



Portfolio Management: 10,000 Hours And A Better Intuition



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Does An Optimizer Require A Forecast Of Individual Return Correlations?

For a “N” Stock Portfolio, The Formula for the Number of Correlation Forecasts is:

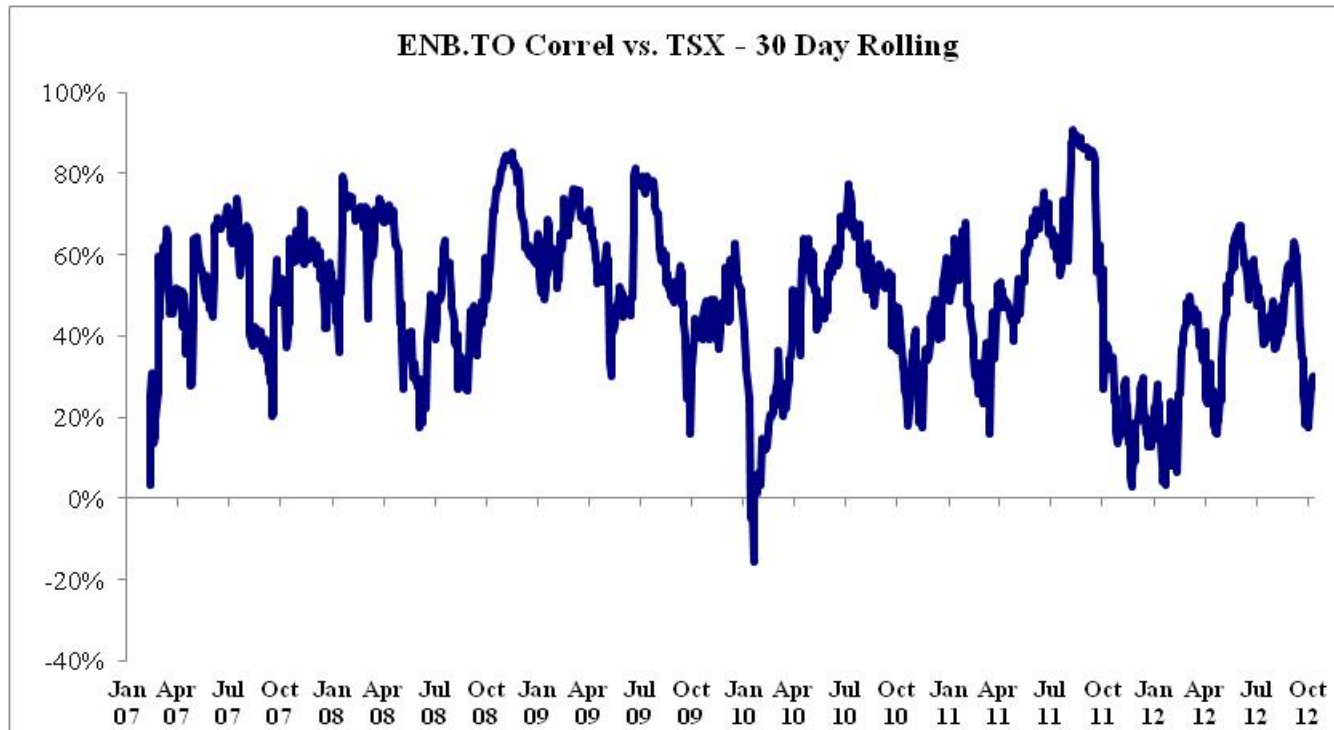
$$N (N - 1) / 2$$

For Example, a 100 Stock Portfolio Requires:

$$100 (100 - 1) / 2$$

$$= 4950 \text{ Forecasts}$$

Enbridge is A Stable Stock But Its Correlation is Very Unstable. This Will Cause Turnover in Most Frequencies



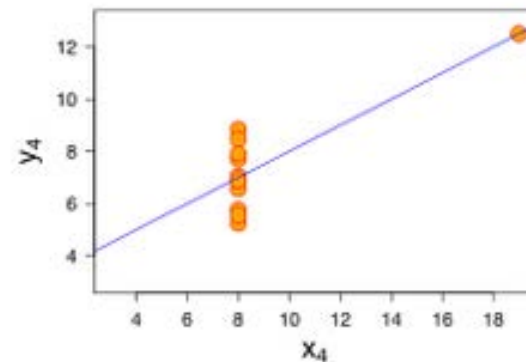
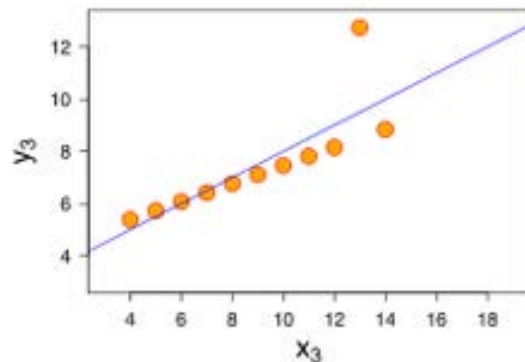
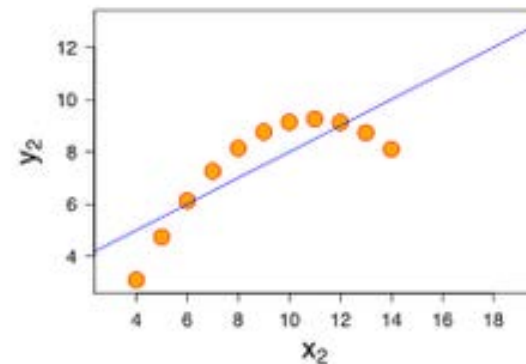
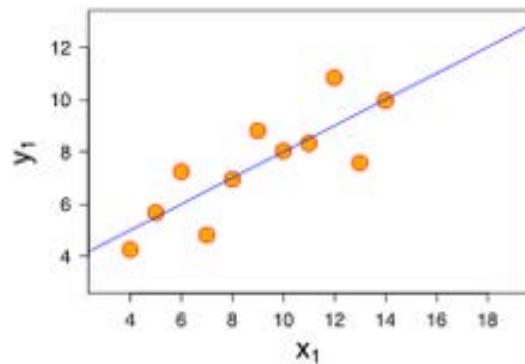
Please Pin On Your Wall: Anscombes Quartet of Correlations

Be careful with regression

All four datasets below have nearly identical statistical properties

Mean of both X and Y, Variance of both X and Y and Correlation between X and Y

Each dataset also results in the same linear regression line



Contribution to Volatility is Sensitive To Correlation As Well As Time

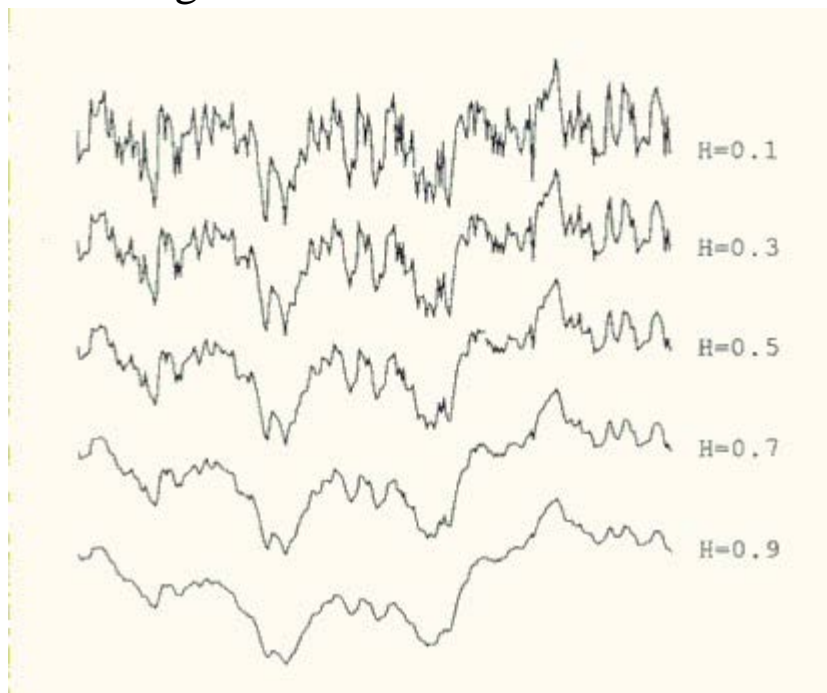
- Looking at the 10 biggest contributors to the volatility of the TSX 60 Index over 6 months, we can see as we move from daily to weekly to monthly frequency, the relative contributors to index volatility change dramatically

TSX 60 Index - Last 6 Months			Daily - Volatility 11.95%			Weekly - Volatility 9.09%			Monthly - Volatility 8.07%		
Symbol	GICS	Weights	Volatility	% CTV	CTV Rank	Volatility	% CTV	CTV Rank	Volatility	% CTV	CTV Rank
RY	40	8.3%	14.4%	7.0%	1	14.6%	8.3%	1	6.8%	4.6%	6
SU	10	4.8%	23.1%	6.1%	2	19.7%	6.1%	4	13.2%	3.3%	12
TD	40	7.4%	12.2%	5.8%	3	10.4%	6.0%	5	7.4%	3.9%	8
BNS	40	6.2%	12.1%	4.8%	4	11.4%	6.4%	2	10.1%	6.3%	4
ABX	5	1.7%	60.4%	4.7%	5	60.6%	6.2%	3	68.9%	10.0%	1
G	5	1.9%	50.9%	4.2%	6	45.4%	4.8%	6	40.8%	6.3%	3
CNQ	10	3.0%	23.6%	3.8%	7	21.4%	3.9%	7	20.7%	5.6%	5
CNR	20	3.7%	15.0%	2.9%	8	13.5%	3.2%	8	15.0%	3.2%	13
FM	15	1.0%	51.2%	2.9%	9	33.7%	2.0%	18	35.9%	3.4%	11
TCK.B	15	1.2%	41.7%	2.7%	10	37.7%	3.0%	9	38.6%	4.2%	7

Fractals: Most Stock Prices Are Self-Replicating

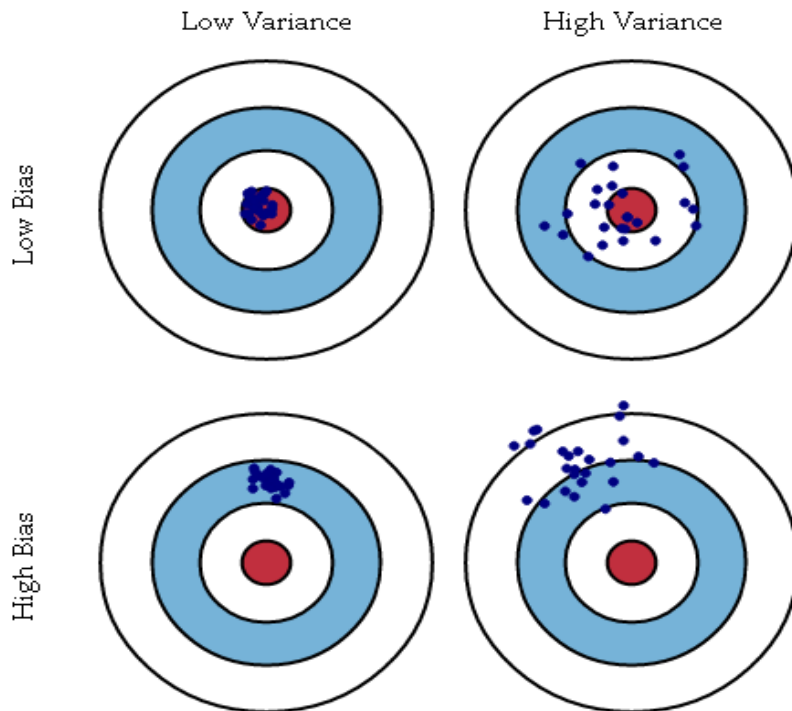
The Hurst Exponent and Fractional Brownian Motion

Brownian walks can be generated from a defined Hurst exponent. If the Hurst exponent is $0.5 < H < 1.0$, the random process will be a long memory process. A small Hurst exponent has a higher fractal dimension.



Forecasting Models: Beware Of Bias Versus Variance

- When generating models it is important to understand the two primary sources of error: Variance and Bias



Bias

Bias relates to the degree of reliance on underlying conditions. A large bias can lead to important differences between the forecast of your model and the actual value when conditions change.

Variance

Variance relates to the variability in outputs for a given data point. A model with large variance is robust in most conditions but gives a uniformly wrong answer.

Tradeoff

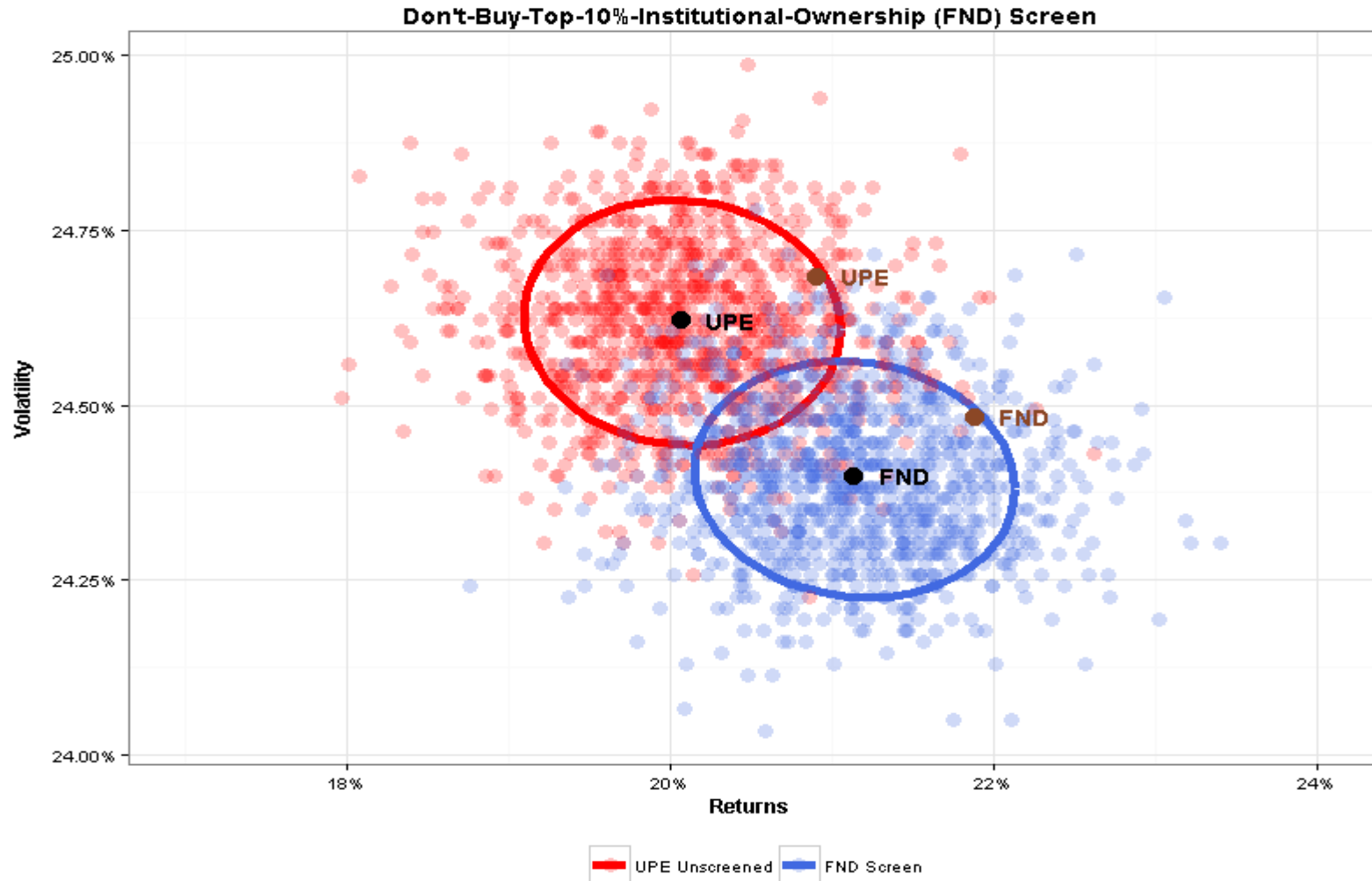
Increasing model complexity can reduce bias but is likely to increase variance

Model specification should seek to balance (*not minimize*) bias and variance

The Uncertainty Principle (vs The Economist)

In [quantum mechanics](#), the **uncertainty principle** is any of a variety of mathematical inequalities asserting a fundamental limit to the precision with which certain pairs of physical properties of a particle known as complementary variables, such as [position](#) x and [momentum](#) p , can be known simultaneously. For instance, **the more precisely the position of some particle is determined, the less precisely its momentum can be known, and vice versa.**^[1] The original heuristic argument that such a limit should exist was given by [Werner Heisenberg](#) in 1927, after whom it is sometimes named the **Heisenberg principle**.

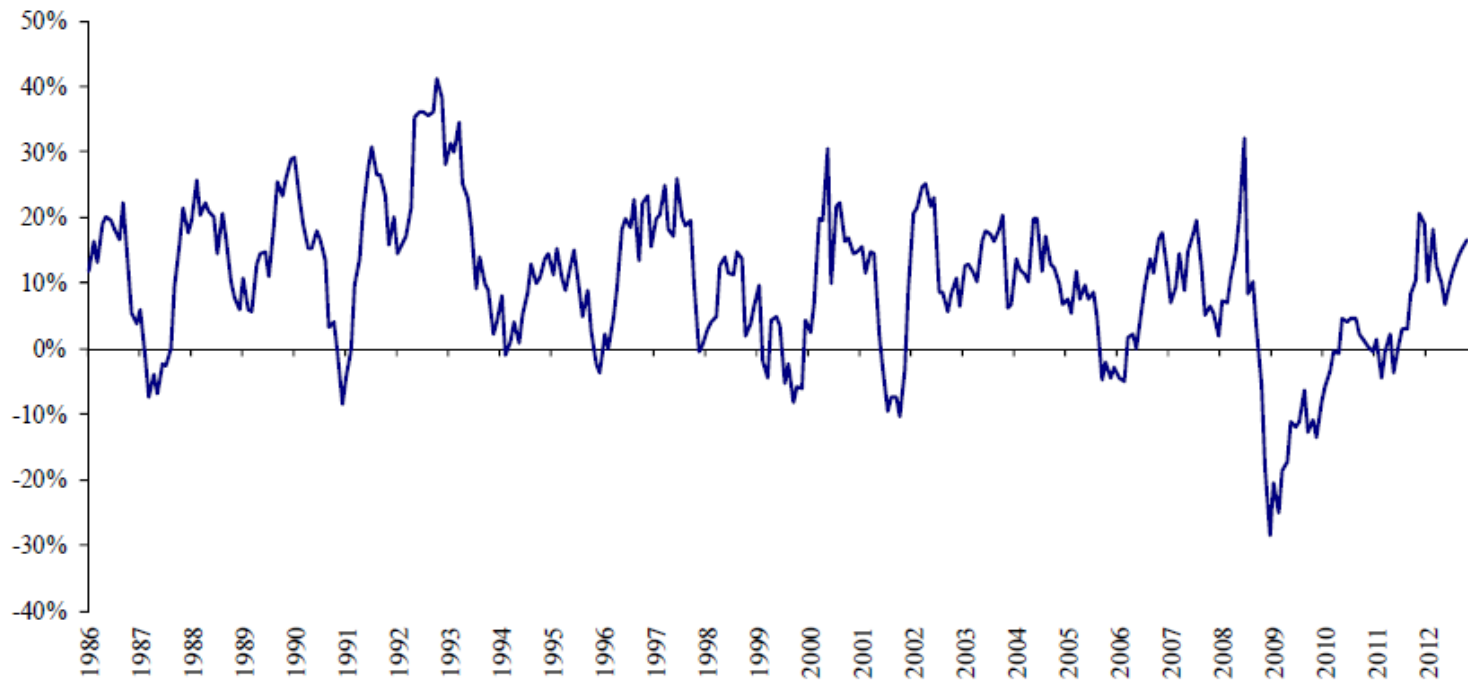
Use Monte Carlo And Bootstrapping. Fill In The Sum Of All Histories.



Expectational Factor

TSX Composite Equally Weighted Index, As of March 31, 2013

Latest Quarterly Earnings Surprise Top 30 Stocks – Bottom 30 Stocks, 6 Months Rolling



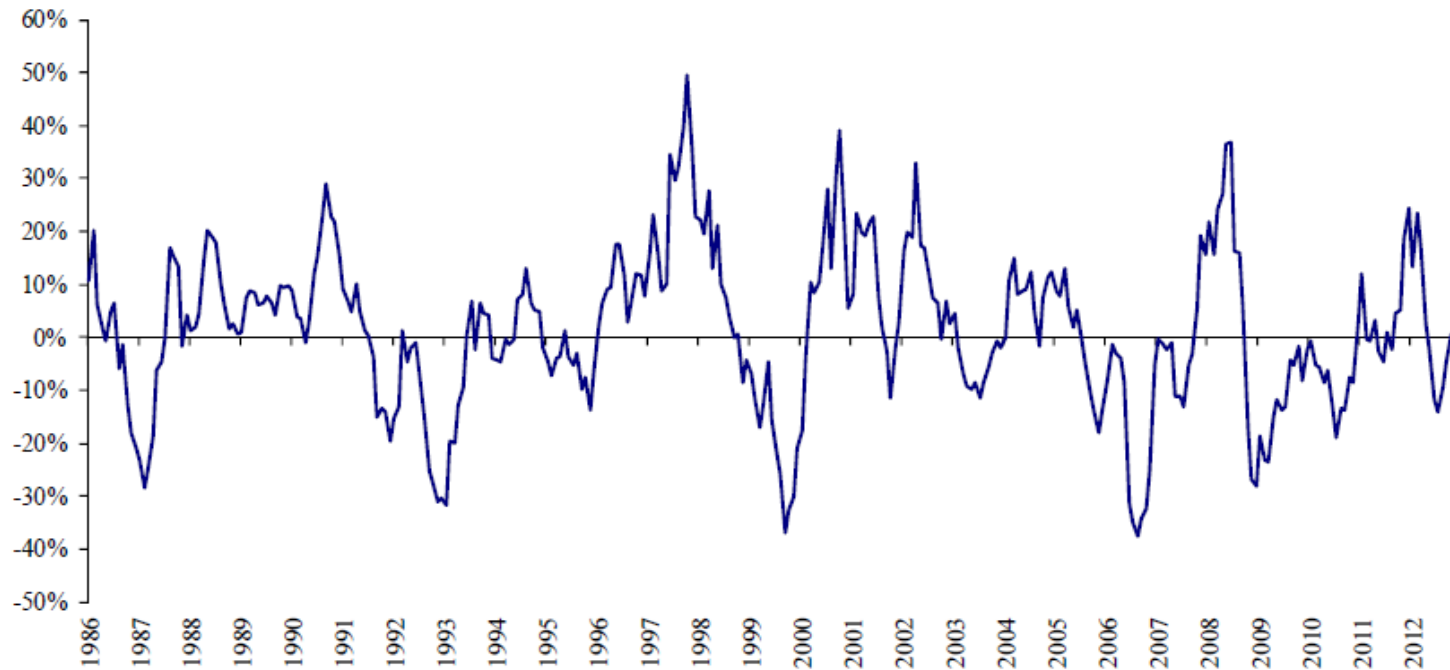
Stock Universe is the TSX Composite Index. Top 30 stocks are the largest or highest. Bottom 30 Stocks are the Smallest or Lowest. Portfolios are Equally Weighted

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Income Factor

TSX Composite Equally Weighted Index, As of March 31, 2013

Dividend Yield
Top 30 Stocks – Bottom 30 Stocks, 6 Months Rolling



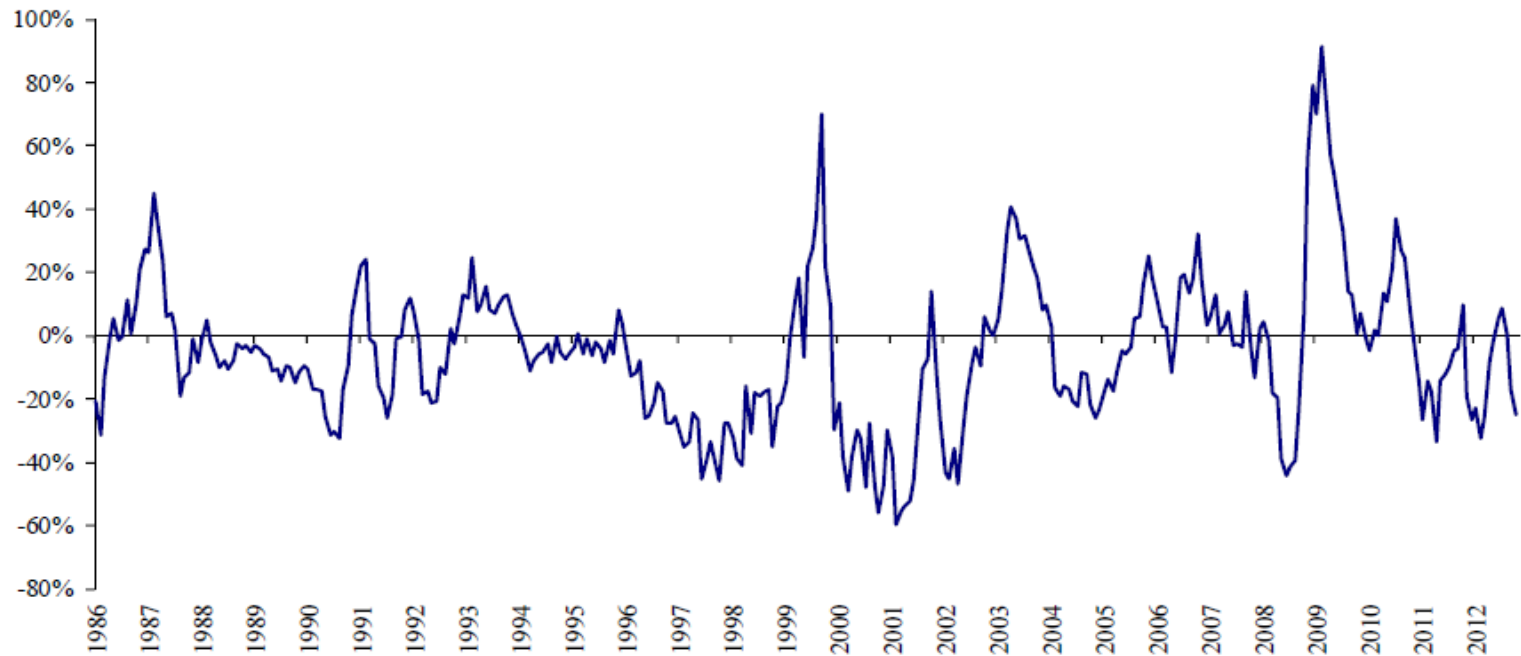
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Risk Factor

TSX Composite Equally Weighted Index, As of March 31, 2013

120 Day Standard Deviation
Top 30 Stocks – Bottom 30 Stocks, 6 Months Rolling

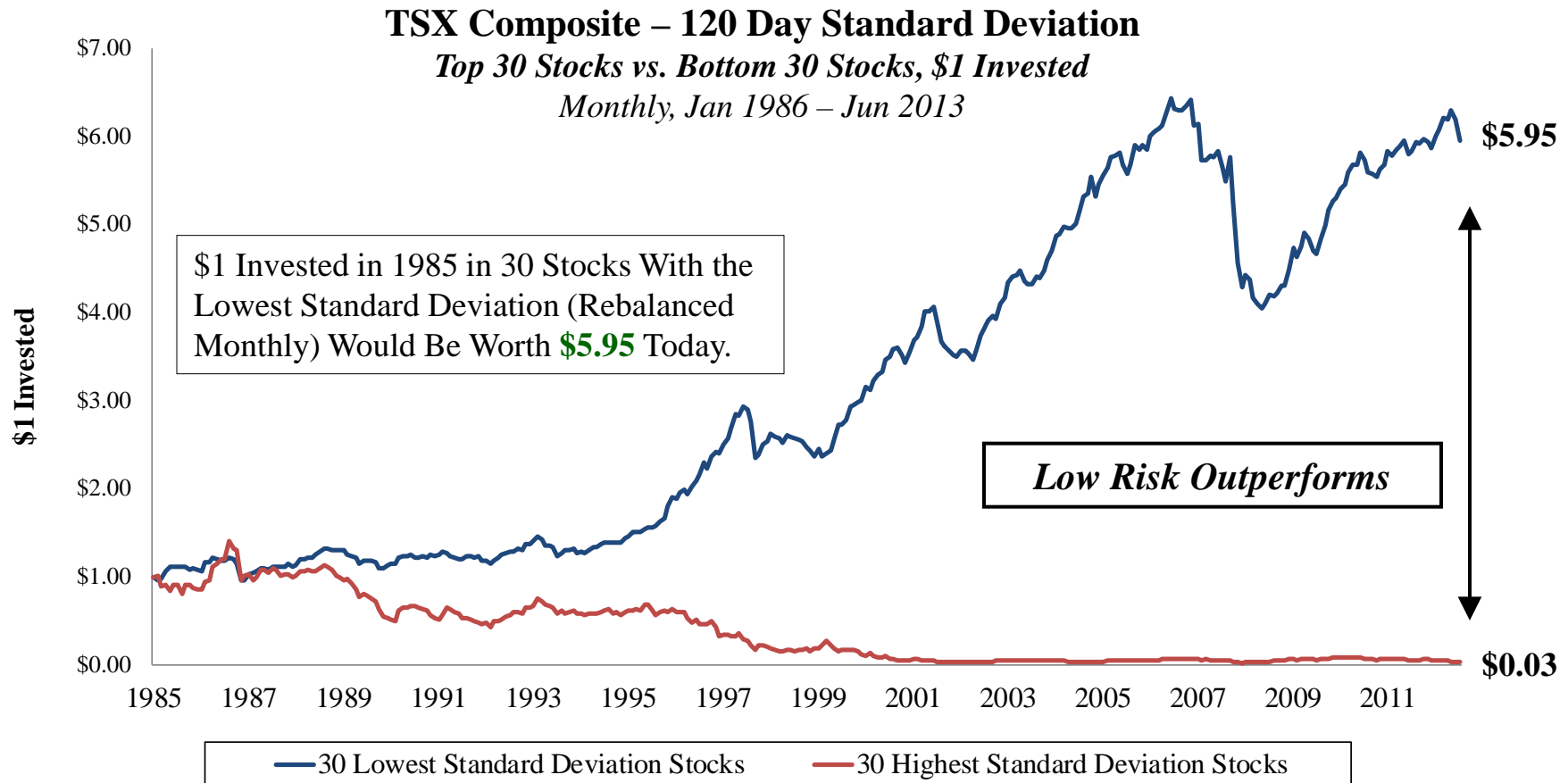


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The Low Volatility Anomaly¹

Low Volatile Stocks Outperform High Volatile Stocks in the Long Term¹



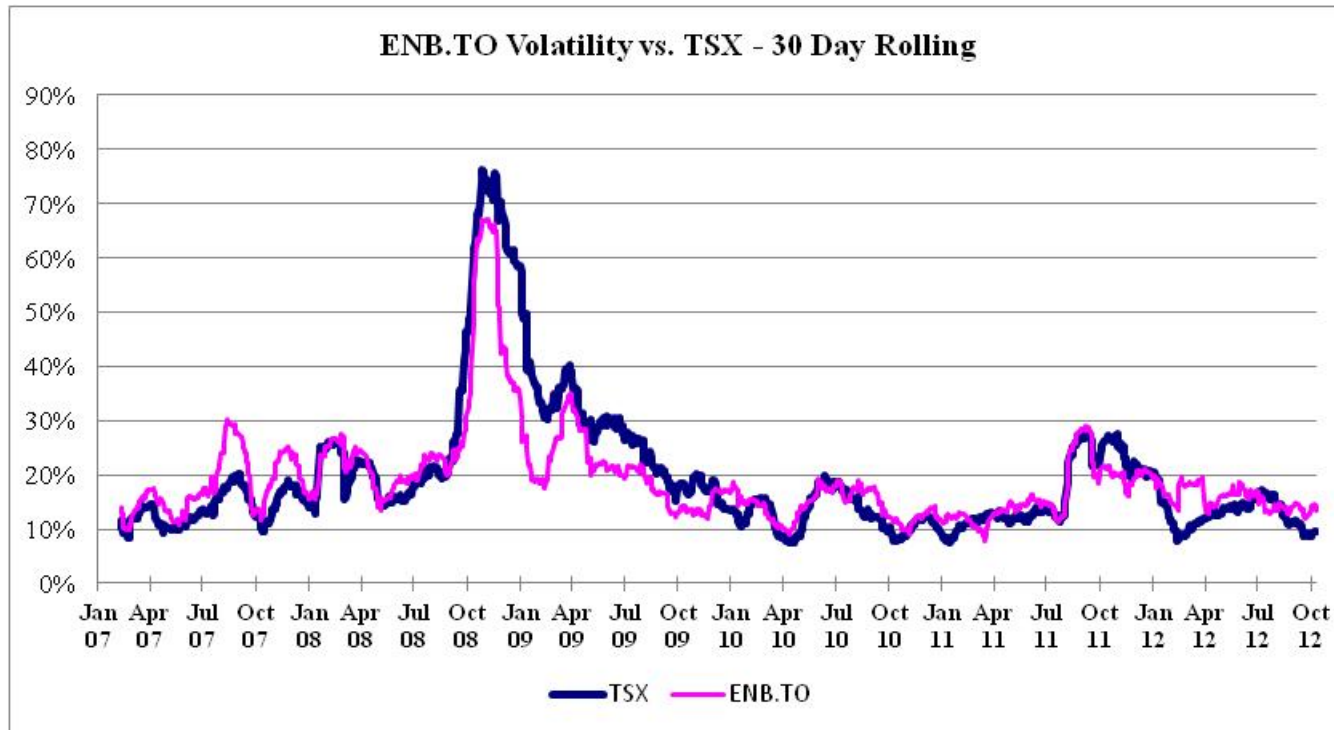
Stock Universe is the TSX Composite Index. Top 30 stocks are the largest or highest. Bottom 30 Stocks are the smallest or lowest. Portfolios are equally weighted and rebalanced monthly. Data as of June 30, 2013.

1 - Clarke, R., H. de Silva, and S. Thorley. 2006. "Minimum-Variance Portfolios in the U.S. Equity Market." *The Journal of Portfolio Management*.

Ang, A., R. J. Hodrickz, Y. Xingx, and X. Zhang. 2006a. "The Cross-Section of Volatility and Expected Returns." *Journal of Finance*, 61

Source: Hillsdale Investment Management

Enbridge's Correlation May Be Unstable, But Its Relative Volatility is Very Stable



Why Low Vol?

“Among The Many Candidates For The Greatest Anomaly In Finance, A Particular Compelling One Is The Long-Term Success of Low-Volatility...Stock Portfolios...Which Offered An Enviable Combination of High Average Returns and Small Drawdowns.”¹

What Is An Equity Minimum Risk Strategy?

An Equity Minimum Risk Strategy Is A Systematic And Quantitative Approach To Selecting Stocks That Relies Principally On A Risk Metric To Construct A Portfolio.¹

How Long Will This Anomaly Persist? When Will It Be Arbitraged Away?

- “Irrational Preference For High Volatility Stocks” Arising From a Variety of Behavioral Biases Including:
 - *A Preference for Lotteries*
 - *Representativeness*
 - *Overconfidence*¹
- Employing a Market Cap Index as a Benchmark are Unlikely to Exploit Low Volatility Anomalies for Reluctance to Invest in High Tracking Error Strategies, i.e. Benchmark Driven Mandates Limit Arbitrage

Intuition

- It takes intuition to discover the nature of the world.
 - Kepler, Newton, Ampere, Maxwell.
- Intuition may sound casual but it takes intimate knowledge of the world acquired by careful observation and painstaking effort.
- Keynes on Newton:
"I believe that the clue to his mind is to be found in his unusual powers of continuous concentrated introspection ... His peculiar gift was the power of holding continuously in his mind a purely mental problem until he had seen straight through it."
- Maxwell on Ampere
"We can scarcely believe that Ampere really discovered the law of action by means of the experiments which he describes. We are led to suspect, what, indeed, he tells us himself, that he discovered the law by some process which he has not shown us, and that when he had afterwards built up a perfect demonstration, he removed all traces of the scaffolding by which he had built it."