

School of Futures – Interactive Brokers

Session 3: Stock Index Futures Overview

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CD&S - Intermediaries
March 27th, 2014

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Futures trading is not suitable for all investors, and involves the risk of loss. Futures are a leveraged investment, and because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money deposited for a futures position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because they cannot expect to profit on every trade. All references to options refer to options on futures.

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What was the first stock index futures contract?





Benchmarking

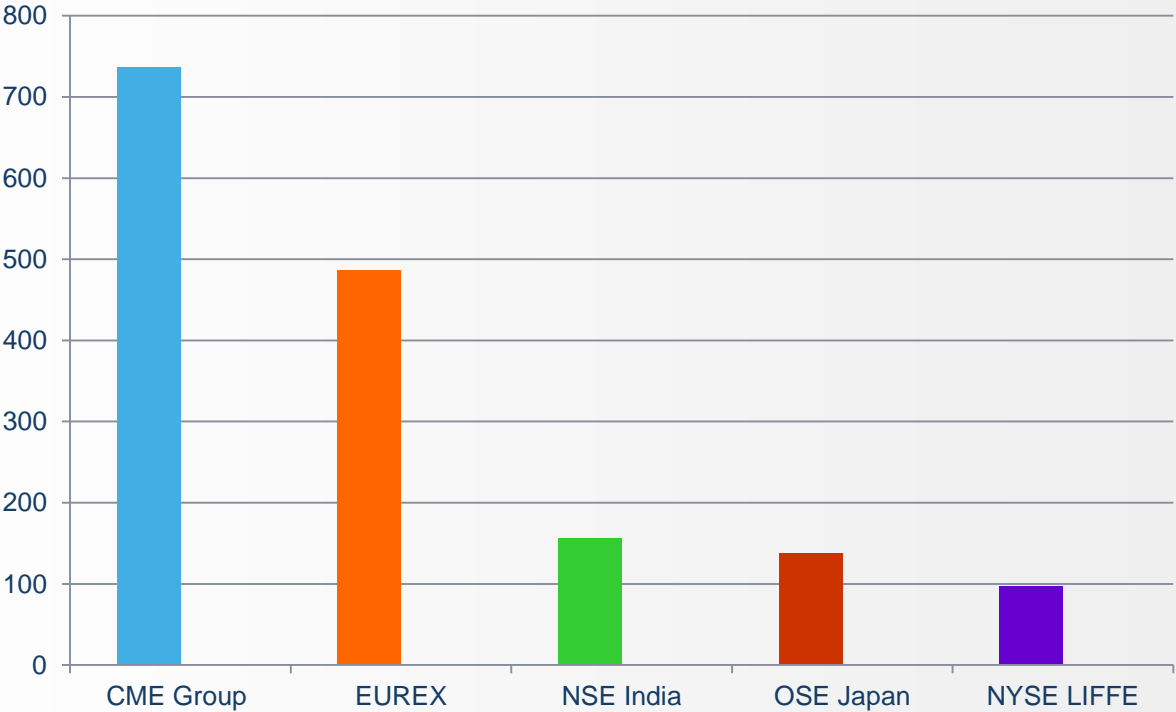
**Over \$1.25 trillion
directly indexed to
S&P 500**

Other World Benchmarks

Equity Index	Country	Exchange
FTSE 100	United Kingdom	NYSE Euronext
CAC 40	France	NYSE Euronext
DAX	Germany	EUREX
Nikkei 225	Japan	SGX, OSE, CME
Kospi	Korea	KRX
Hang Seng	Hong Kong	HKEx
IBovespa	Brazil	BM&F, CME

World Equity Futures Volume

Stock Index Futures



Data: WFE

Equity Index Contracts on CME

Equity Futures

23

Equity Options

18

Major volume indices include:

S&P 500[®]

E-mini S&P 500

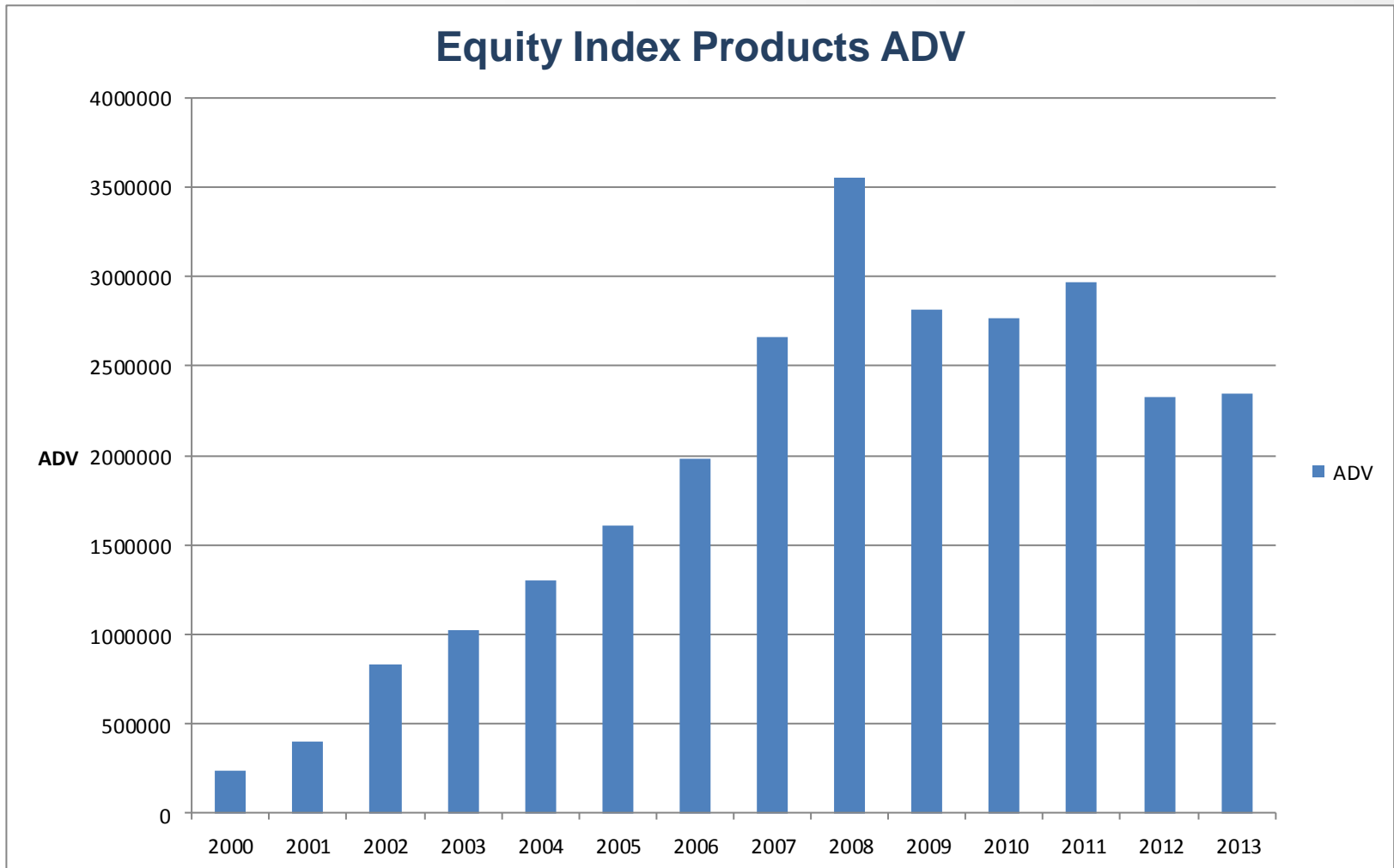
NASDAQ-100[®]

E-mini NASDAQ-100

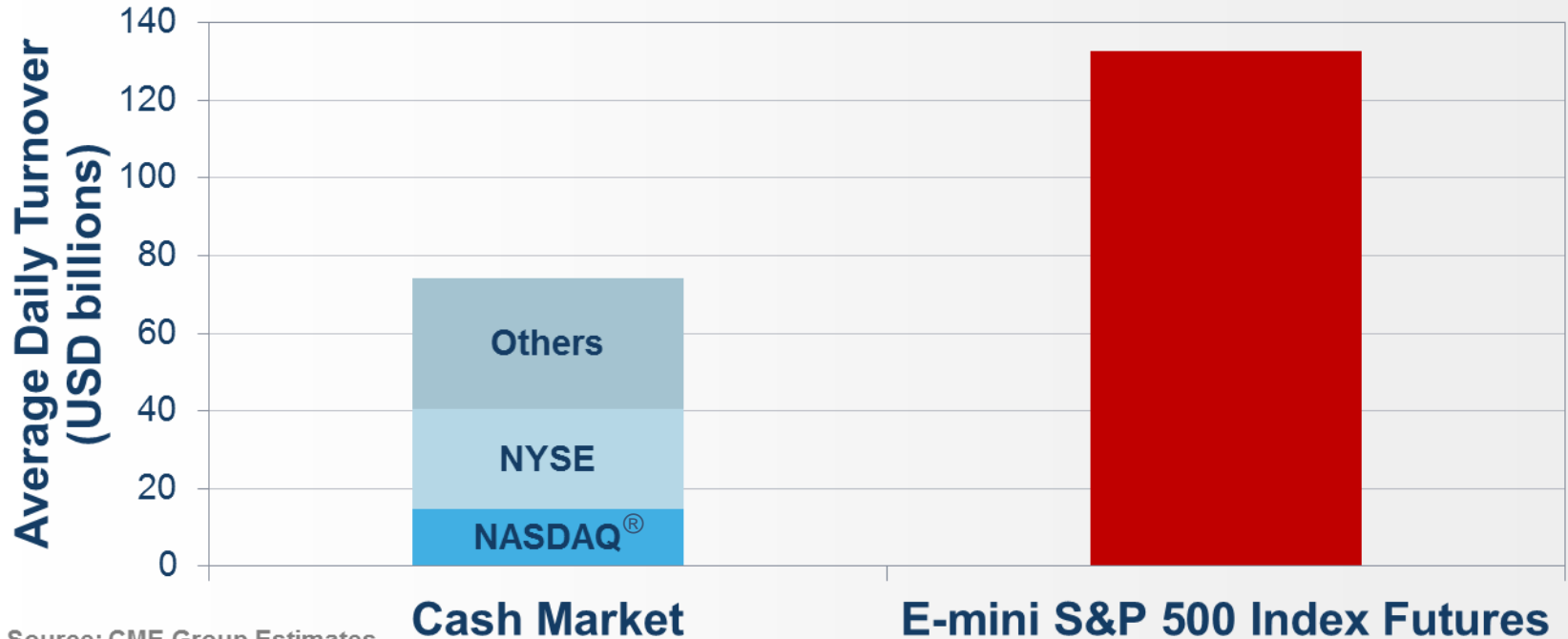
S&P MidCap 400[™]

E-mini Dow (\$5)

Size of U.S. Index Futures Market



Size of U.S. Index Futures Market



Source: CME Group Estimates

In terms of notional trading volume activity, index futures dwarf the cash market in the U.S.

Multiple uses and users....

Users

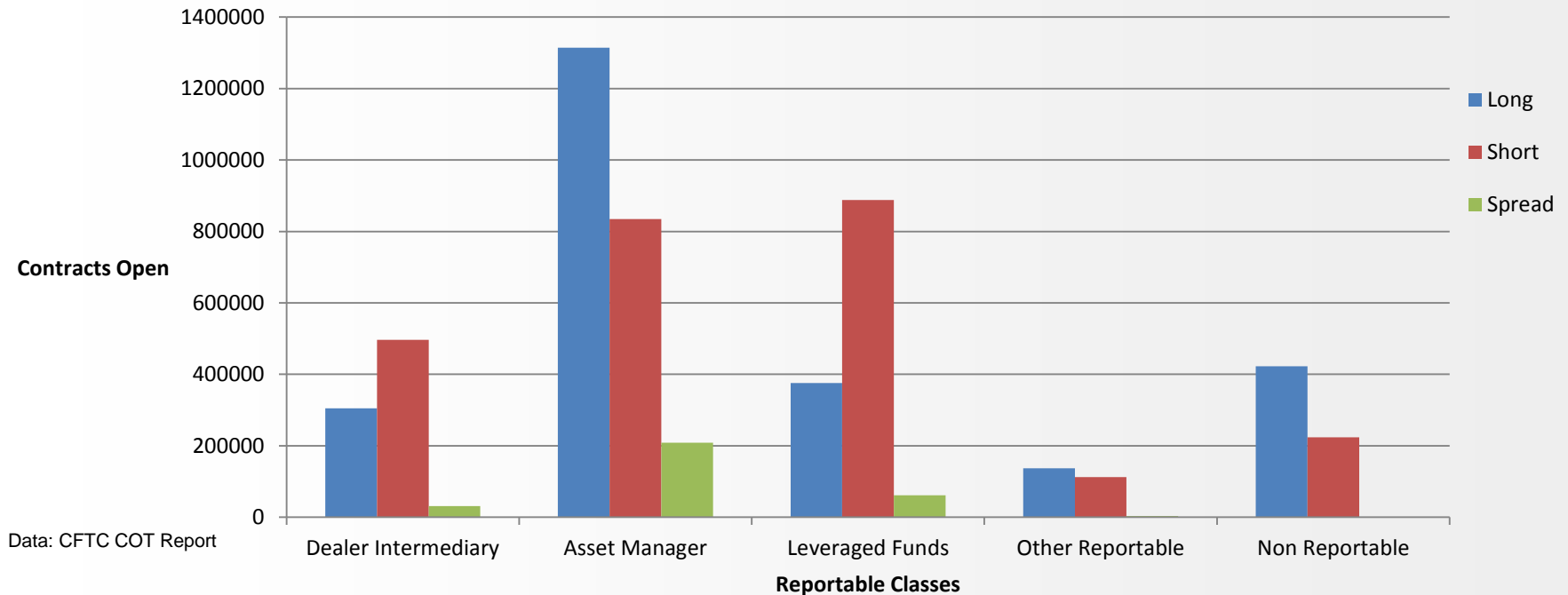
- **Asset managers - mutual funds, investment advisors, hedge funds, ETF sponsors, commodity trading advisors (CTAs)**
- **Arbitrageurs and market makers**
- **Insurance companies, pension funds**
- **Proprietary traders**
- **Private investors**

Uses

- **Arbitrage or program trading**
- **Cash equitization**
- **Beta adjustment**
- **Long/short strategies**
- **Sector rotation strategy**
- **Conditional rebalancing**
- **Portable alpha strategies**
- **Outright price speculation**

Multiple uses and users....

E-mini S&P 500 Stock Index



CFTC COT Report:

Breaks Open Interest data in reporting categories:

1. Dealer / Intermediary
2. Asset Manager / Institutional
3. Leveraged Funds
4. Other Reportable

Indexing

- When people talk about “the market” they are generally referring to a stock index.
- A equity, or stock, index is a statistical measure of change in a select group of listed stocks. Designed to represent a particular market or portion of it.
- Each index has its own calculation methodology.
- Usually expressed in terms of a change from a base level. Percentage change is therefore usually more important than numeric value.



Indexing

Dow Jones Industrial Average[®] (DJIA) or commonly referred to simply “The Dow”

- First calculated in 1896
- Represents large and well-known U.S. companies.
- It is a price weighted index comprised of 30 stocks.

Top 10 Holdings	
VISA Inc.	IBM
Goldman Sachs	3M
Boeing	United Technologies
Chevron	McDonalds
Caterpillar	Exxon Mobile

Indexing

S&P 500®

- Contains 500 of the most widely traded stocks in the U.S.
- It is a capitalization weighted index, every stock represented in proportion to its market capitalization, or price times shares outstanding

Top 10 Holdings	
Apple	Google
Microsoft	GE
Wells Fargo	Johnson & Johnson
Chevron	JP Morgan
P&G	Exxon Mobile

Indexing

NASDAQ-100[®]

- Contains 100 of the largest domestic & international non-financial companies listed on The Nasdaq Stock Market
- It is a modified capitalization weighted index

Top 10 Holdings	
Apple	Google
Microsoft	Amazon
Intel	Qualcomm
Cisco	Gilead Sciences
Comcast	Facebook

Indexing

S&P MidCap 400[®]

- S&P MidCap 400 Index measures the performance of mid-sized companies with market capitalizations of \$1.2 billion to \$5.1 billion
- It is a modified capitalization weighted index

Top 10 Holdings	
Affiliated Managers	Tractor Supply
LKQ Corp	Green Mtn. Coffee Roasters
Schien Henry Inc.	Holly Frontier Corp
Polaris Ind.	Church & Dwight
Cimarex Energy	Trimble Navigation

Mechanics

E-mini S&P 500 Pricing (8 January 2014)

Month	Open	High	Low	Settlement	Change	Globex Volume	Open Interest
MAR 14	1830.75	1834.75	1825.50	1832.50	+1.75	1,330,414	2,775,966
JUN 14	1823.75	1828.25	1818.75	1826.00	+2.00	2,882	12,110
SEP 14	1818.25	1821.75B	1813.25A	1820.00	+2.00	5	2,154
DEC 14	-	1812.25B	1808.50A	1813.00	+2.00	-	132
MAR 15	1803.25	1805.75B	1803.25	1807.50	+2.00	1	1
TOTAL						1,333,302	2,790,363

Futures Contract Value = Contract Multiplier x Quoted Value

$$\mathbf{\$91,625 = \$50 \times 1832.50}$$

*Note: The dollar value of one contract is the contracts Notional Value (NV).
NV changes with index price moves.*

Mechanics

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1. Volume & Open Interest (OI) tend to stay in front quarterly contract month.
2. Small percentage of Open Interest goes to delivery

Mechanics

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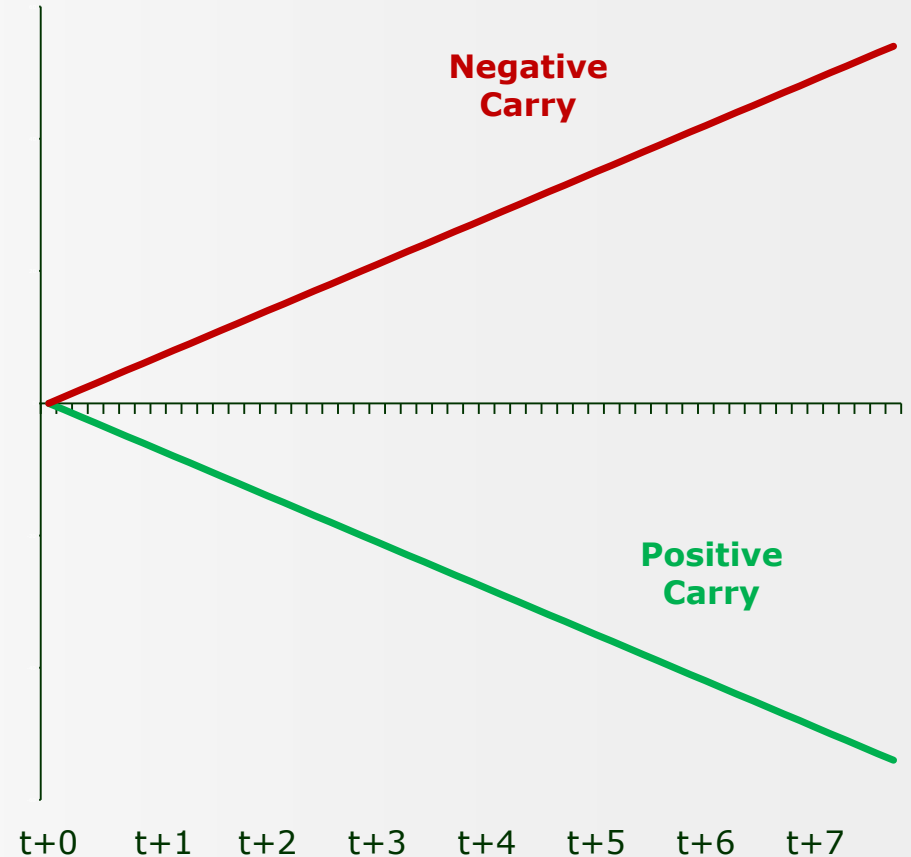
Futures at lower levels in deferred months reflecting positive carry as dividend earnings are greater than financing costs.

Mechanics

Cost of Carry

- If dividend stream $<$ finance costs
→ negative carry
 - Futures at higher levels in deferred months ... reflecting costs incurred carrying stock portfolio
- If dividend stream $>$ finance costs
→ positive carry
 - Futures at lower levels in deferred months ... reflecting dividend earnings carrying stock portfolio

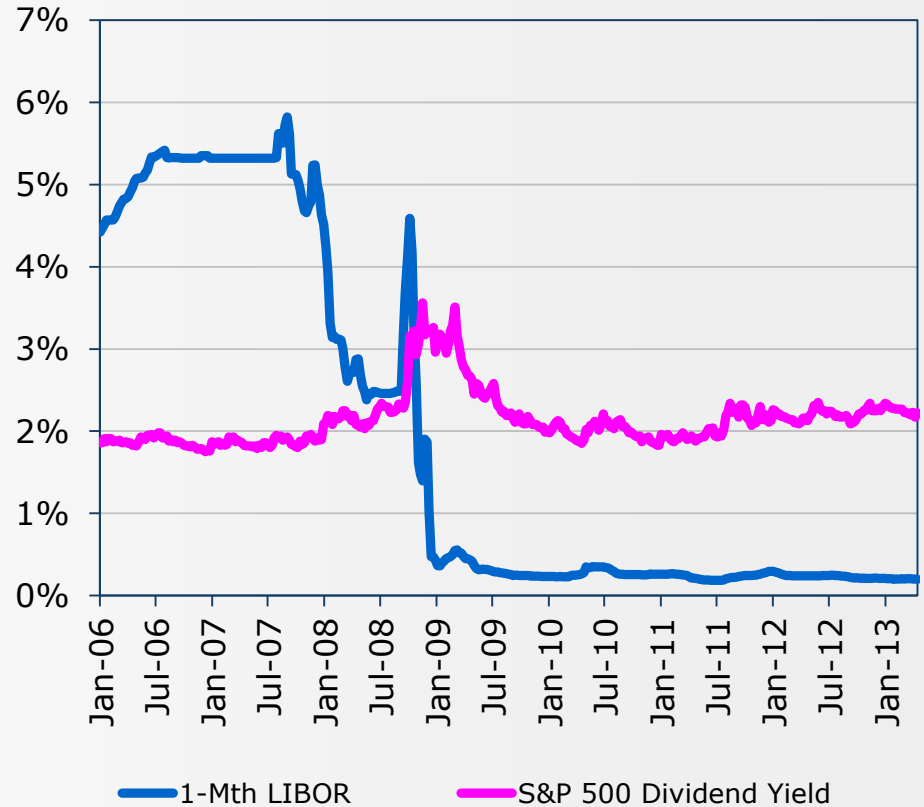
Positive and Negative Carry



Mechanics

- The relationship between short-term interest rates and dividends dictate whether positive or negative carry prevails.

Short-Term Rates & Dividend Yields



Mechanics

E-mini Index Futures Contract Specification

	E-mini S&P 500	E-mini DJIA (\$5)	E-mini NASDAQ	E-mini S&P MidCap
Index Multiplier	US\$50	US\$5	US\$20	US\$100
Quotation and Contract Value (MAR-14 on 4 Mar 2014)	1871.50 (\$93,575)	16381.0 (\$81,905)	3716.75 (\$74,335)	1388.90 (\$138,890)
Tick Size (Outright/Cal Spreads)	0.25 / 0.05 (\$12.50/\$2.50)	1.00 / 1.00 (\$5.00/\$5.00)	0.25/0.05 (\$5.00/\$1.00)	0.10 / 0.05 (\$10.00/\$5.00)
Listing Cycle and Expiration	March, June, September, December cycle, with expiration every 3 months. Expiration date is the third (3rd) Friday of contract month			
Trading Hours	Sundays – Thursdays: 5:00pm – 3:15pm CT and 3:30pm – 4:15pm CT. New trading day begins at 5:00pm CT each weekday afternoon. Weekly trading in equity index futures and options ends at 4:15pm CT on Friday afternoon.			
Final Settlement	Final settlement in cash to the Special Opening Quotation (SOQ) on expiration day.			
Max Daily Fluctuation	U.S. daytime trading hours: -7%, -13%, -20% circuit breakers. U.S. overnight trading hours: +/- 5%			

Mechanics

Index Futures Contract Specification, “Bigs”

	S&P 500 [®]	DJIA [®] (\$10)	NASDAQ -100 [®]	S&P MidCap- 400 [®]
Index Multiplier	US\$250	US\$10	US\$100	US\$500
Quotation and Contract Value (MAR-14 on 4 Mar 2014)	1871.60 (\$467,900)	16381.0 (\$163,810)	3716.75 (\$371,675)	1388.90 (\$694,450)
Tick Size (Outright/Cal Spreads)	0.10 / \$25.00	1.00 / \$10.00	0.25 / \$25.00	0.05 / \$25.00
Listing Cycle and Expiration	March, June, September, December cycle, with expiration every 3 months. Expiration date is the third (3rd) Friday of contract month			
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Final Settlement	Final settlement in cash to the Special Opening Quotation (SOQ) on expiration day.			

Mechanics

Daily and Final Settlement Price Calculation

- Daily settlement price calculation:
 - S&P 500[®] and NASDAQ-100[®] Indices
 - VWAP (volume-weighted average price) of both pit traded (“Bigs”), and electronic traded (E-minis) at 3:14:30pm CT to 3:15pm CT.
 - A multiplier of 5 is applied to the “Bigs” to account for their larger size
 - Dow and MidCap 400[™] settle to the E-mini price.
- Final settlement price calculation:
 - For US based indices, by SOQ, Special Opening Quotation, last trading day, e.g. 3rd Friday of quarterly contract month.
 - Note, the “Bigs” stop trading at 3:15pm CT Thursday prior, E-minis stop at 8:30am CT Friday LTD. S&P makes this calculation.

Capital Asset Pricing Model (CAPM)

Total Risk = Systematic Risks + Unsystematic Risks

- Systematic risk refers to 'market risks' reflected in economic conditions affecting all stocks
- Unsystematic or 'firm-specific risks' are factors that uniquely impact upon specific stock
- Beta analysis ... statistical regression to define relationship between individual stock, or fund, and expected market returns



Capital Asset Pricing Model (CAPM)

- Beta (β) identifies expected relative return between a stock, a stock fund and overall market return.

If $\beta > 1.0 \rightarrow$ **Aggressive** stock fund

If $\beta < 1.0 \rightarrow$ **Conservative** stock fund

Alpha...

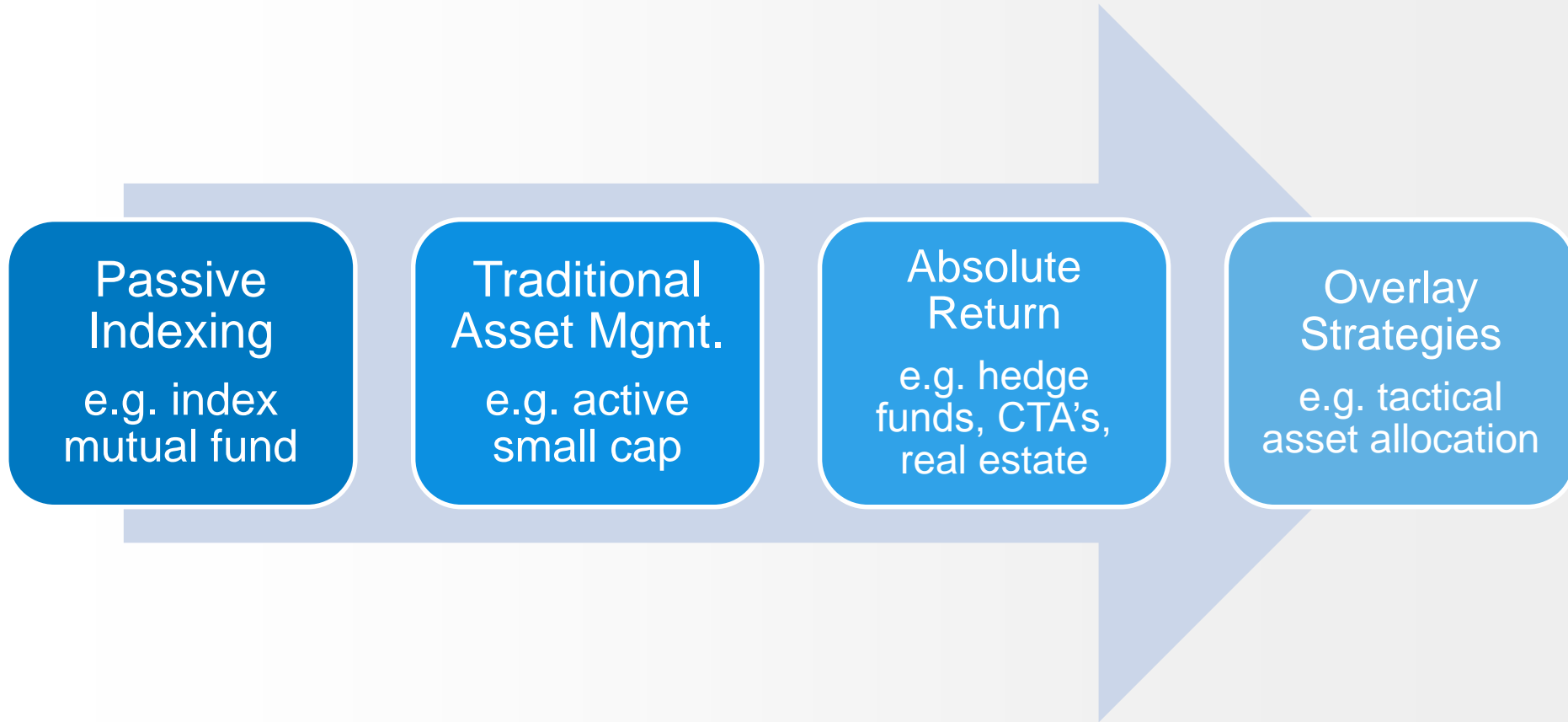
**Alpha measures
the excess return
of a fund relative
to its benchmark.**

Practical Applications

- Many index funds try to replicate performance of benchmark index
- Thus, some asset managers passively buy and hold futures as proxy for portfolio investment ... a “passive” investment strategy
- Added benefit ... futures margin structuring frees up cash for redemptions and/or portable alpha strategies



Portable Alpha Strategies



Comparing Various Equity Indices by Correlation

Index Correlations | YTD Jan 2014

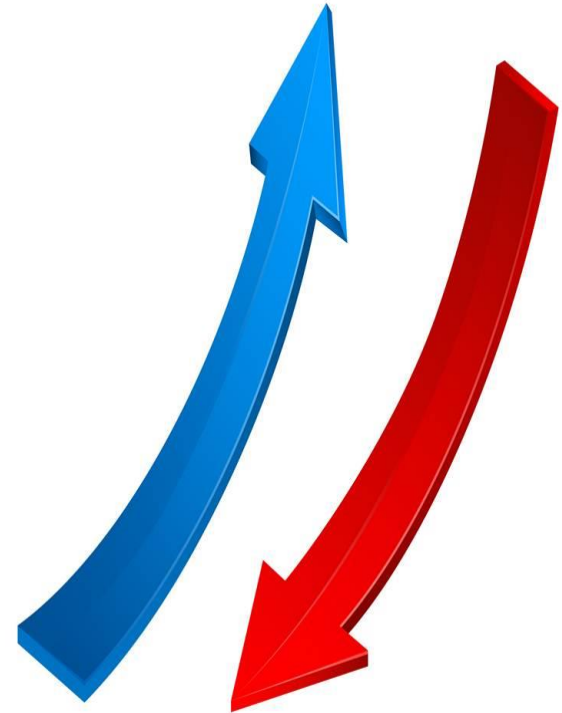
	S&P 500 [®]	S&P MidCap 400 [™]	S&P SmallCap 600	DJIA [®]	ND100 [®]	R2000	DJ U.S. Real Estate	Nikkei 225 [™]	Brazil Ibovespa	CSI 300	CNX Nifty	MEXBOL
S&P 500	100.00%											
S&P MidCap 400	97.75%	100.00%										
S&P SmallCap 600	95.45%	97.87%	100.00%									
DJIA	93.32%	89.96%	87.66%	100.00%								
NASDAQ-100	91.26%	88.64%	88.73%	77.12%	100.00%							
Russell 2000	96.08%	98.37%	99.40%	87.64%	89.31%	100.00%						
DJ U.S. Real Estate	84.86%	87.45%	86.13%	73.29%	76.79%	86.70%	100.00%					
Nikkei 225	-9.53%	-0.01%	-1.23%	-9.90%	-11.74%	-0.81%	-5.55%	100.00%				
Brazil Ibovespa	31.91%	37.77%	34.59%	30.46%	24.64%	31.70%	39.37%	16.97%	100.00%			
CSI 300	2.29%	9.44%	16.63%	-14.98%	16.80%	13.54%	-2.87%	26.09%	23.68%	100.00%		
CNX Nifty	11.66%	18.59%	25.96%	1.32%	15.22%	24.15%	23.17%	54.25%	26.05%	26.34%	100.00%	
MEXBOL	62.61%	68.32%	63.51%	54.06%	59.92%	62.50%	60.66%	5.31%	39.36%	17.32%	13.73%	100.00%

Source: CME Group Monthly Stock Index Review

Spreads

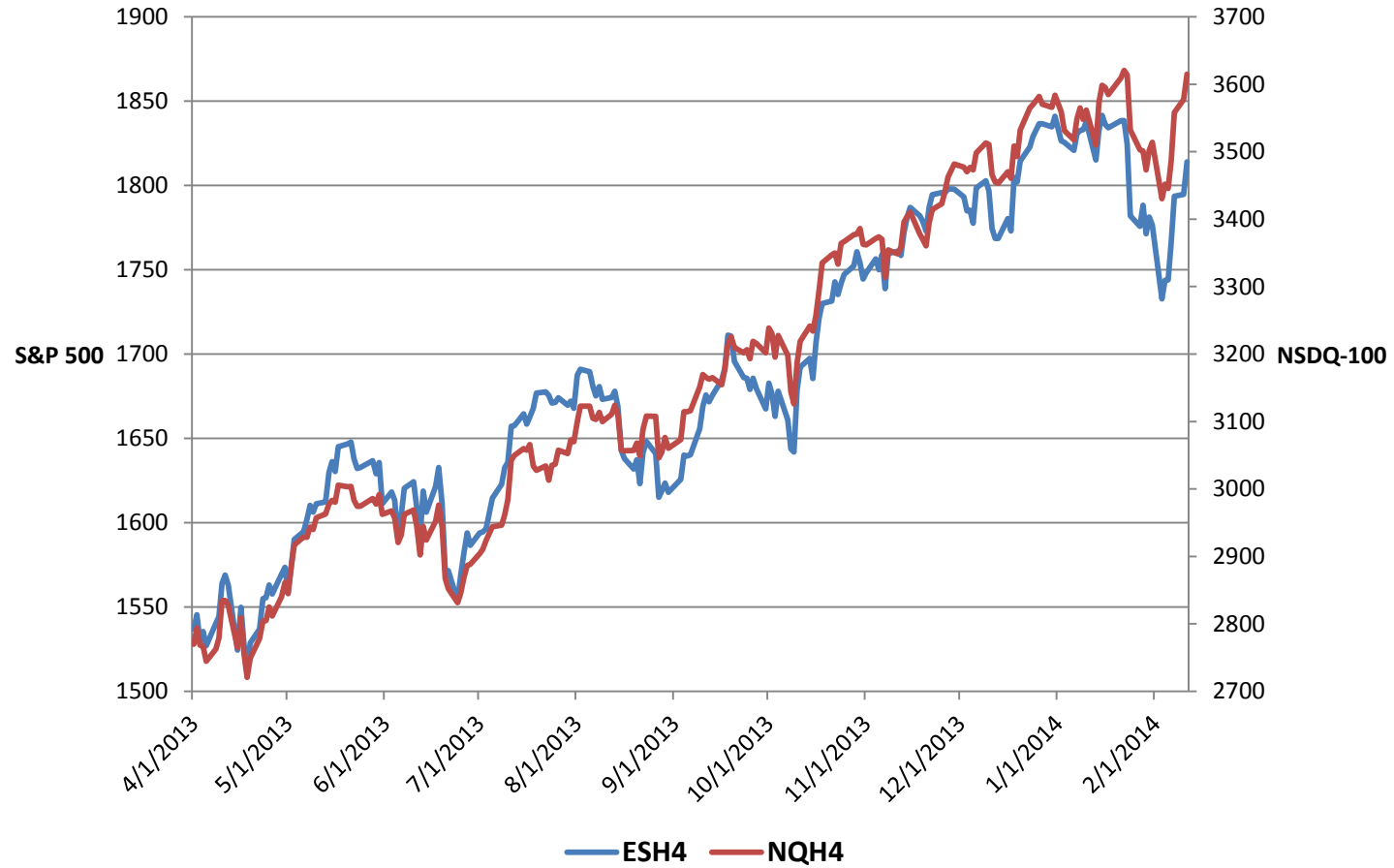
Spread trading opportunities

- The simultaneous buying and selling of two futures contracts against each other is known as a “spread” or a spread trade.
- Spreading equity index futures is a common and effective way to express the relative value between contracts.
- Spreading can be used to reduce the risk of an outright position.
- Spread positions generally reflect lower market and as such require lower margin requirements.



Spreads

E-mini S&P 500 vs. E-mini NSDQ-100



Spreads

A Look at each index or contract individually

- S&P 500[®]
 - capitalization weighted index of 500 stocks covering all market sectors

Top Ten Holdings:

1. Apple
2. Exxon
3. Google
4. MSFT
5. GE
6. JNJ
7. Wells Fargo
8. Chevron
9. P&G
10. JP Morgan

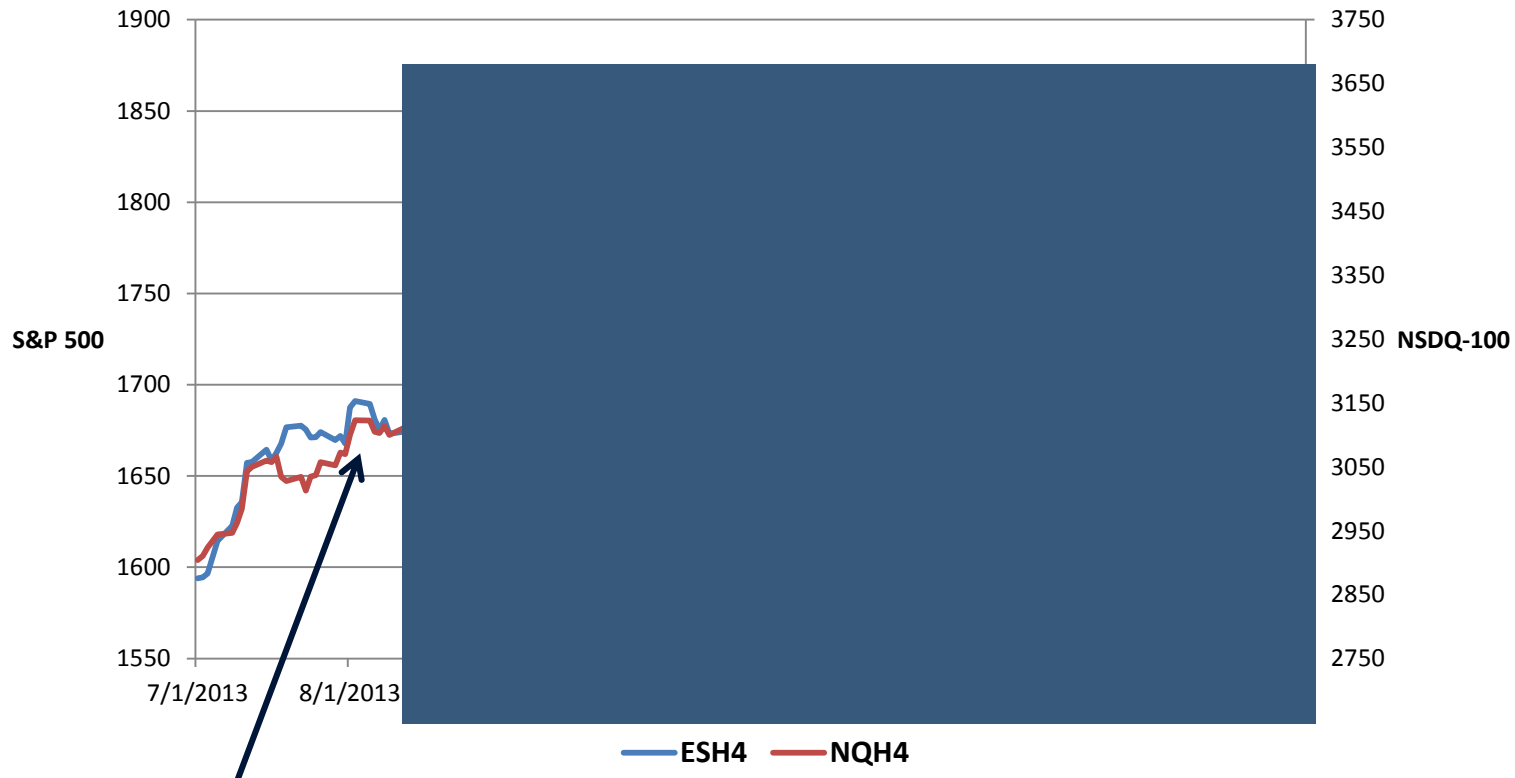
- NASDAQ-100[®]
 - modified capitalization index of 100 largest non-financial domestic and int'l stocks in NASDAQ system

Top Ten Holdings:

1. Apple
2. Google
3. MSFT
4. Amazon
5. Qualcomm
6. Gilead Sciences
7. Intel
8. Facebook
9. Cisco
10. Comcast

Spreads

E-mini S&P 500 vs E-mini NSDQ-100



After a solid run higher a trader is concerned his Long E-mini NASDAQ-100 position may be a risk for a price pull back or profit-taking retracement.

Spreads

- Rather than exit the trade he decides to use a spread as a defensive strategy. On 1 August 2013 he decides on a spread strategy.
- Because of the high correlation to NASDAQ-100[®] and excellent volume and open interest E-mini S&P 500 futures are a good fit as a spread partner.
- How should he weight his trade? Assume he is Long 11 March-14 E-mini NASDAQ-100 (NQH4) contracts.

Step 1: Determine the notional, or dollar, value of his NQH4 position.

Step 2: Determine the notional value of the March-14 E-mini S&P 500 (ESH4) contract.

Step 3: Calculate the dollar weight equivalent ratio between the two.

Step 4: Sell the appropriate number of ESH4 futures.

Spreads

Execution

Step 1: Notional Value (NV) = Index Price x Multiplier

$$\text{NQH4 NV} = 3099.75 \times \$20$$

$$= \$61,995.00$$

Step 2: Notional Value (NV) = Index Price x Multiplier

$$\text{ESH4 NV} = 1687.50 \times \$50$$

$$= \$84,375.00$$

Step 3: Spread Ratio (SR) = NQH4 (NV) ÷ ESH4 (NV)

$$\text{SR} = 61995 / 84375$$

$$\text{SR} = 0.7348$$

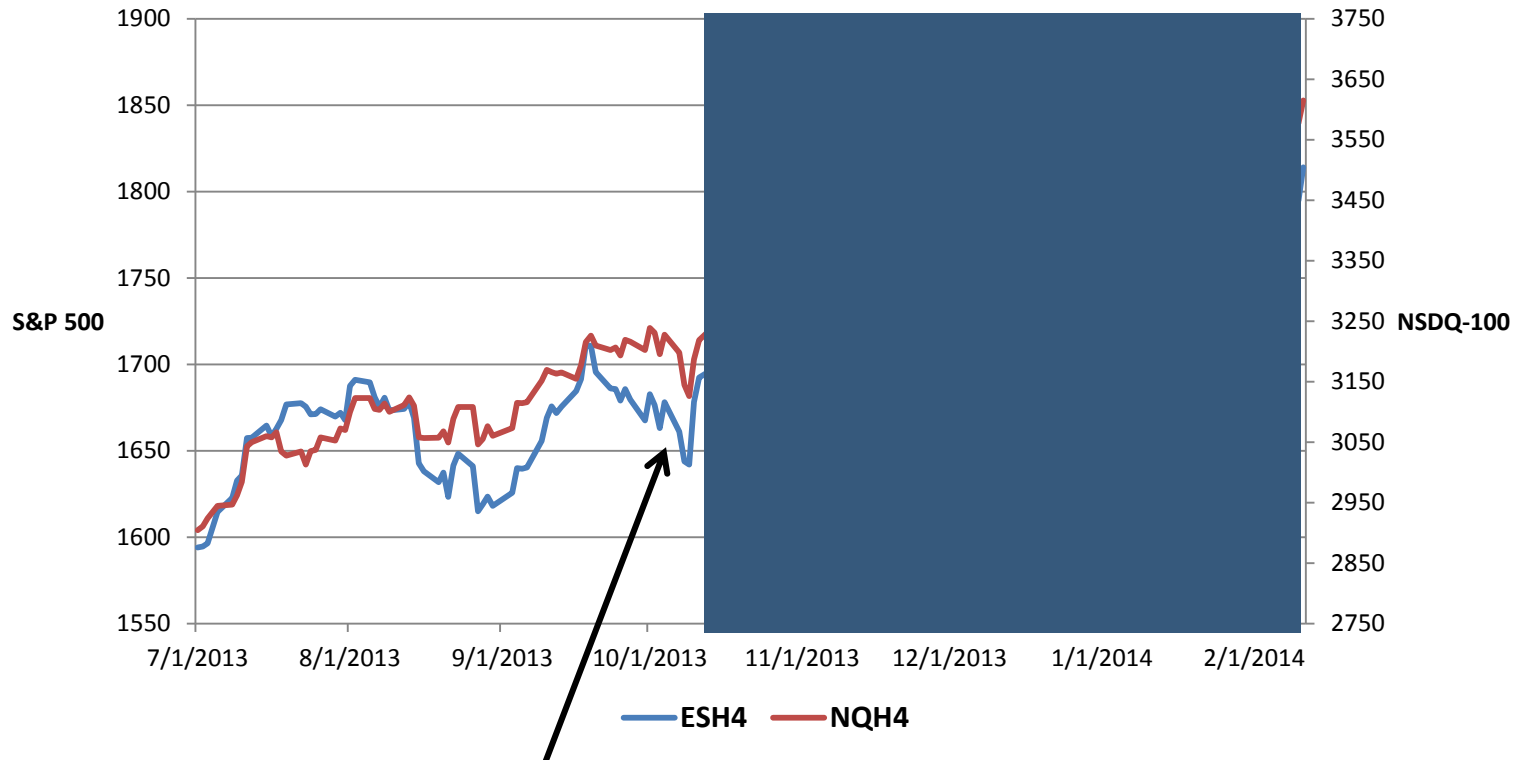
Step 4: SR x existing NQH4 position

$$0.7348 \times 11 \text{ NQH4}$$

$$= 8.08 \text{ or Sell 8 ESH4 contracts}$$

Spreads

E-mini S&P 500 vs E-mini NSDQ-100



Market chops sideways to slightly higher. Trader regains confidence in underlying Long NASDAQ-100[®], covers ESH4 leg on 8 October 2013.

Spreads

How did his “hedge” work out?

1 Aug 13: Long 11 NQH4 at 3099.75
Short 8 ESH4 at 1687.50

8 Oct 13: Long 11 NQH4 at 3144.25
Bought 8 ESH4 at 1643.75

NQH4 leg = 44.50 points x \$20 x 11 contracts
= **\$9,790** profit (*before commissions and fees*)

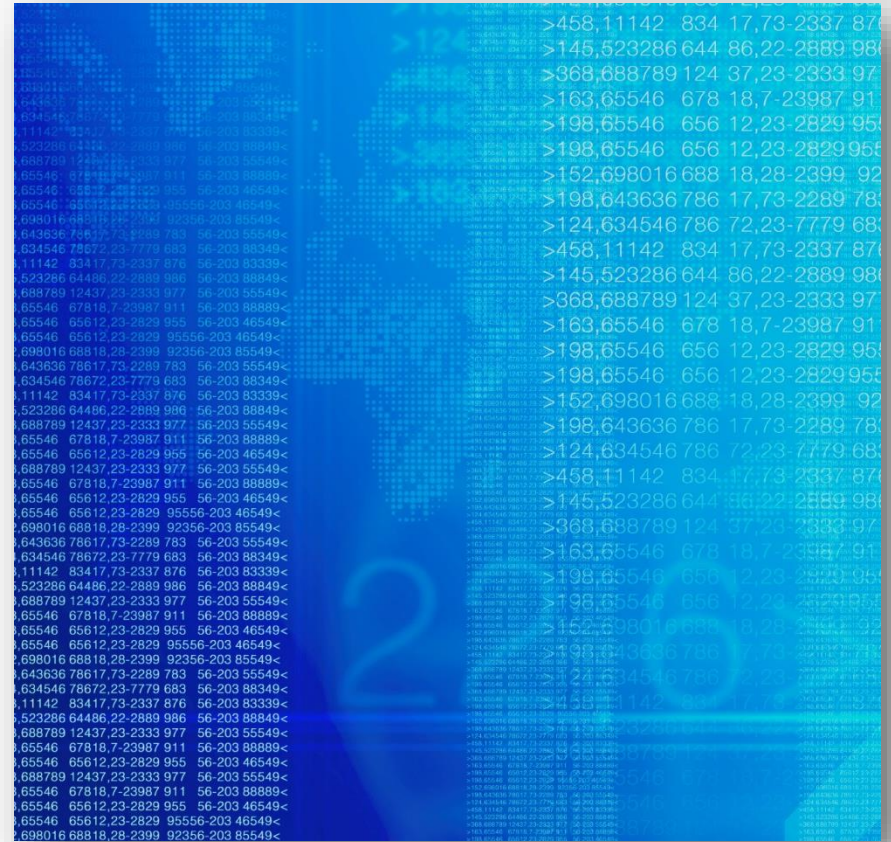
ESH4 leg = 43.75 points x \$50 x 8 contracts
= **\$17,500** profit (*before commissions and fees*)

Spread produced \$17,500 additional profit (*before commissions and fees*).

Spreads

Summary

- Equity Index spreads can be used effectively to express outright market opinions or relative value between contracts.
- Spreads generally reduce outright market directional exposure if contract indexes are closely correlated.
- Closely correlated spreads because they are lower in directional risk and volatility are subject to lower margin requirements



Options on Futures

Options on Futures

Overview

- Option exercise results in a position in the underlying cash-settled futures contract
- Option price is affected by the underlying futures
- Expirations types & Exercise style
 - Quarterly options – American style
 - Serial (Monthly) options – American style
 - End-of-month options – European style
 - Weekly options – European style

Options on Futures

Specifications

	E-mini S&P options offered by CME
Underlying	E-mini S&P 500 futures
Exercise Style	American (Quarterly Serial options) European (Weekly, EOM, options)
Exercisable Into	E-mini S&P futures
Expiration date	<p>Quarterly options: 8:30am CT, the 3rd Friday of the contract month Serial options: 3:15pm CT, the 3rd Friday of the contract month EOM options: 3:00pm CT, last business day of the month</p> <p>Weekly options: Week 1 – 3:00pm CT, 1st Friday of the contract month Week 2 – 3:00pm CT, 2nd Friday of the contract month Week 4 – 3:00pm CT, 4th Friday of the contract month</p>
Contract Size (\$)	Since the underlying is one E-mini S&P 500 futures contract, you can calculate it as follows: If the S&P 500 [®] index level is 1300, the <u>notional value</u> of one E-mini S&P futures contract is \$65K or (\$50x1300).

Options on Futures

Short-term Options Nuances for Weekly & End-of-month (EOM) options on E-mini S&P 500 Futures

- Expiration day
 - **EOM options** expires on the last business day of each month
 - **Weekly options** expires on the 1st, 2nd and 4th Friday of the month (the 3rd Fridays are regular expiration days for quarterly and serial options)
- European Style
 - No “contrarian instructions”
 - On their expiration day, EOM and weekly options will be automatically exercised if they are ITM or abandoned if OTM.
- Settlement
 - Special Fixing Price based on the VWAP of underlying ES futures in the last 30 seconds of trading up to the 3pm (CT) close on expiration day.

Options on Futures

Quarterly and Serial Options

- Quarterly Options
 - Expire Time: 8:30am CT
 - Settlement Price: Special Opening Quotation (SOQ)
 - Process: exercised into underlying ES futures which expires at the same time and would be cash settled to the SOQ, thus the option settlement is equivalent to cash settlement
- Serial Options
 - Expire Time: 3:15pm CT
 - Settlement Price: Closing price of the underlying ES futures
 - Process: exercised into the next quarterly ES futures (i.e. August serial option => results in position in September ES futures). Note: ES futures only offers quarterly expirations.

Options on Futures

- Dense expiration schedule (17 concurrent expirations)
 - 4 Quarterly expirations on 3rd Friday, March-cycle months
 - 3 Monthly (“Serial”) expirations on 3rd Friday, every month outside March quarterly cycle
 - 6 Monthly (“End-of-Month”) expirations on last business day, every month
 - 4 Weekly expirations on 1st, 2nd and 4th Fridays, every month
- Dense strike listings
 - Within 200 index points on current futures prices in increments of 5 index points, e.g. 1200, 1205, 1210, 1215, etc.
- Liquidity & Transparent valuation
 - Active market maker quoting on CME Globex
 - With a structured and highly liquid market, E-mini S&P 500 options are very conducive to combination or strategy trades, e.g. option spreads and, more complicated structures like Accumulators / Decumulators

Options on Futures

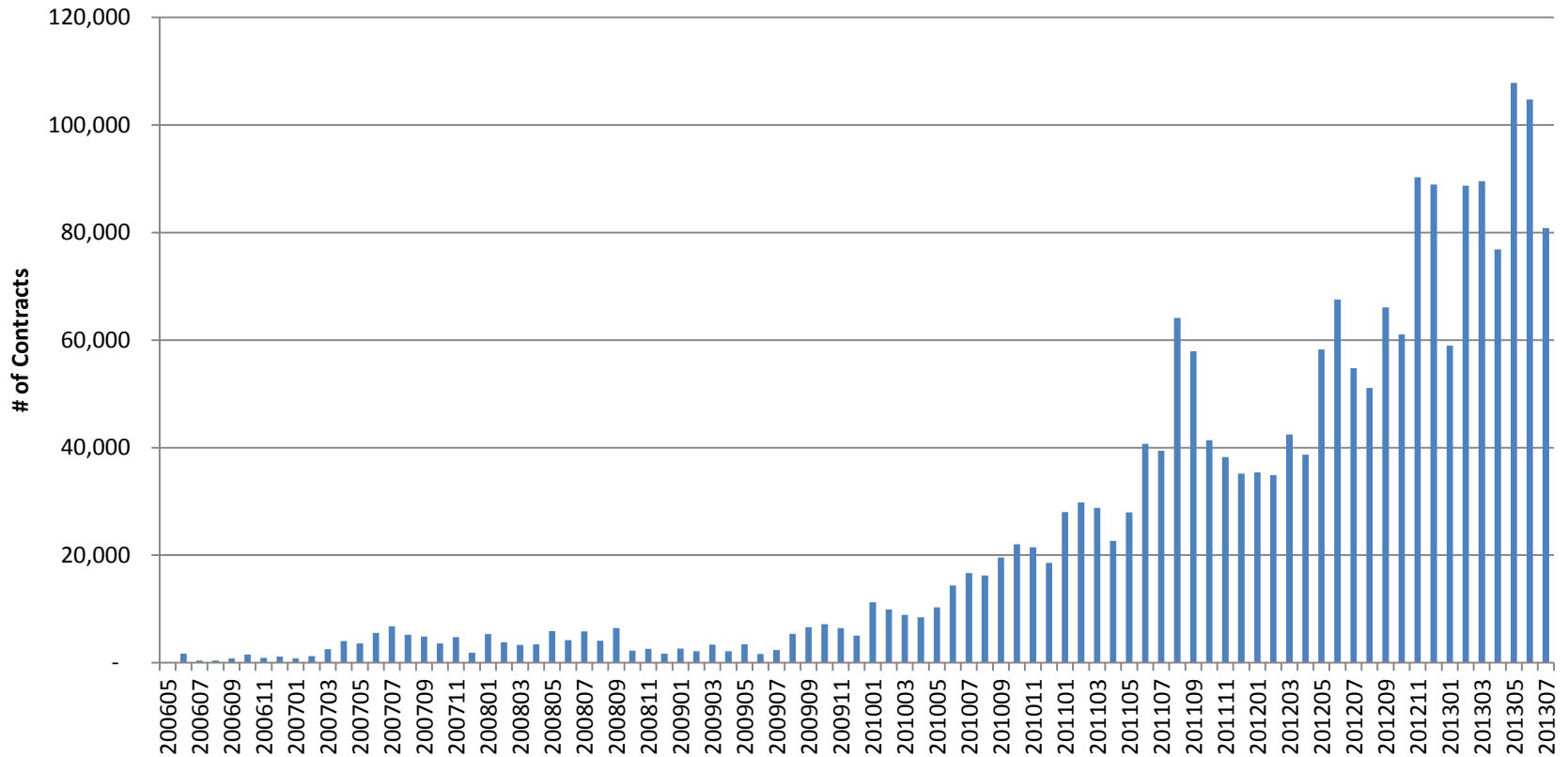
Why are Short-term Options popular?

- Shorter term → more flexibility to traders, executing trading strategies at any time
- No “contrarian instructions” → more certainty to traders
- Minimize time value → lower premium for same level of volatility
- Month-end options → align with month-end accounting cycles



Options on Futures

Weekly and End-of-month options on E-mini S&P 500 Futures



Quik Strike

PRODUCTS: US RATES ▾ MY ACCOUNT SUPPORT HELP

Welcome, Sabrina! Log O



Pricing Sheets

CHICAGO 14:52 NEW YORK 15:52 LONDON 20:52 TOKYO 04:52



EURODOLLARS ULTRA 30 YR 10 YR 5 YR 2 YR FED FUNDS

Your Membership Type: Essentials

SETTLEMENT OPEN PRICING OPTION PRICING VOL
REPORTS INTEREST SHEETS SPREADS TOOLS TOOLS

FRONTS (WHITES) 1 YEAR (REDS) 2 YEAR (GREENS) 1 YEAR MIDCURVE 2 YEAR MIDCURVE 3 YEAR MIDCURVE 4 YEAR MIDCURVE 5 YEAR MIDCURVE

EDU3 Prices (26 DTE) vs 99.730

Settles as of 8/20/2013

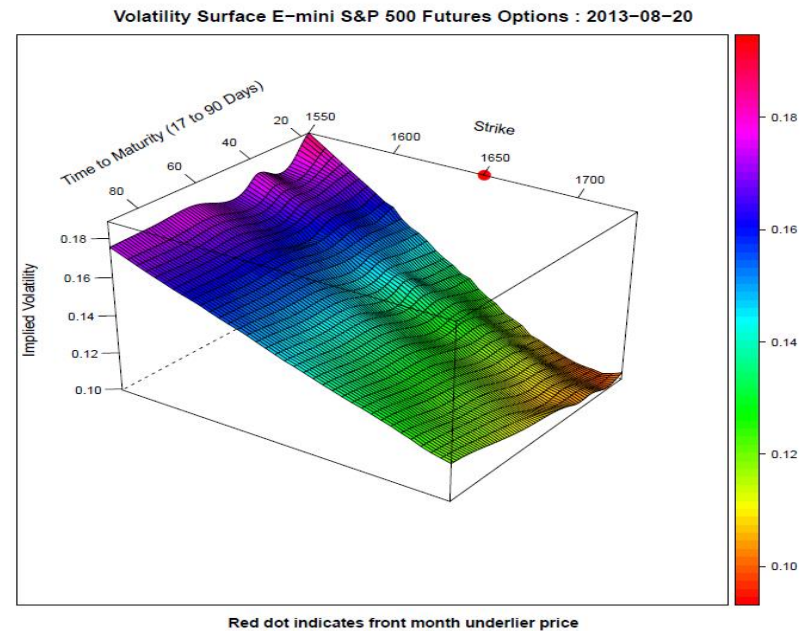
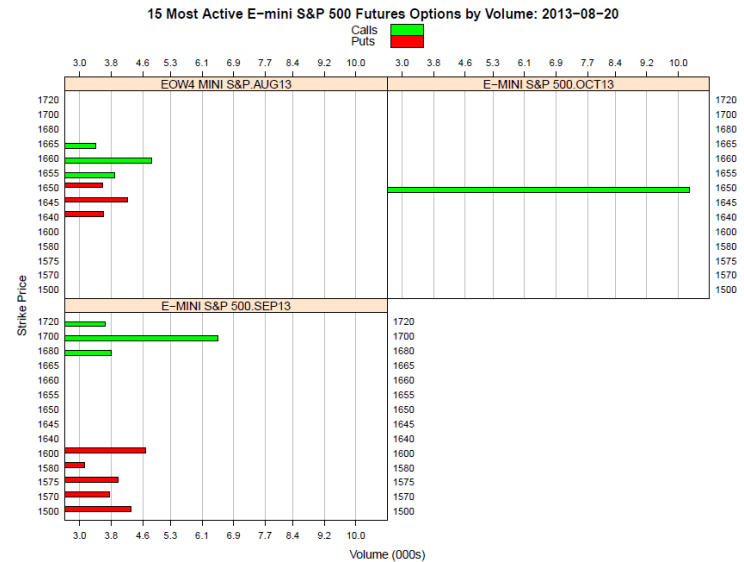
Strikes: 15 ▾

Volatility	Delta	Call Settle	Call	Strike	Put	Put Settle	Delta	Straddle	Gamma	Vega	Theta	Basis Points Per Day	Black-Scholes Volatility
290.32	99	1.8550	1.8571	97.875	0.0021	0.0025	-1	1.8593	2.93	0.0001	-0.0003	18.32	333.91
273.15	99	1.7300	1.7322	98.000	0.0022	0.0025	-1	1.7343	3.28	0.0001	-0.0003	17.24	326.51
255.85	99	1.6050	1.6072	98.125	0.0022	0.0025	-1	1.6093	3.69	0.0001	-0.0003	16.15	318.57
238.42	99	1.4800	1.4822	98.250	0.0022	0.0025	-1	1.4843	4.19	0.0001	-0.0003	15.05	310.00
220.84	99	1.3550	1.3572	98.375	0.0022	0.0025	-1	1.3593	4.82	0.0001	-0.0003	13.94	300.71
203.08	99	1.2300	1.2322	98.500	0.0022	0.0025	-1	1.2343	5.61	0.0001	-0.0003	12.82	290.55
185.14	99	1.1050	1.1072	98.625	0.0022	0.0025	-1	1.1094	6.62	0.0001	-0.0003	11.69	279.37
166.98	99	0.9800	0.9822	98.750	0.0022	0.0025	-1	0.9844	7.98	0.0001	-0.0003	10.54	266.93
148.56	98	0.8550	0.8572	98.875	0.0022	0.0025	-2	0.8594	9.84	0.0001	-0.0003	9.38	252.96
129.84	98	0.7300	0.7322	99.000	0.0022	0.0025	-2	0.7344	12.52	0.0001	-0.0003	8.20	237.02
110.75	98	0.6050	0.6072	99.125	0.0022	0.0025	-2	0.6094	16.62	0.0001	-0.0003	6.99	218.51
91.19	98	0.4800	0.4822	99.250	0.0022	0.0025	-2	0.4845	23.44	0.0002	-0.0003	5.76	196.49
70.99	97	0.3550	0.3572	99.375	0.0022	0.0025	-3	0.3595	36.40	0.0002	-0.0002	4.48	169.40
49.84	96	0.2300	0.2323	99.500	0.0023	0.0025	-4	0.2345	67.28	0.0002	-0.0002	3.15	134.32
26.95	93	0.1075	0.1073	99.625	0.0023	0.0025	-7	0.1096	191.08	0.0004	-0.0002	1.70	84.50
8.53	19	0.0025	0.0024	99.750	0.0224	0.0225	-81	0.0248	1,191.19	0.0007	-0.0001	0.54	32.85
34.57	6	0.0025	0.0023	99.875	0.1473	0.1450	-94	0.1496	125.75	0.0003	-0.0002	2.18	185.56
56.75	4	0.0025	0.0023	100.000	0.2723	0.2700	-96	0.2745	53.77	0.0002	-0.0002	3.58	338.28

Volatility Surface Report

Key Features:

- Provides the previous day's 15 most active strikes in terms of volume and open interest
- Includes a pre-defined range of strikes and maturities of both puts and calls
- Graphs the full volatility surface using a cubic interpolation spline
- Current report as well as an archive of previous 10 days of reports available
- Auto-generated every night around 2:00am CT
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Access here: <http://www.cmegroup.com/trading/equity-index/options-volatility-surface-report.html>

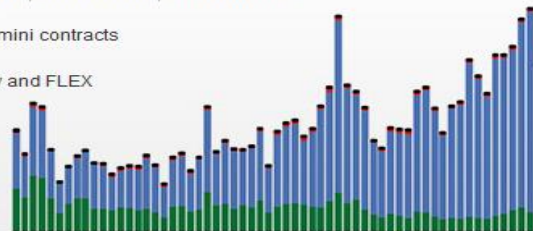
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Thank you

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