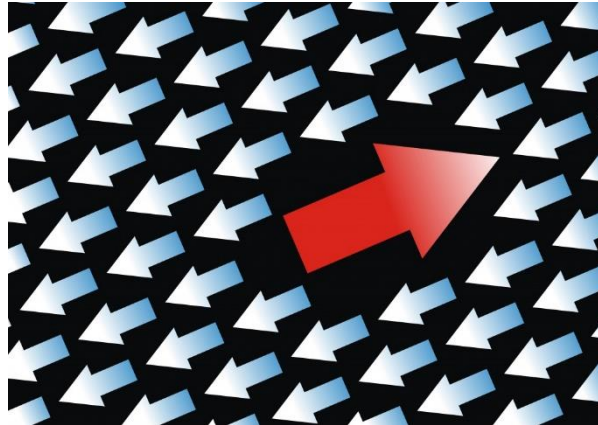


**Boston QWAFAFEW**

## **The Case for Reverse Market Cap Indexing**



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**GLOBAL FINESSE**  
Where Finance and Technology Converge

# Topics to Be Covered

- Evolution of US Index Weighting Schemes
- Challenges to Market-Cap Weighting
- Trading and Fund Structures Get Much More Efficient
- Reverse Cap Weighting Methodology Derived
- Why Should Reverse Cap Weighting Work?
- Empirical Results
- Implications for Investors

# Indexing: Back to the Beginning

- Wells Fargo: Huge Investment in “Modern” Computers



- Team Put in Place at Wells Fargo – Three Insightful Leaders



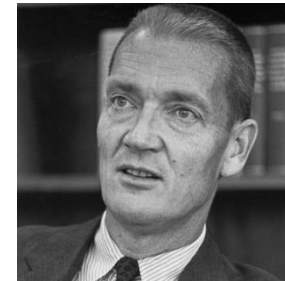
- 1971 - \$6 Million Samsonite Pension Fund – Keith Shwayder
- Challenges of Creating and Managing a Market Portfolio



# Indexing Solution: The S & P 500 Index

- Launched in 1957 based upon index developed by Alfred Cowles in 1938
- Referenced mostly by economists and academics until 1971
- Dream implementation tool for index funds when trading costs were substantial
  - Stocks still traded by open outcry
  - Bid-ask spreads were in 1/8s
  - Brokers typically charged their best institutional customers just 10 ¢ per share
- Automatic position weight tracking – an ingenious solution already available
- Implementation of WF S&P 500 fund led institutional investment evolution
- Technology and CME futures established Cap-weighted Indexing Benchmarks

STANDARD  
&POOR'S **500**



- 1992 – Vanguard makes S&P 500 Indexing work for retail investors too

# Challenges to Market-Cap Weighting

- Fama and French: 1992 – Price/Book and Small-Cap Stock Anomalies



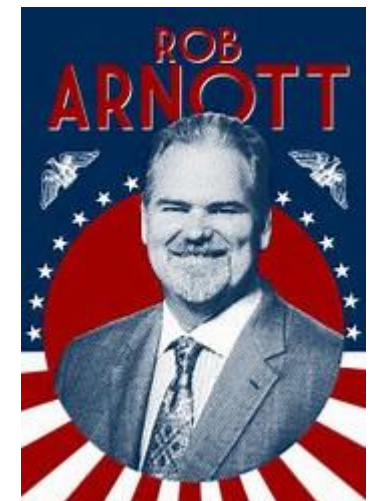
- Fernholz, Garvey, and Hannon, 1998 – Diversity-Weighted Index



- Hillenbrand, 2003 – Mean Reversion Evidence



- Arnott, Hsu and Moore: 2005 – Fundamental Indexation



# Efficiency Improvements: Fund Structure and Trading

## TRADING

- Techno-evolution
- Decentralization
- End of disintermediation
- \* Decimalization
- \* Deregulation
- \* Specialist essentially eliminated

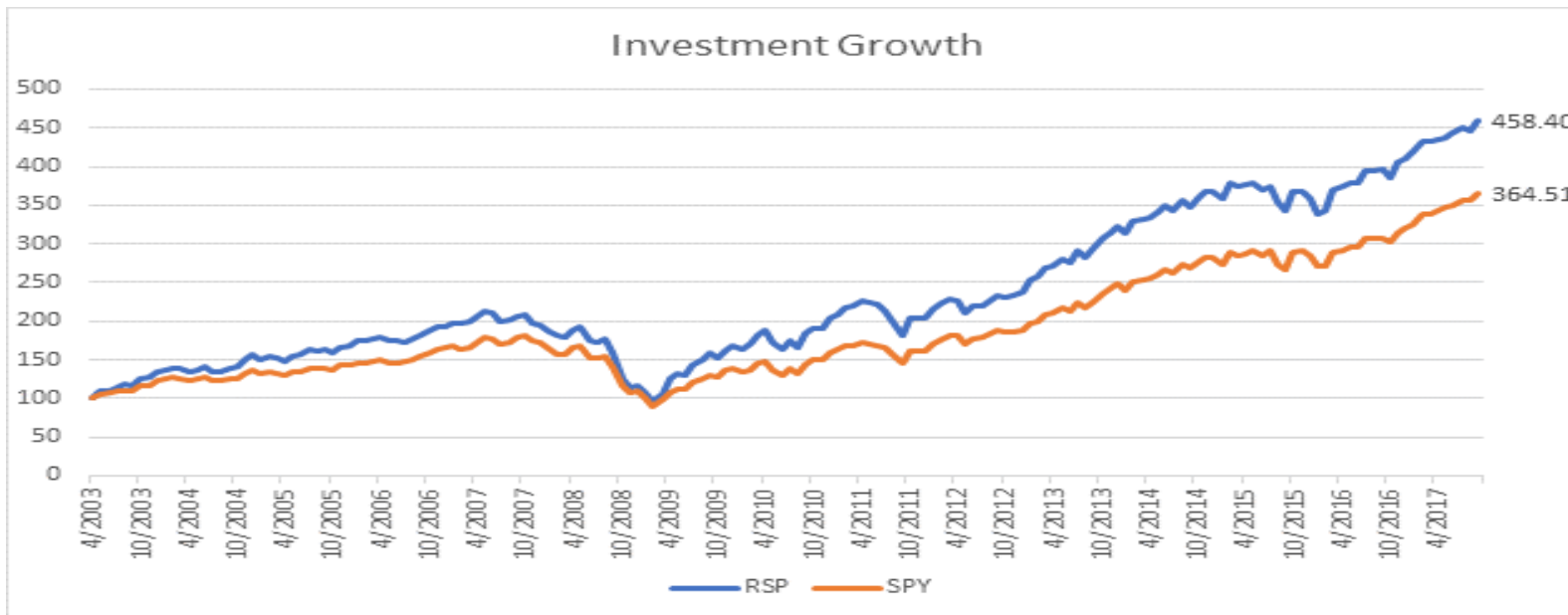


## ETFs

- Beta access nearly free
- Insulated from daily flows
- *De minimus* cash drag
- \* Near-zero cap gains to distribute
- \* No redemption fees
- \* Trading costs near zero for US eq.

# RSP: 14+ Year Study in Beating Market Cap Weighting

- 2003: RSP introduced by Rydex
- Equal-weighted 500 S&P Indexing
- Has outperformed SPY since inception but with higher annual vol



# Index Weighting Methodologies

In all cases, only the constituents of the S&P 500 at time  $t$  are used.

SPY (Market Cap Weighting):

- $mv_i = MCAP_i \div (\sum_{i=1}^{i=500} MCAP_i)$  for  $i=1$  to  $i=500$
- $eq_i = (1/500) = 0.2\%$  for  $i=1$  to  $i=500$
- $rv_i = (1 / MCAP_i) \div [ \sum (1 / MCAP_i) ]$  for  $i=1$  to  $i=500$



# Mathematical Rationale for Reverse-Cap Weighting

Dividing the 500 stock universe into top 120 stocks as ranked by market cap vs. bottom 380

Let  $x$ =the return of the market cap weighted portfolio;  $y$ =return of the equally weighted portfolio; and  $z$ =return of the reverse cap weighted portfolio

$$x = \sum_{i=1}^{120} mv_i * r_i + \sum_{i=121}^{500} mv_i * r_i$$

$$Y = \sum_{i=1}^{120} eq_i * r_i + \sum_{i=121}^{500} eq_i * r_i$$

$$Z = \sum_{i=1}^{120} rv_i * r_i + \sum_{i=121}^{500} mv_i * r_i$$

*Average co-efficients for the sums of the first 120 co-efficients, plugged in results in:*

$$E(x) = 0.667 * a + 0.333 * b \text{ where } a \text{ is average return for 120 top-cap stocks \& } b = 380 \text{ bottom cap stocks}$$

$$E(y) = 0.240 * a + 0.760 * b \text{ where } a \text{ is average return for 120 top-cap stocks \& } b = 380 \text{ bottom cap stocks}$$

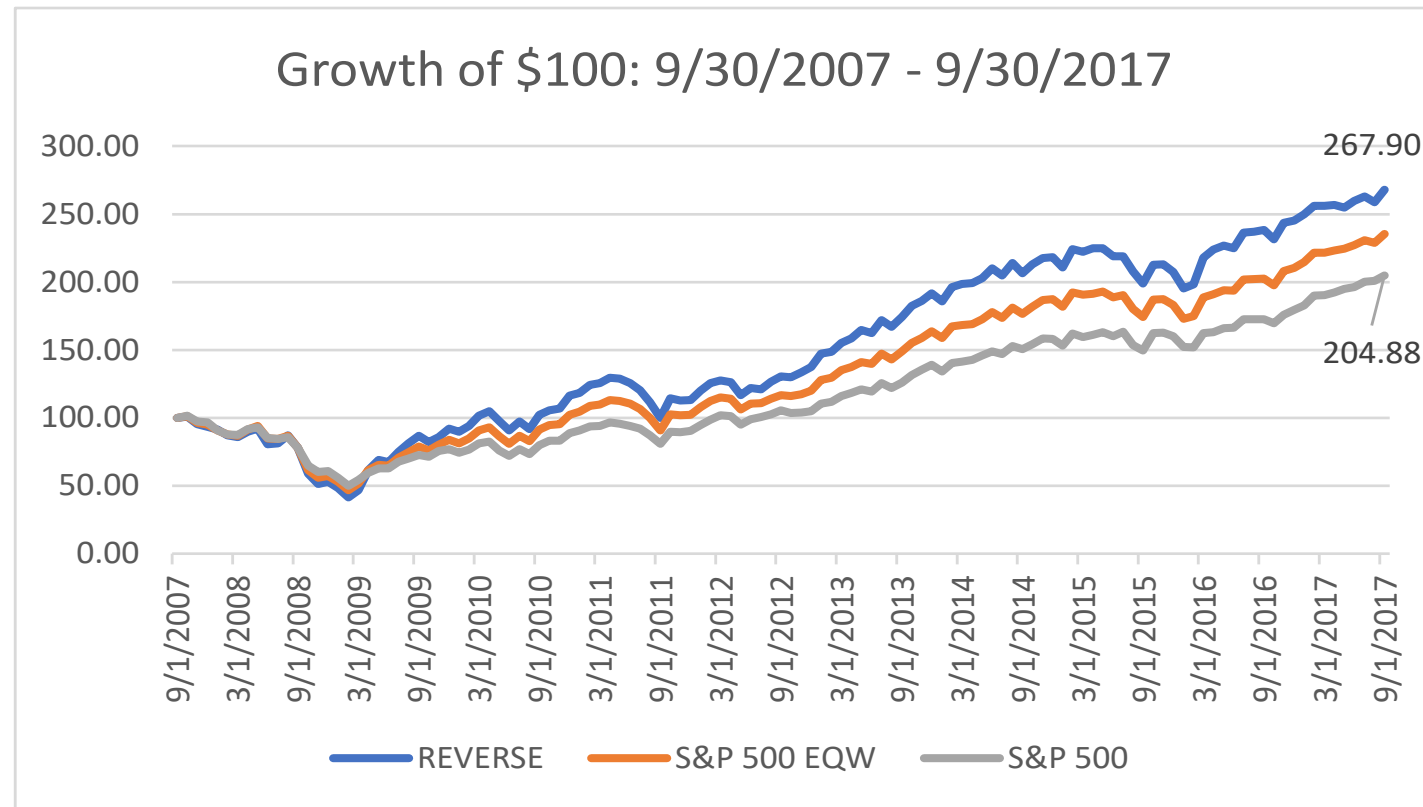
$$E(z) = 0.056 * a + 0.944 * b \text{ where } a \text{ is average return for 120 top-cap stocks \& } b = 380 \text{ bottom cap stocks}$$

*Therefore, when  $a < b$ ,  $E(x) < E(y) < E(z)$  BUT when  $b < a$ ,  $E(x) > E(y) > E(z)$*

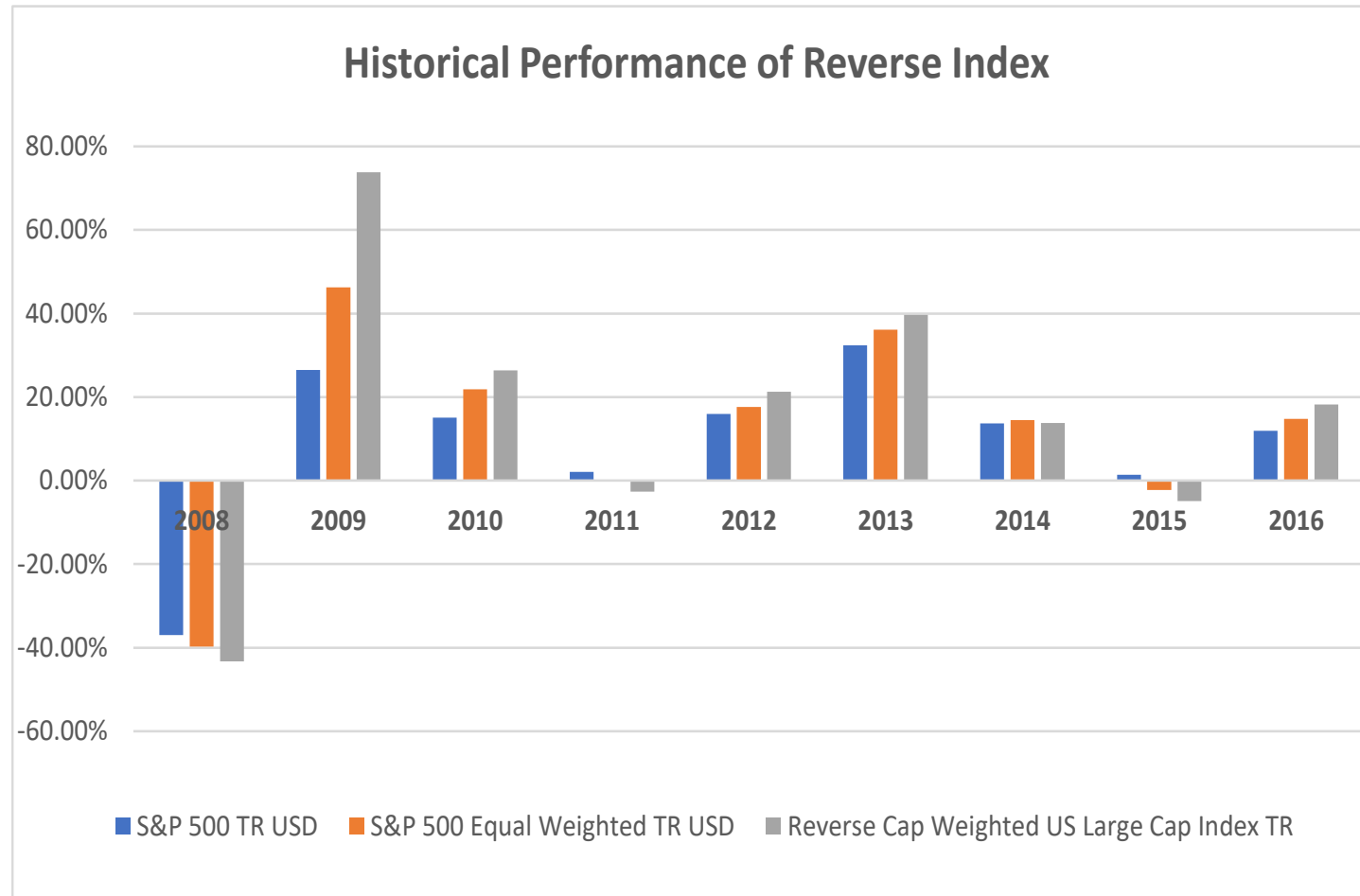
*Given that empirically  $y$  has been greater than  $x$  in most periods, then we may expect  $z > y > x$  in those same periods.*

# Indeed, our expectations hold true for the test period

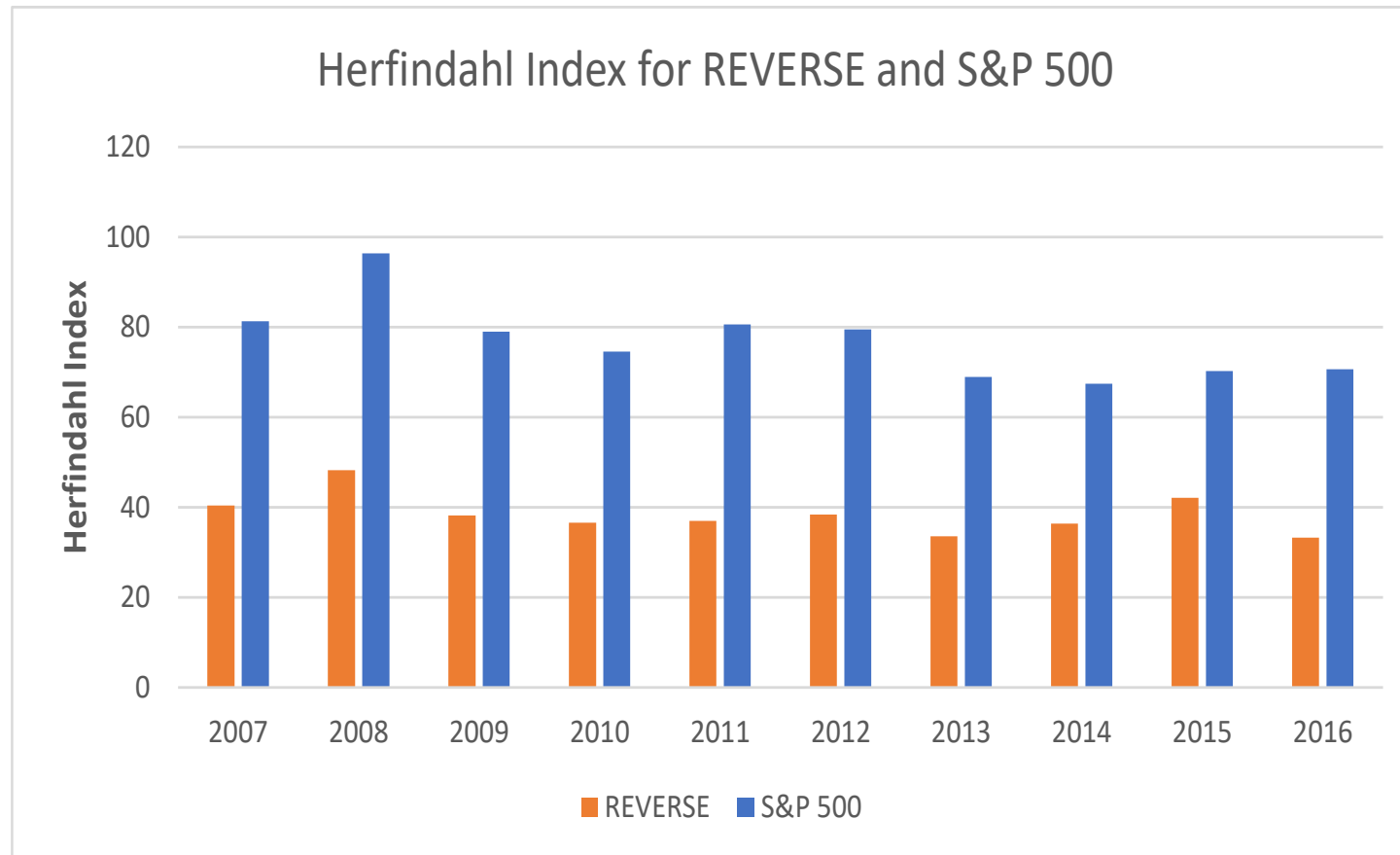
## Performance calculated by S&P Custom Index Services



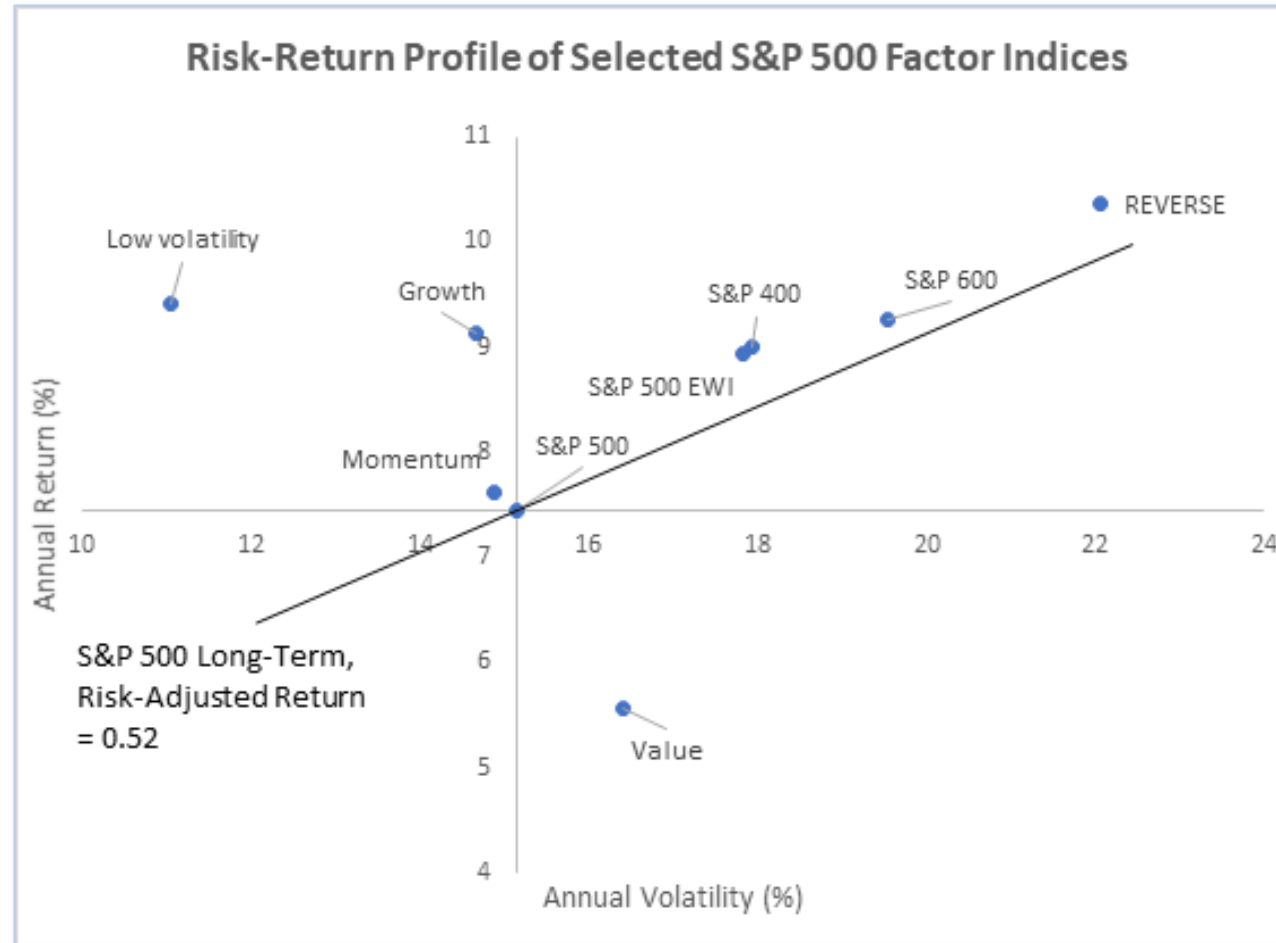
# Year-by-Year Performance



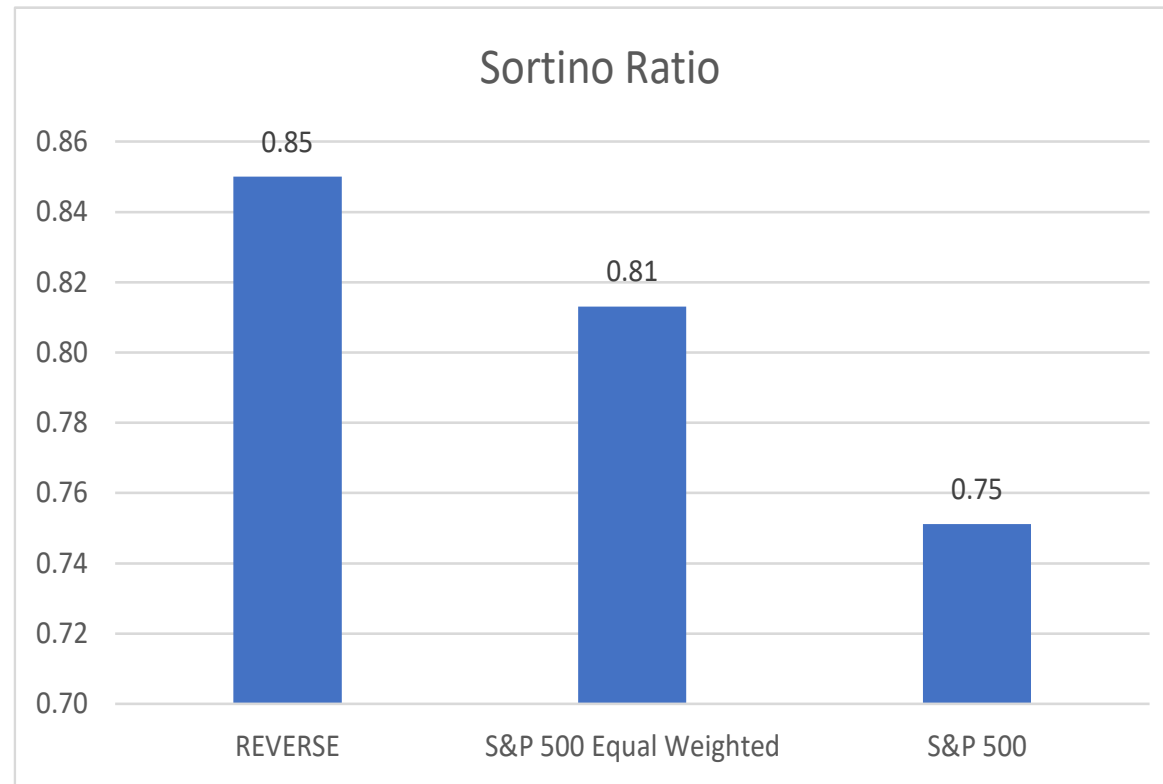
# Market Concentration: Herfindahl-Hirschman Index



# Risk-Return Comparisons



# Downside Risk Comparisons of Sortino Ratios



# Summary

1. Market cap weighted S&P 500 Indexing still tough to beat
2. Yet, anti-value, pro-size, pro-momentum biases are vulnerabilities
3. Alternative weighting schemes no longer as tough to implement as portfolio solutions
4. RSP, equally weighted S&P 500 ETF has outperformed SPY since inception
5. RVRS, reverse market-cap weighted index, can be expected to outperform RSP index most times when latter beats S&P 500
6. RVRS can be useful as long-term return-oriented holding and as a tactical tool for hedge funds

# Thank You!

Questions? Comments?

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