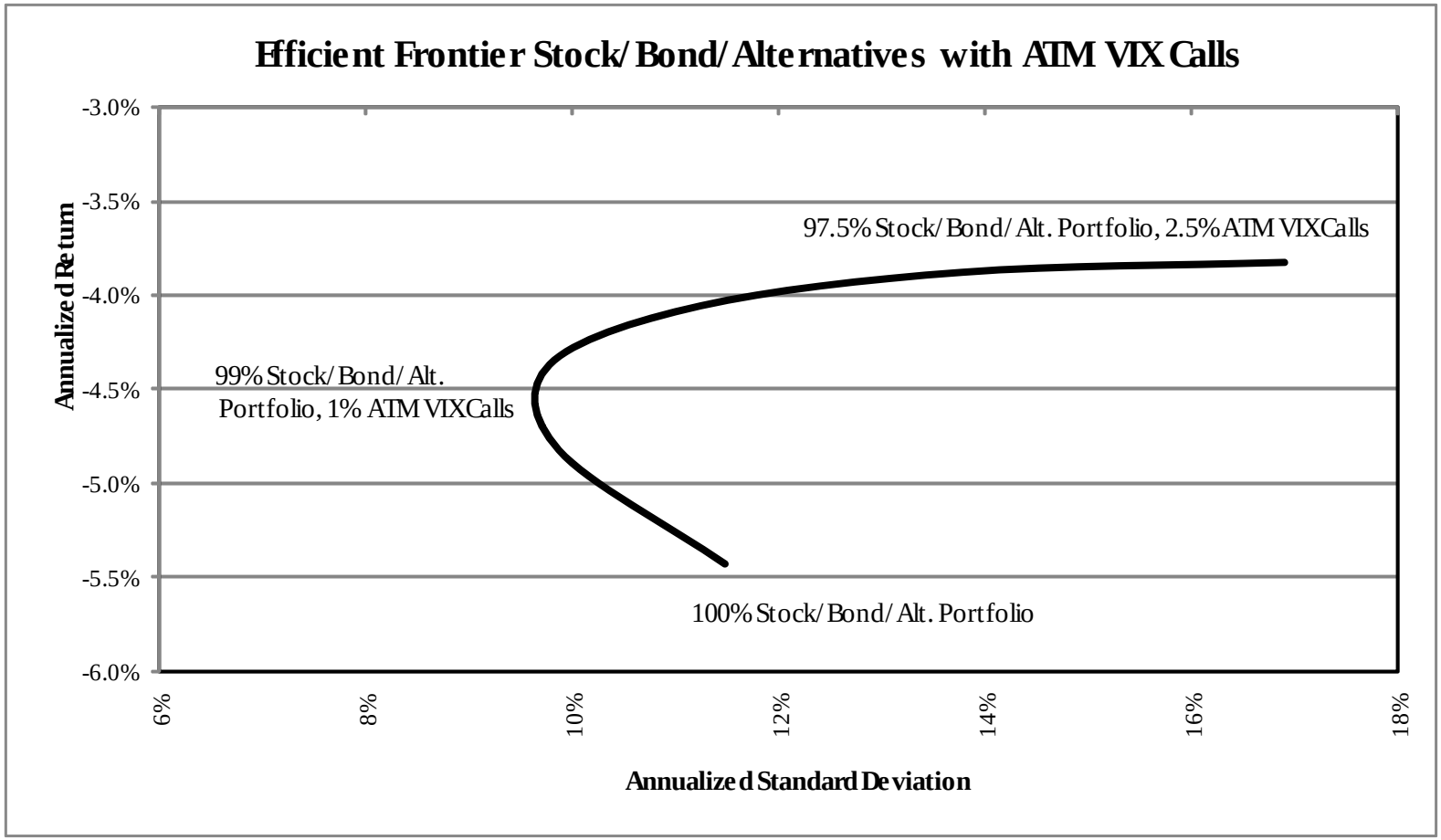


(March 2006 – December 2008)

Draft from a forthcoming 2009 paper "VIX Futures and Options – A Case Study of Portfolio Diversification During the 2008 Financial Crisis"
by Edward Szado, CFA, University of Massachusetts

Add Long VIX ATM Calls to a "Traditional" Portfolio

With a 1% allocation to long VIX calls, the portfolio's standard deviation was reduced by about 14%



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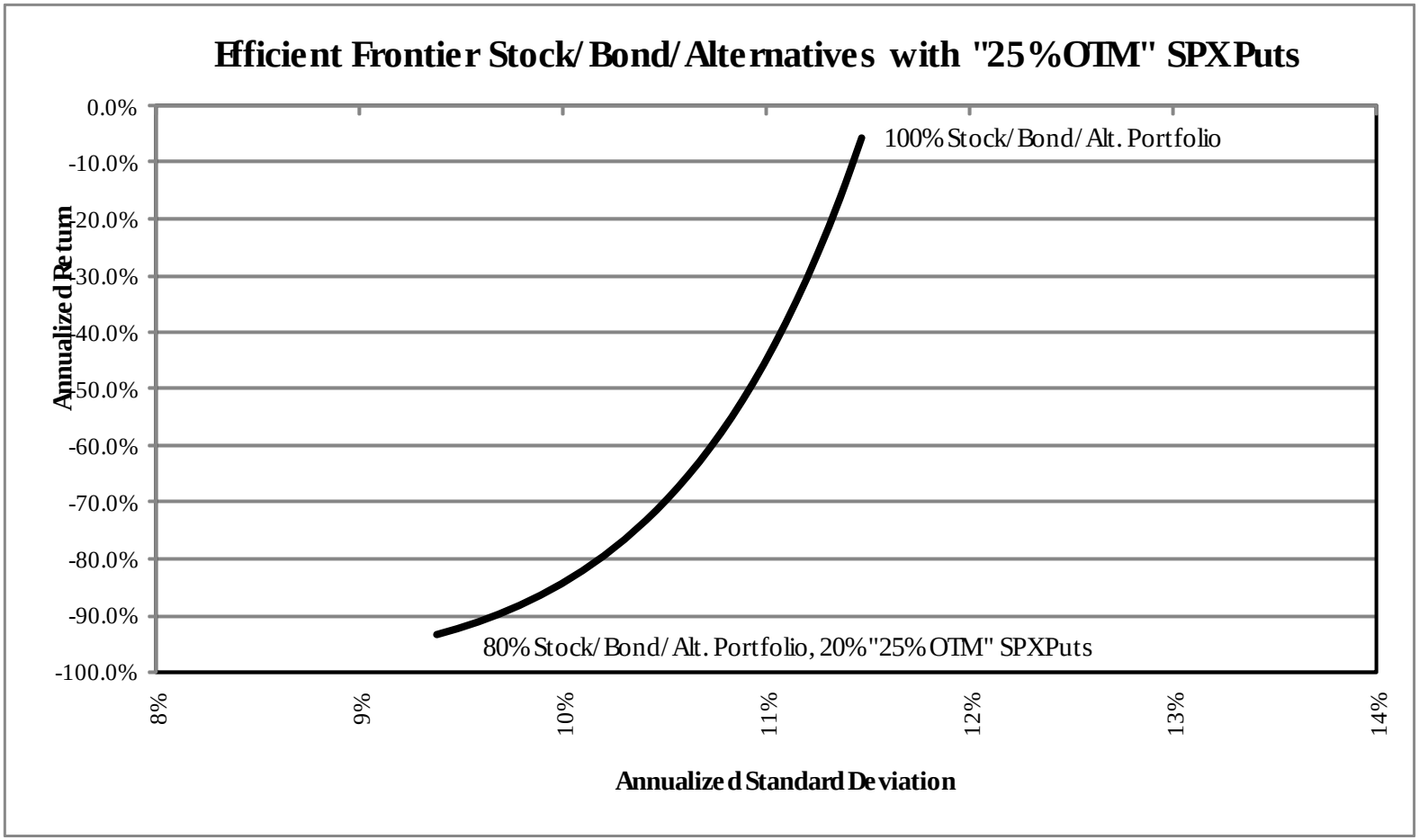
Add S&P 500® (SPX) Puts to a "Traditional" Portfolio

With a 20% allocation to long O-T-M SPX puts, the portfolio's standard deviation was reduced by about 14%



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