Risk Management for Equity Asset Managers

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Disclaimer

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.

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Outline

- Market Development
- Mechanics of Stock Index Futures
- Fair Value and Arbitrage
- Measuring Risk
- Beta Adjustment Strategies
- Long/Short Strategy
- Portable Alpha Strategy
- Efficient Beta

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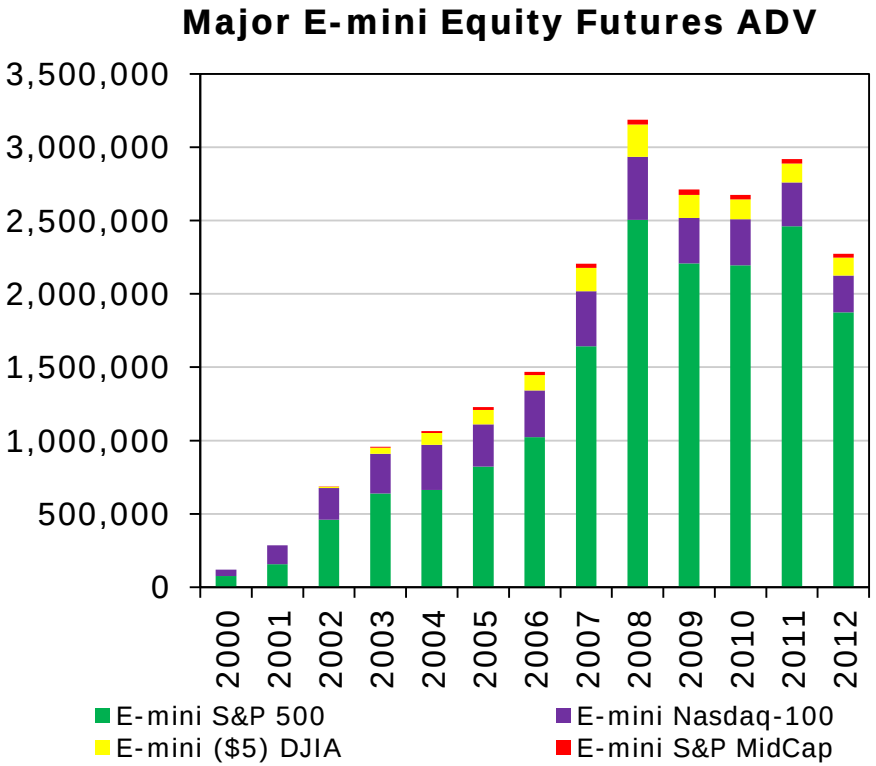
Market Development

Stock index futures ……

- **Cash settled at $X multiplied by Index value**
  - ***E.g.*, E-mini S&P 500 futures valued at $50 x Index**
  - **If S&P 500 = 1,318.80, futures valued at $65,940 ($50 x 1,318.80)**
- **Quoted in index points in increments of 1 "tick"**
  - ***E.g.*, 1 tick in E-mini S&P 500 futures = 0.25 index points or $12.50 (= $50 x 0.25)**



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Market Development

Trends contributing to growth ……

- **S&P 500 = asset class benchmark with $5-6 trillion linked assets**
  - **Low rates, poor equity returns prompt "search for alpha" over benchmark return … shift from passive to active strategies … see hedge fund growth**
- **CME Globex® fosters liquidity … low transaction costs in transparent, competitive electronic trading venue**
  - **"Open access" policy offers direct access to Globex on global basis**
  - **Handles > 1 billion orders monthly with average response < 20 milliseconds**
- **Financial sureties offered by CME Clearing House**
  - **Counterparty credit risk is significant … particularly after subprime crisis**
  - **Centralized counterparty (CCP) clearing = financial confidence & capital efficiency**

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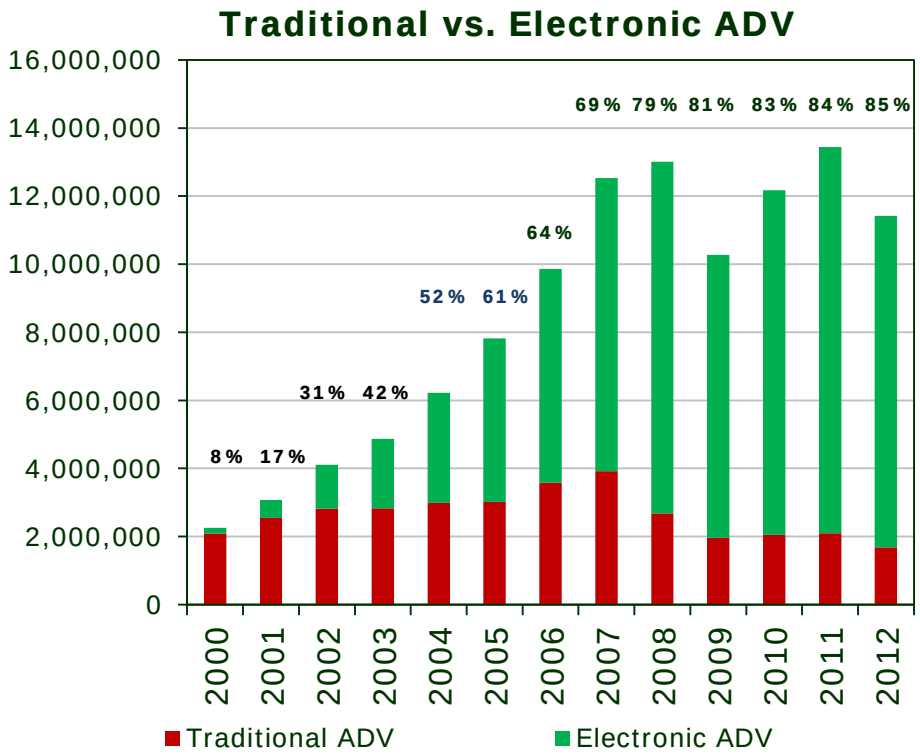
Market Development

Electronic trading

- CME Globex® originally introduced in 1992 to facilitate “after-hour” trading
- “Open access” policy introduced in 2000 allows any customer to trade directly on system
- 85% of all CME Group volume is electronic
- Growth during past decade largely attributable to electronic trading ... this enhances liquidity



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Mechanics of Stock Index Futures

Popular stock index futures …

	E-mini S&P 500	E-mini Nasdaq-100	E-mini S&P MidCap 400	E-mini DJIA ($5)
Contact Multiplier	$50 x S&P 500 Index	$20 x Nasdaq-100 Index	$100 x S&P MidCap 400	$5 x Dow Jones Industrial Avg
Minimum Price Fluctuation (Tick)	0.25 index points ($12.50)	0.50 index points ($10.00)	0.10 index points ($10.00)	1.00 index points ($5.00)
Price Limits	Limits at 7%, 13%, 20% moves			
Contract Months	1st 5 months in March quarterly cycle			1st 4 months in March quarterly cycle
Trading Hours	Mon–Thu: 5:00 PM (previous day) to 4:15 PM with trading halt between 3:15 PM and 3:30 PM			
Trading Ends at	8:30 am on 3rd Friday of month			
Cash Settlement	vs. Special Opening Quotation (SOQ)			
Position Limits or Accountability	100,000 E-mini S&P contracts	50,000 E-mini S&P contracts	25,000 E-mini MidCap contracts	100,000 E-mini DJIA contracts
Ticker	“ES”	“NQ”	“ER”	“YM”

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Mechanics of Stock Index Futures

E-mini S&P 500 pricing (4/23/13) …

Month	Open	High	Low	Settle-ment	Change	Volume	Open Interest
Jun-13	1,557.25	1,527.00	1,548.75	1,573.60	+17.70	2,108,113	2,984,052
Sep-13	1,550.25	1,570.50	1,543.00	1,567.60	+17.80	14452	41661
Dec-13	1,549.25	1,563.50	1,536.50	1,561.10	+17.80	60	2438
Mar-14	1,532.50	1,555.00B	1,530.25	1,554.90	+17.80	10	27
Jun-14		1,544.25B	1,529.25	1,547.90	+17.80		1
						2,122,635	3,028,179

Value of futures contract …

Futures Contract Value = Contract Multiplier x Quoted Value

= $50 x 1,573.60

= $78,680

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Mechanics of Stock Index Futures

Cash settlement mechanism …

- **Futures 'Marked-To-Market' (MTM) like any other day, *i.e.*, pay losses and collects profits daily and in cash**
  - **Subsequent to final settlement day, positions simply expire and are settled at spot value of underlying index or instrument**
- **The Final Settlement Price is marked to a 'Special Opening Quotation' (SOQ) on the 3rd Friday of the contract month**
  - **SOQ is intended to facilitate arbitrage activity by allowing arbitrageurs to enter market on open (MOO) orders to liquidate cash positions at same price that will be reflected in the Final Settlement Price**
  - **A morning settlement was established in late 1980s to avoid so-called "triple witching hour"**

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Fair Value and Arbitrage

Fair value (FV) of futures contract …

Futures Price = Spot Index Value + Finance Charges - Dividends

This difference reflects the expected premium or discount at which futures are expected to trade relative to the spot index value … often referred to as "Fair Value"

- **'Basis' (=futures price – spot price) normally expected > 0**
  - **Normally, we expect short-term rates > dividend yields ➔ "negative carry" as finance costs exceed dividend payouts**
  - **Sometimes rates < dividend yields and basis goes negative ➔ "positive carry" as finance costs exceed dividend payouts**

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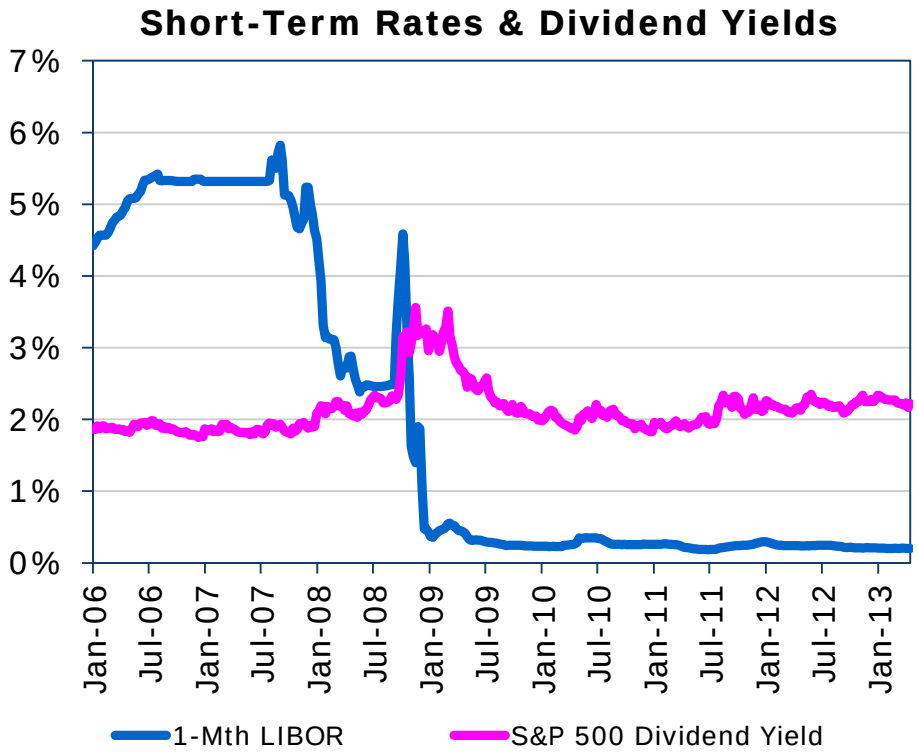
Fair Value and Arbitrage

Basis driven by carry …

- **Relationship between short-term interest rates and dividends dictate whether positive or negative carry prevails**



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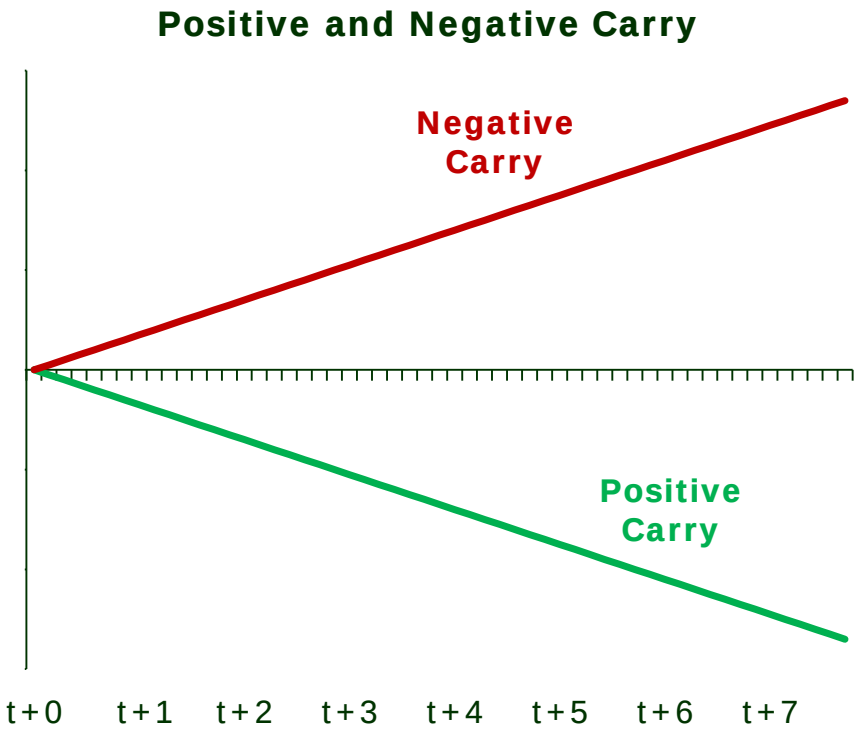
Fair Value and Arbitrage

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



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Applications

Multiple uses and users …

	Retail Traders	Proprietary Traders	Arbitrageurs	Asset Managers
Outright Price Speculation	✓	✓		✓
Arbitrage aka Program Trading			✓	✓
Cash Equitization				✓
Beta Adjustment				✓
Option Strategies	✓	✓	✓	✓
Long/Short Strategies				✓
Sector Rotation	✓	✓		✓
Conditional Rebalancing				✓
Portable Alpha				✓

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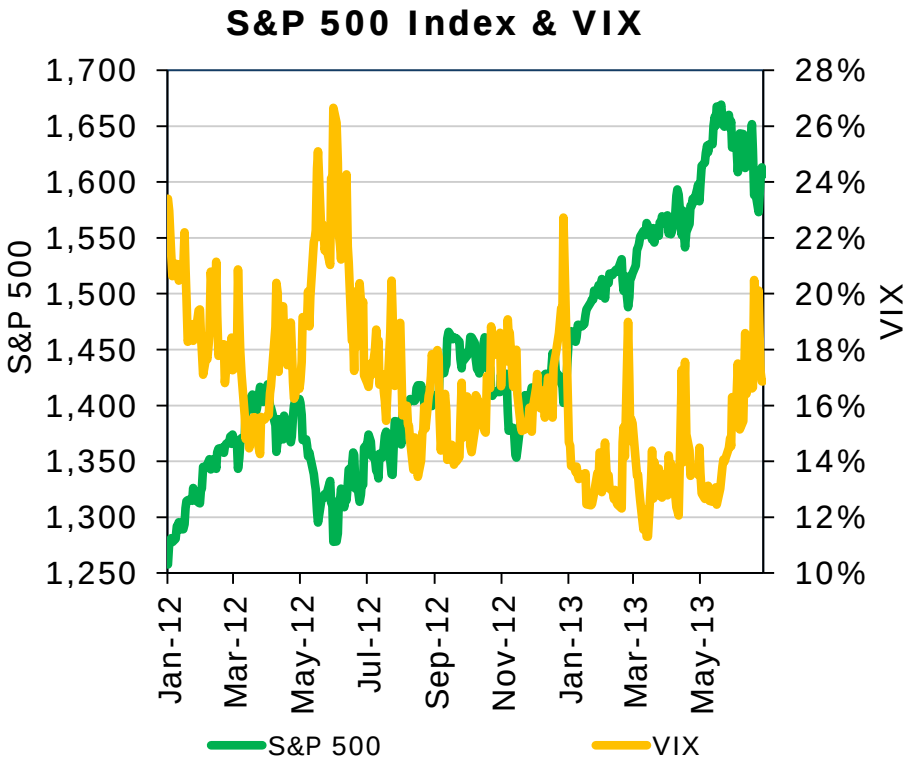
Measuring Risk

Seeking "alpha" (α) …

- **Domestic equities have been volatile but have not produced sizable returns over past decade**
- **Equity managers faced with challenge of generating attractive returns while managing risk**
- **Stock index futures and options provide effective tool in "search for alpha"**



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Measuring Risk

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 and market returns**

$$R_{stock} = \alpha + \beta\,(R_{market}) + \varepsilon$$

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Measuring Risk

Beta (β) analysis …

- **Beta (β) identifies expected *relative* movement between an individual stock and market**

If β > 1.0 ➔ Aggressive stock

If β < 1.0 ➔ Conservative stock

- **R^2 identifies the degree to which movements in the stock are explained by market movements … varies between 0 and 1.0**

If R^2 = 1.0 ➔ Perfect correlation

If R^2 = 0 ➔ Zero correlation

  - **"Average" stock R^2~0.30 which implies that perhaps 30% of movements explained by systematic factors … remaining 70% of unsystematic risks unhedgeable with macro index futures**

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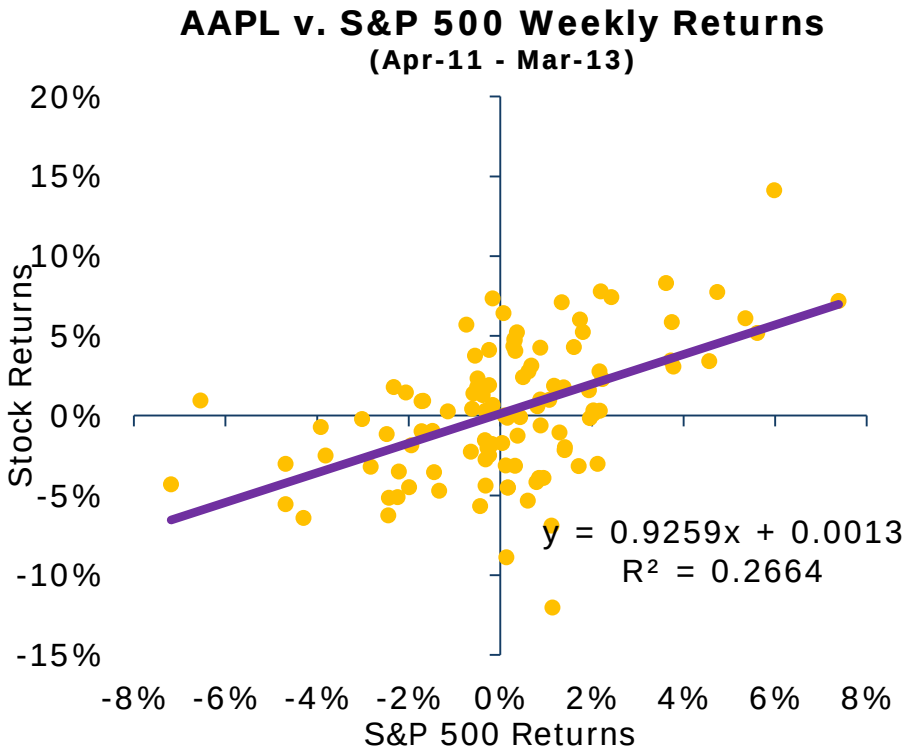
Measuring Risk

Measuring beta (β) …

- **Apple (AAPL) had raw β=0.9259 … conservative stock**
- **R^2 = 0.2664 implying that only 27% of its movement attributed to systematic market risks**



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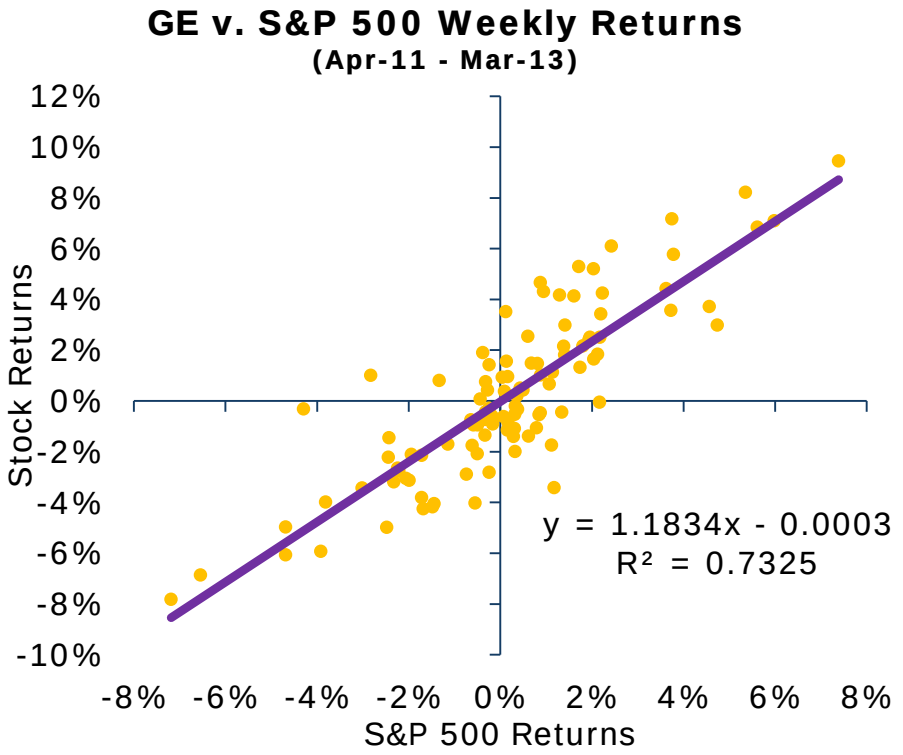
Measuring Risk

Measuring beta (β) …

- General Electric (GE) had raw β=1.1834 … aggressive stock
- R^2 = 0.7325 implying that only 73% of its movement attributed to systematic market risks
- FASB 133 allows hedge accounting, *i.e.*, simultaneous recognition of returns in hedged item with hedging vehicle, if $R^2 \geq 0.80$



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Measuring Risk

Hypothetical portfolio …

- **Constructed from 38 top stocks in S&P 500**
- **Portfolio valued at $100,010,954 with value-weighted adjusted β = 0.988**

Hypothetical Stock Portfolio (3/29/13)

	Ticker	Shares	Price	Value	Adj β
1	XOM	$90.11	50,000	$4,505,500.00	0.993
2	AAPL	$442.66	18,000	$7,967,880.00	0.950
3	GE	$23.12	175,000	$4,046,000.00	1.123
4	CVX	$118.82	40,000	$4,752,800.00	1.085
5	IBM	$213.30	12,000	$2,559,600.00	0.926
6	MSFT	$28.61	100,000	$2,860,500.00	0.912
7	JPM	$47.46	75,000	$3,559,500.00	1.299
8	PG	$77.06	56,000	$4,315,360.00	0.638
9	JNJ	$81.53	60,000	$4,891,800.00	0.656
10	T	$36.69	50,000	$1,834,500.00	0.750
11	WFC	$36.99	75,000	$2,774,250.00	1.168
12	PFE	$28.86	98,000	$2,828,280.00	0.794
13	KO	$40.44	46,000	$1,860,240.00	0.702
14	BRK/B	$104.20	34,000	$3,542,800.00	0.875
15	BAC	$12.18	100,000	$1,218,000.00	1.555
16	C	$44.24	100,000	$4,424,000.00	1.765
			…		
34	UPS	$85.90	19,000	$1,632,100.00	0.888
35	CMCSA	$41.98	54,000	$2,266,920.00	1.072
36	MMM	$106.31	14,000	$1,488,340.00	0.984
37	CAT	$86.97	12,000	$1,043,640.00	1.321
38	HD	$69.78	32,000	$2,232,960.00	0.959
	Portfolio			**$100,010,954**	**0.988**

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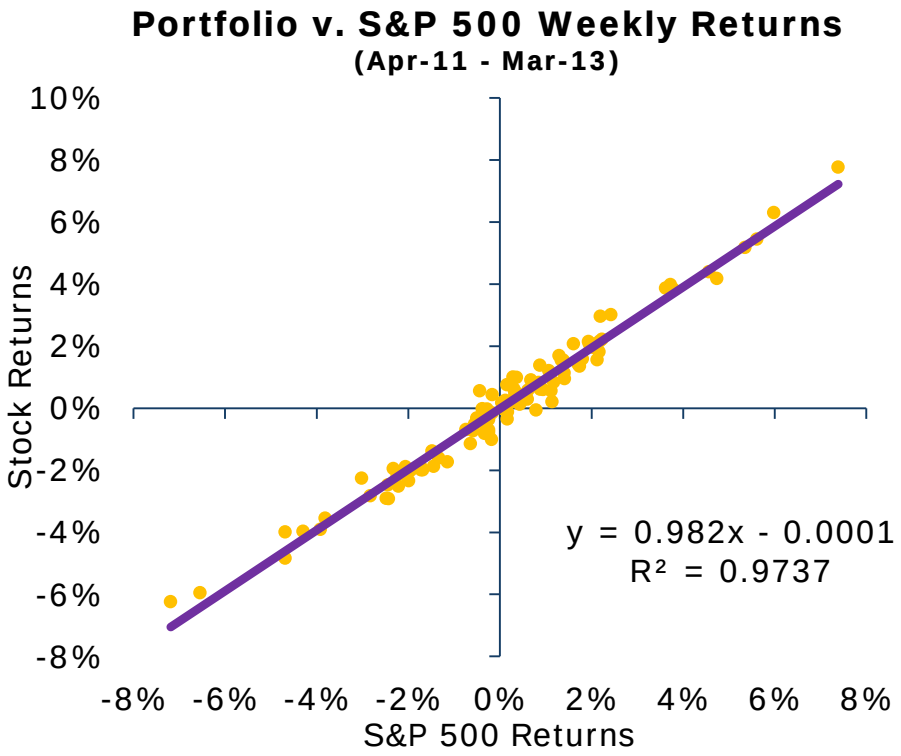
Measuring Risk

Measuring beta (β) …

- **Portfolio had raw β=0.982 … a conservative portfolio**
- **R^2 = 0.9737 implying that 97% of its movement attributed to systematic market risks**
- **Because $R^2 > 0.80$, portfolio considered "hedge-able" with macro index futures and should qualify for hedge accounting treatment per FASB 133**



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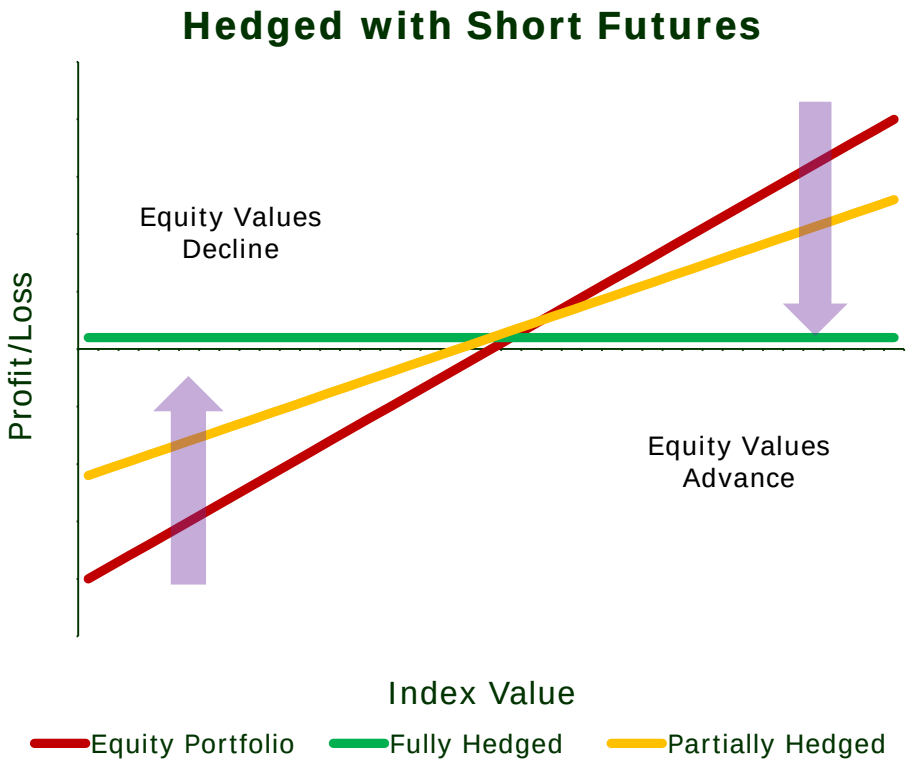
Beta Adjustment Strategies

Selling futures…

- Vs. stock portfolio allows one to reduce risk exposure as measured by beta
- Because futures are leveraged, fully hedged portfolio expected to generate S-T rate of return

Sell futures ➔ **Reduce risk exposure measured by β**



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Beta Adjustment Strategies

Hedge ratio (HR)…

$$HR = (\beta_{target} - \beta_{current}) \times (Value_{portfolio} \div Value_{futures})$$

- **Where …**
  - **β_{target} = targeted portfolio beta**
  - **$\beta_{current}$ = current portfolio beta**
  - **$Value_{portfolio}$ = monetary value of portfolio**
  - **$Value_{futures}$ = monetary value of stock index futures contract, *e.g.,* for E-mini S&P 500 futures … $Value_{futures}$= $50 x Index**

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Beta Adjustment Strategies

- ***E.g.*, market believed to be overvalued, reduce β from 0.988 to 0.900**
  - **$Value_{futures}$ = $78,135 (= $50 x 1,562.70)**
  - **THUS … strategy is sell 113 futures**

$$HR = (0.900 - 0.988) \times (\$100,010,954 \div \$78,135) = -113$$

- ***E.g.*, market believed to be undervalued, increase β from 0.988 to 1.100**
  - **THUS … strategy is buy 143 futures**

$$HR = (1.100 - 0.988) \times (\$100,010,954 \div \$78,135) = 143$$

Sell 113 futures ➔ Reduces β from 0.988 to 0.900

Buy 143 futures ➔ Increases β from 0.988 to 1.100

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Long/Short Strategy

130/30 strategy …

- **Uses leverage to purchase shares with expected high returns and shorting stocks with expected poor returns**
  - **130/30 means buying stocks worth 130% of fund value; shorting stocks worth 30% of fund value**
  - **Other ratios also used, *e.g.*, 120/20, 140/40, etc.**
- **Investors often reference returns on benchmark index (*e.g.*, S&P 500) as strategy "bogey"**
  - **Rank order all 500 stocks in index by fundamental performance criteria … buy stocks at top of list, sell stocks at bottom of list**
  - **Conceptually similar to "pairs trading" but on larger scale**

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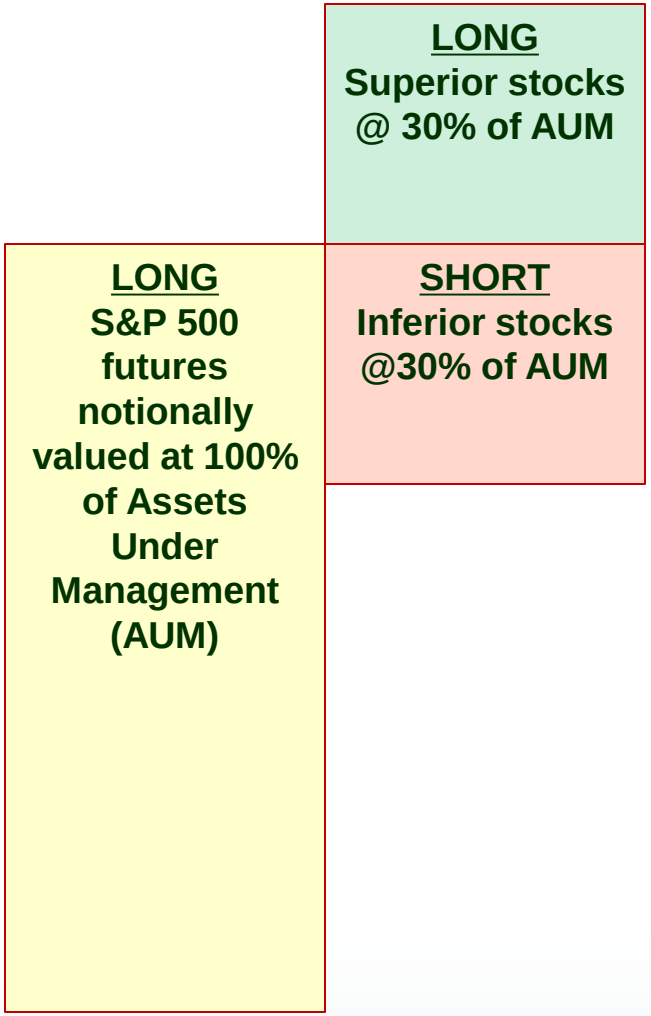
Long/Short Strategy

130/30 strategy, cont. …

- **Buy-and-hold S&P 500 futures notionally valued at 100% of AUM**
- **Buy superior stocks, funded by shorting inferior stocks valued @ 30% of AUM**
- **Futures provide "core beta" performance with liquidity and cash management flexibility**

Buy-and-hold futures ➔ **Replicate core or beta portfolio performance with cash management flexibility**



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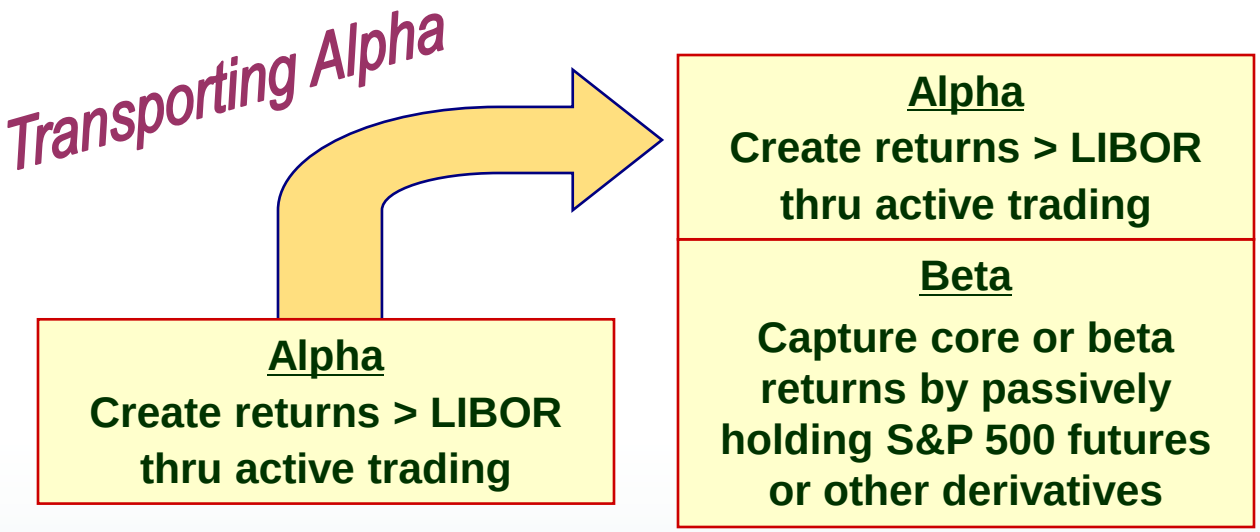
Portable Alpha Strategies

Defining "portable alpha" …

- **Objective … outperform benchmark returns by adding "alpha"**
- **Risk that alpha strategy may not outperform LIBOR**
  - **Active trading strategies or hedge funds often used to capture alpha**
- **Must "capture beta" efficiently**
  - **Futures or swaps used passively to capture beta … need "efficient beta" … *i.e.*, low tracking error and low transaction costs**



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Portable Alpha Strategies

- **Buy-and-hold S&P 500 futures to capture beta**
  - **Performance bond (aka "margin") for E-mini S&P 500 futures may be 5-15% of notional contract value contingent on volatility**
  - **85%-95% residual available for investment**
- **Invest residual 85%-95% of contract value in an alpha generating strategy**
  - ***E.g.,* actively managed investment fund, hedge fund, commodity fund, real estate, tactical asset allocation strategy**
  - **Some popular portable alpha funds trade short-term interest rate instruments to capture alpha on top of S&P 500 core investment**

Buy-and-hold futures ➔ **Replicate core or beta portfolio performance with cash management flexibility**

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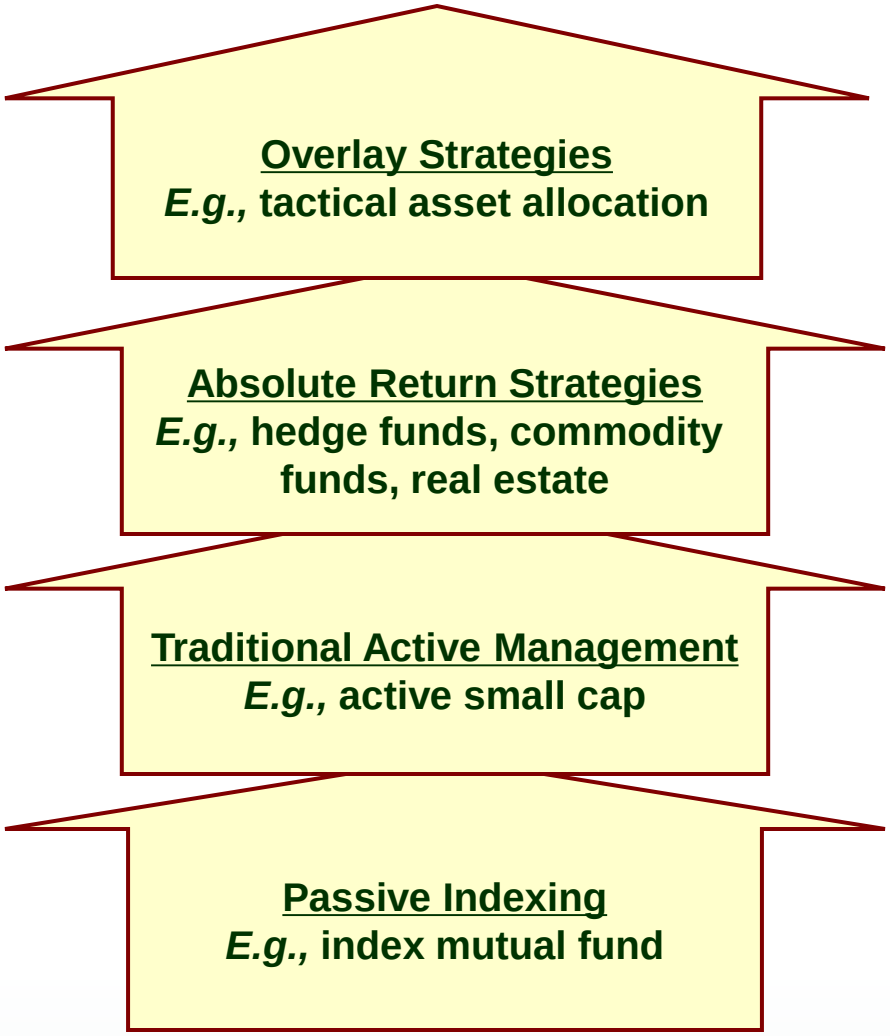
Portable Alpha Strategies

Hierarchy of capital efficient alpha strategies …

- **Ranking investment strategies on basis of alpha potential per capital deployed**
- **Active, aggressive strategies require more trading skill**
- **Still, it's difficult consistently to deliver alpha**



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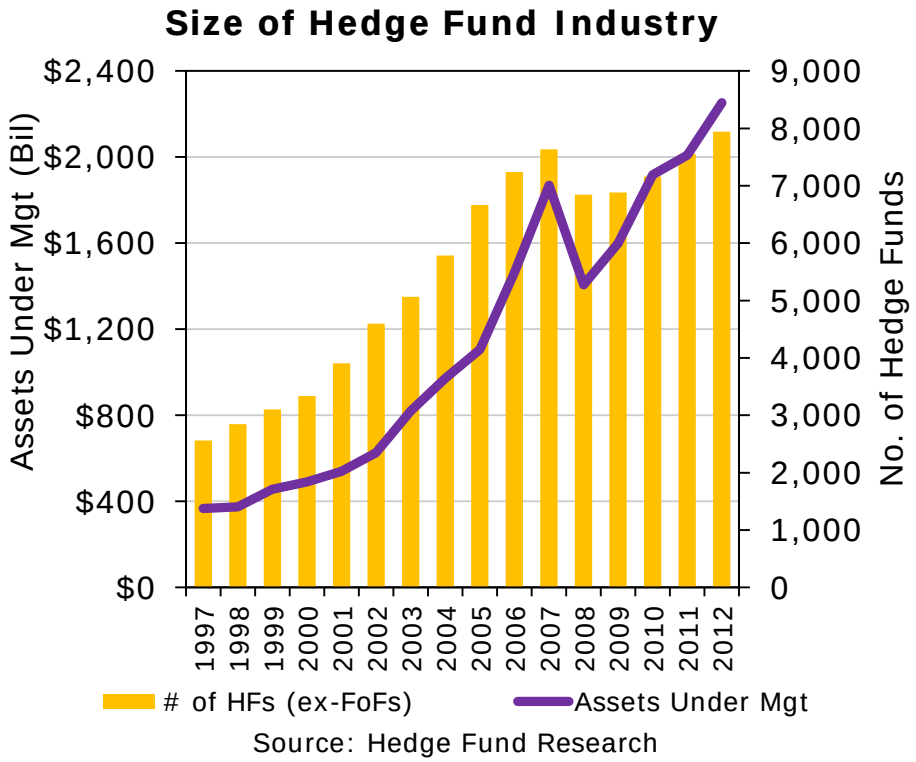
Portable Alpha Strategies

Hedge funds …

- **Hedge funds often used as source of alpha with 2012 return = +6.16%**
- **AUM up to $2.253 trillion with number of funds (ex-fund of funds) at 7,940 by conclusion of 2012**



Efficient Beta

Two factors contribute to efficient beta …

- **Low tracking error**
  - **May be measured by end-of-day (EOD) mispricing**
  - **CME Group eliminates end-of-money (EOM) mispricing thru "fair value settlement" process**
  - **Calendar spread mispricing impacts cost of rolling passive long position from nearby to deferred contract month**
- **Low transaction costs**
  - **Brokerage commissions and exchange fees contribute to transaction costs … but largest component is execution skids or slippage … a function of liquidity**
  - **Liquidity may be measured by width of bid/ask spread**
  - **Or, by market depth or number of limit orders resting in central limit order book (CLOB)**

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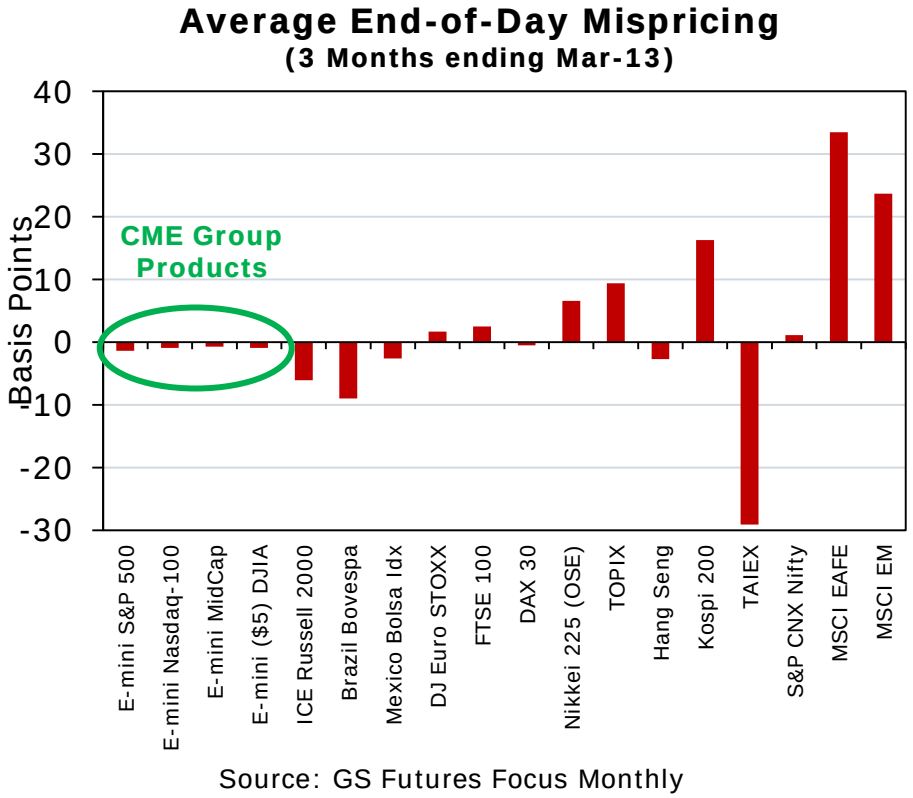
Efficient Beta

Low tracking error …

- **CME products enjoy low end-of-day (EOD) mispricing or tracking error**
- **Fair value settlement process essentially eliminates tracking error on last day of month**



Source: GS Futures Focus Monthly

Efficient Beta

Eliminating end-of-month tracking error …

- **End-of-month (EOM) settlement at fair value (FV)**
  - **Based on survey of interest rates and dividends**
  - ***E.g.,* on 3/28/13, rate @ 0.350; 84 days from 4/3/13 settlement to expiration of Jun-13 contract; S&P 500 @ 1,562.85; dividends @ at 7.831 index points**

Fair Value	=	Finance Charges	-	Dividends
	=	Rate x (days/360) x Index Value	-	Dividends
	=	0.350% x (84/360) x 1,562.85	-	7.831
	=	-6.555		

- **Futures settled at 6.555 discount under index @ 1,556.30**

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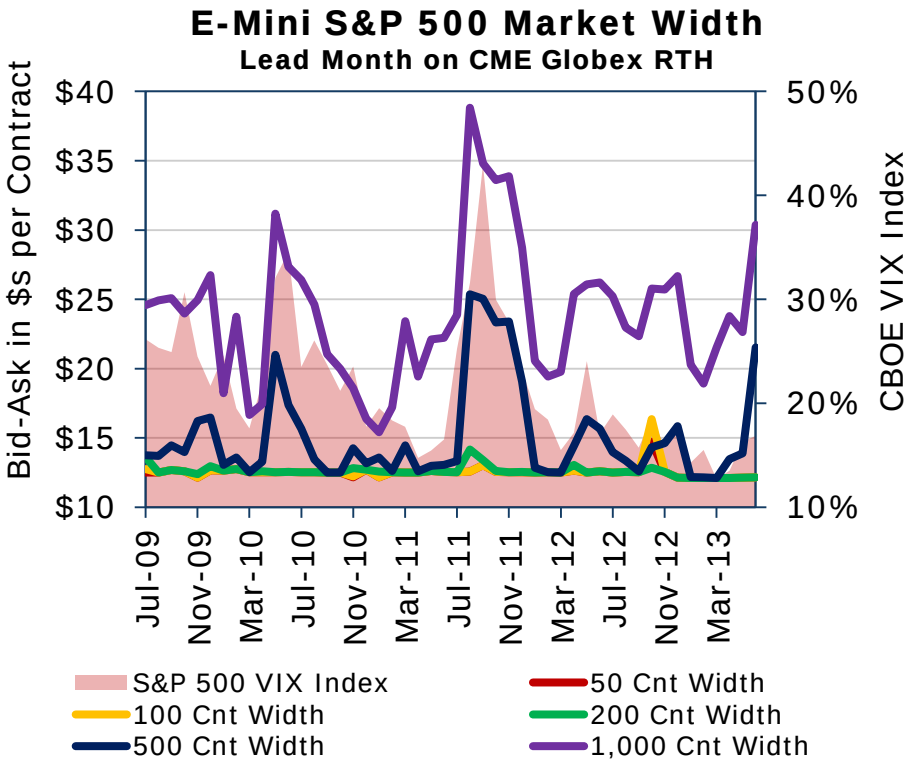
Efficient Beta

Market width …

- **Bid-ask spread in E-mini S&P 500 futures for 500-lot order averaged $21.52 in Jun-13**
- **Tick size = 0.25 index points ($12.50)**



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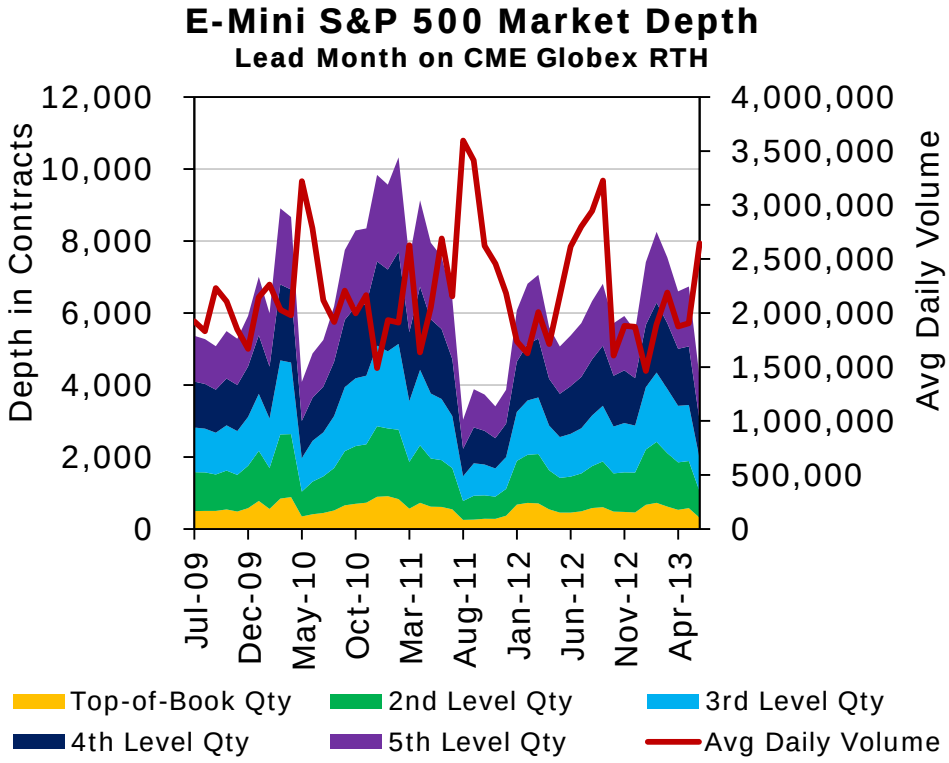
Efficient Beta

Market depth …

- **313 contracts shown at top-of-book for E-mini S&P 500 in Jun-13**



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