



Quantitative Strategy

Joseph J. Mezrich

joe.mezrich@instinet.com
1-212-310-4241

Instinet, LLC
1095 Avenue of the Americas
New York, N.Y. 10036

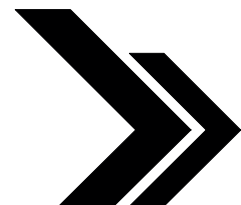
May 29, 2013

Tulip Mania to Twitter Media

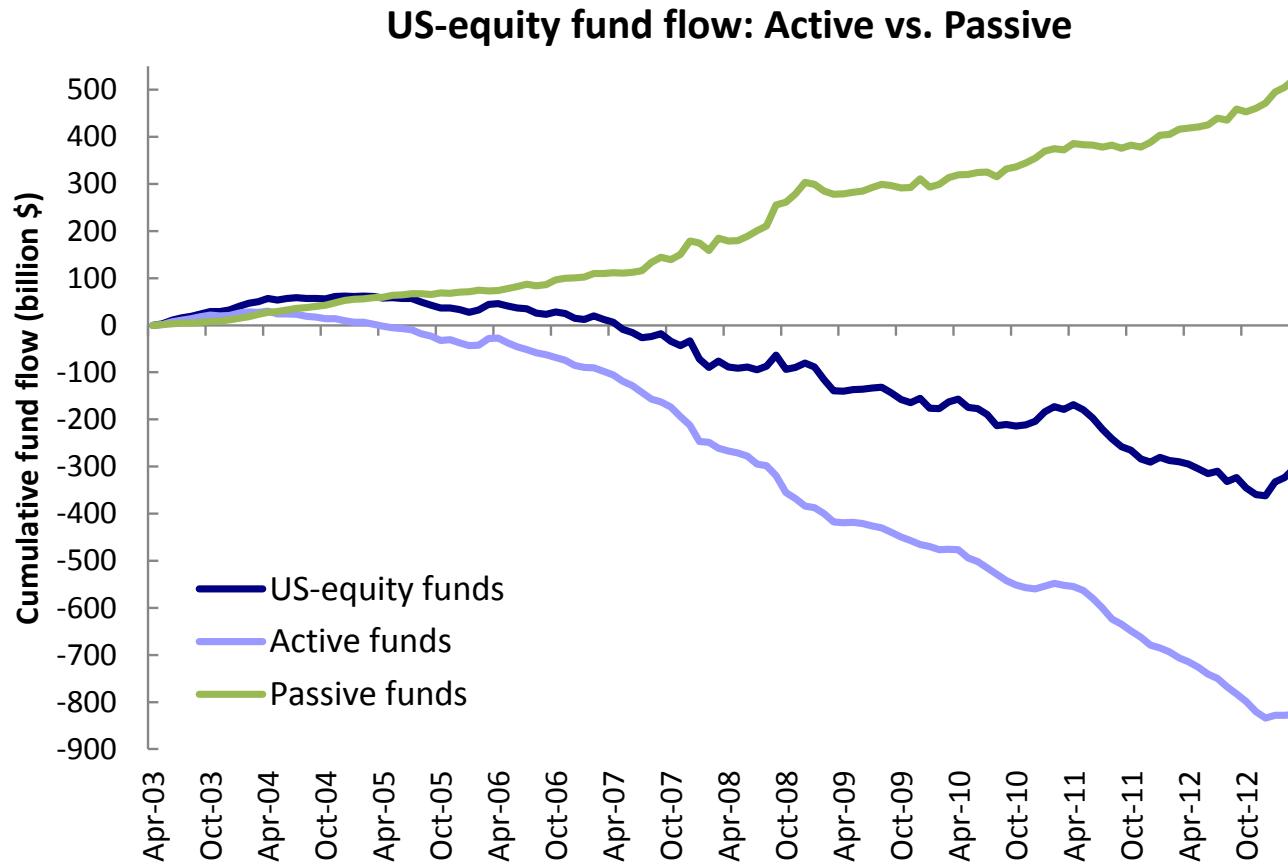
**The opportunity for quants in a
world of diminished alpha**

Tulip Mania to Twitter Media

- No market bubbles before media – tulip mania of 1630's needed newspapers. The twenties bubble needed the telephone. Media and communication can dramatically impact investor behavior.
- Government regulation and industry standardization over a decade ago have played an important role in data, with unintended harm to investment performance.
- This has led to shifts in asset flows, the growing importance of alternative beta, and a new opportunity for quants.



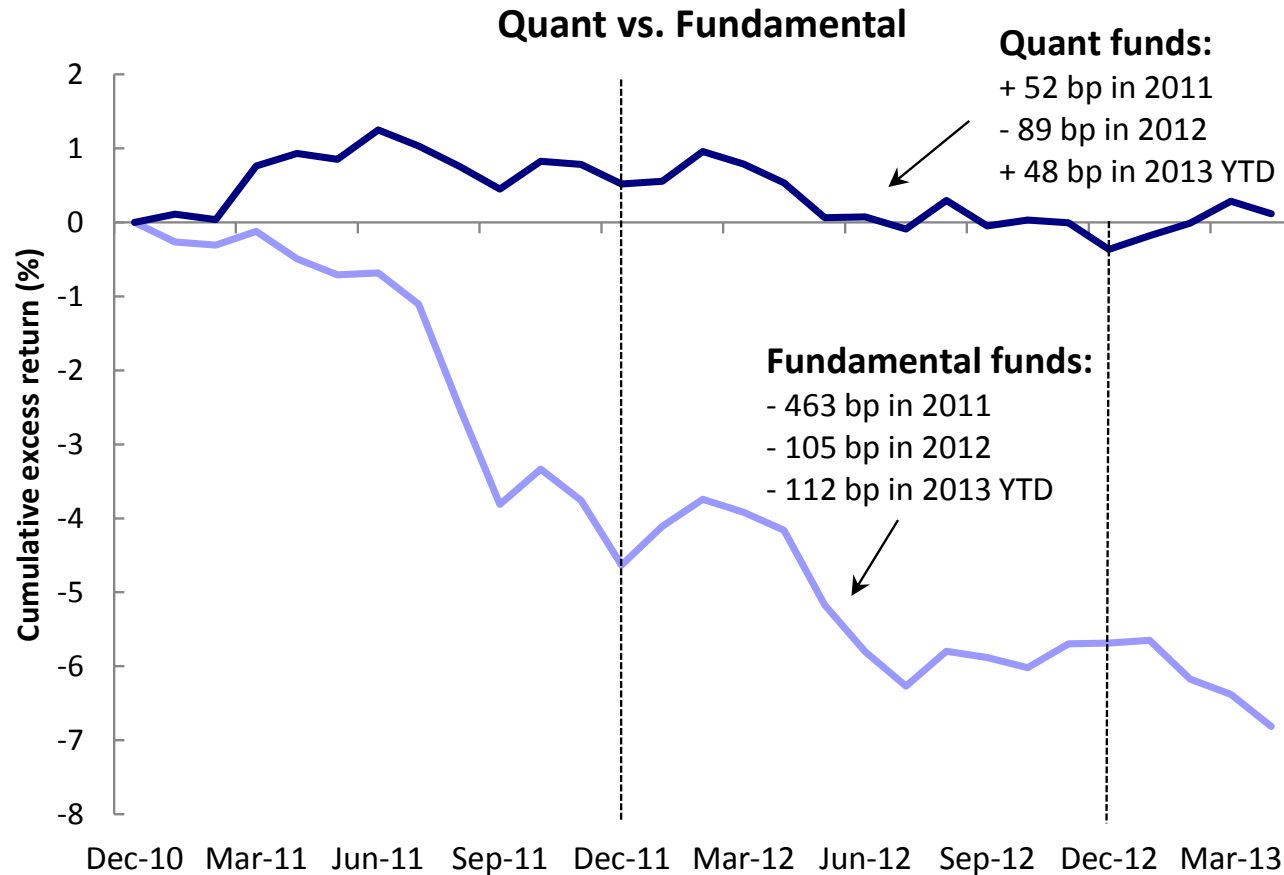
Decade long trend in equity flows: from active to passive



Note: Shows cumulative monthly fund flow into US-equity funds and the breakdown to active funds and passive funds. Period of analysis is from May 2003 through March 2013.

Source: Instinet, EPFR.

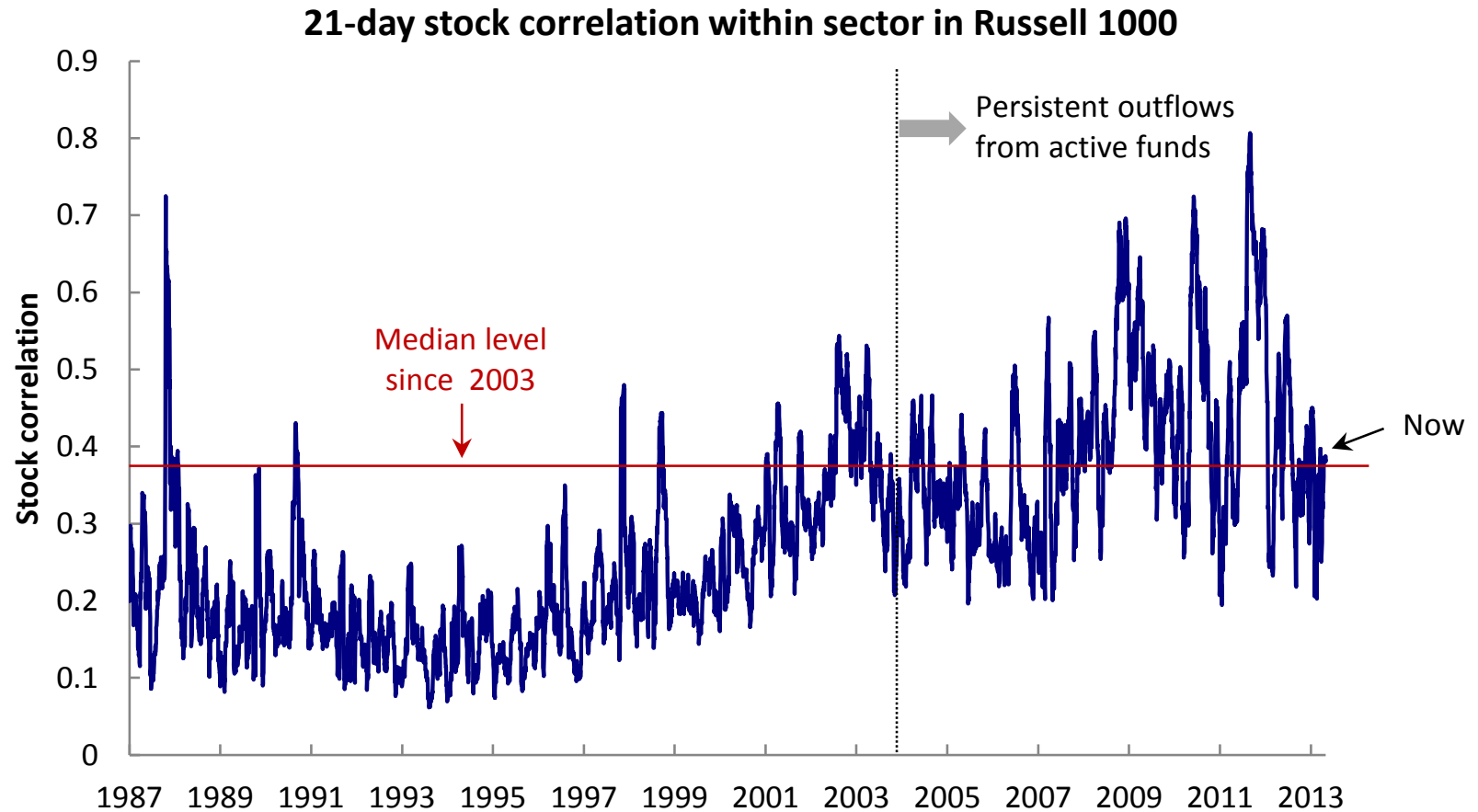
Why pay for poor performance?



Note: Shows cumulative average excess return (relative to the benchmark, after fees) in long-only large-cap core funds based on quantitative methodologies (dark blue line) and long-only large-cap core funds based on fundamental methodologies (light blue line) from January 2011 through April 2013. Currently there are 18 funds in the quant core fund universe and 41 funds in the fundamental core fund universe.

Source: Instinet, Bloomberg.

New normal for correlation – elevated in the past decade

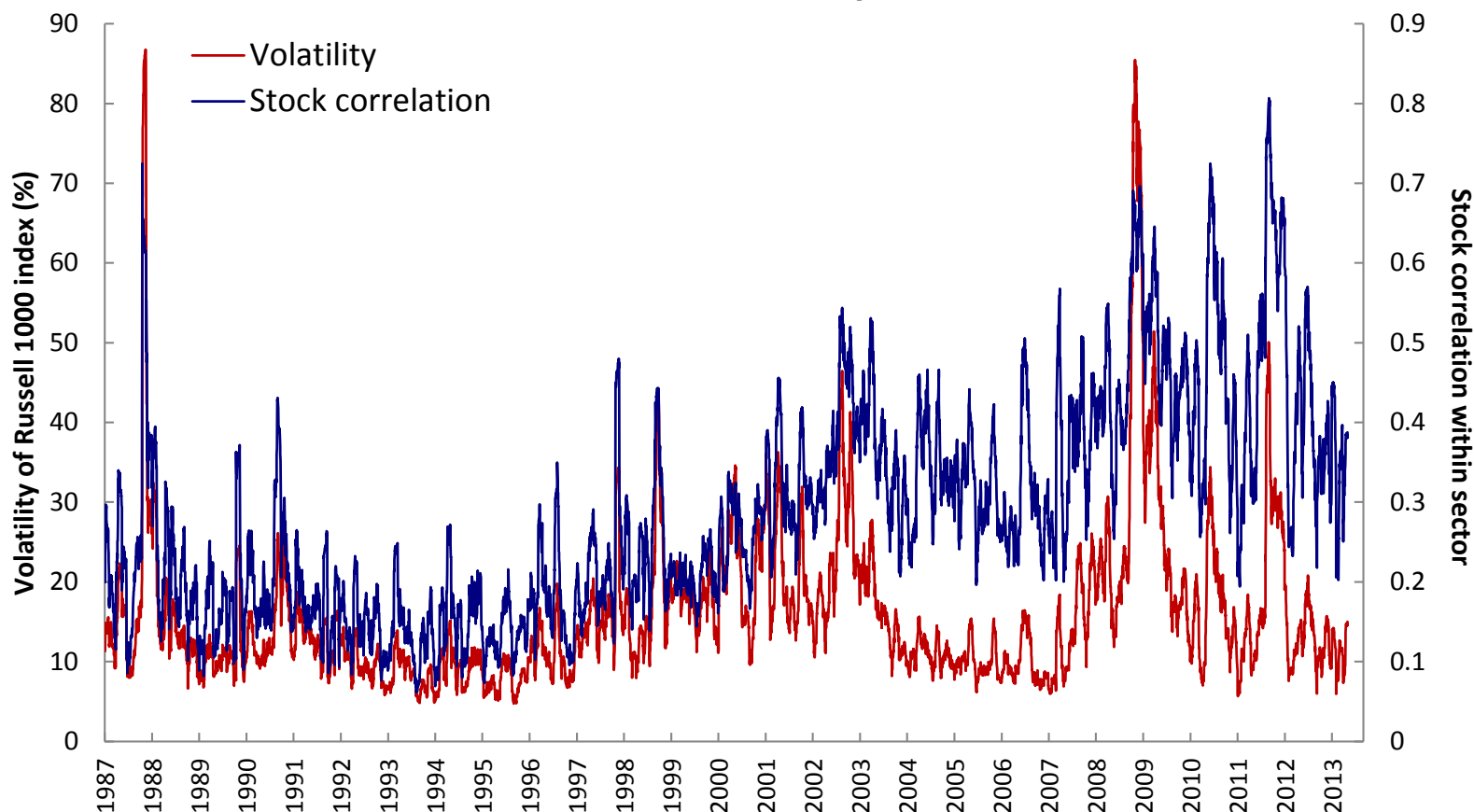


Note: Shows 21-day stock correlation within sector, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in Russell 1000 universe using 21-day total returns and these correlations are averaged over all GICS 10 sectors. Period of analysis is from 2 January 1987 through 1 May 2013.

Source: Instinet, Russell, Compustat, IDC.

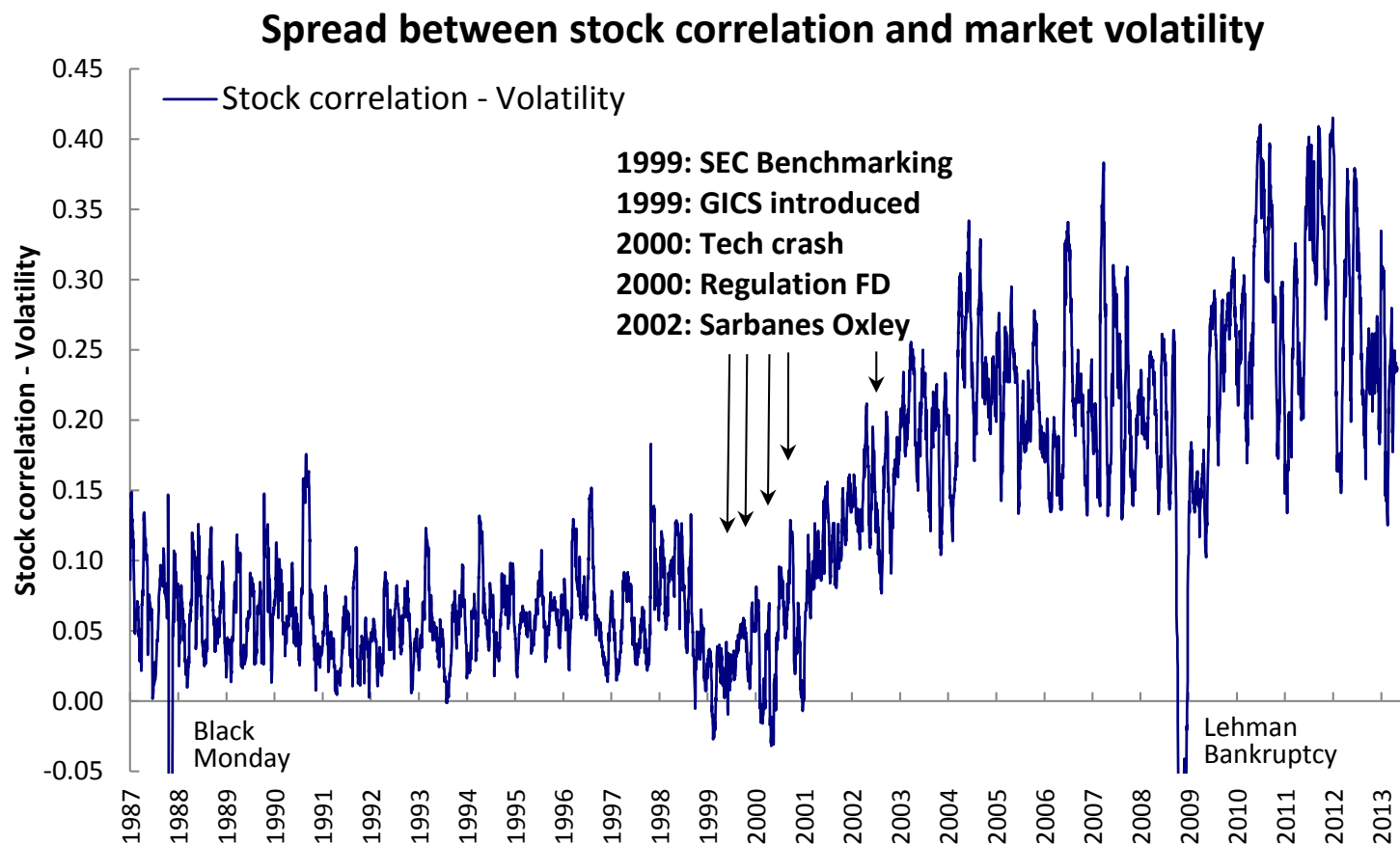
The elevation of stock correlation

Correlation vs. Volatility in the US



Note: Shows 21-day volatility of Russell 1000 index and 21-day stock correlation within sector, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in Russell 1000 universe using 21-day total returns and these correlations are averaged over all GICS 10 sectors. Period of analysis is from 2 January 1987 through 1 May 2013.
Source: Instinet, Russell, Compustat, IDC.

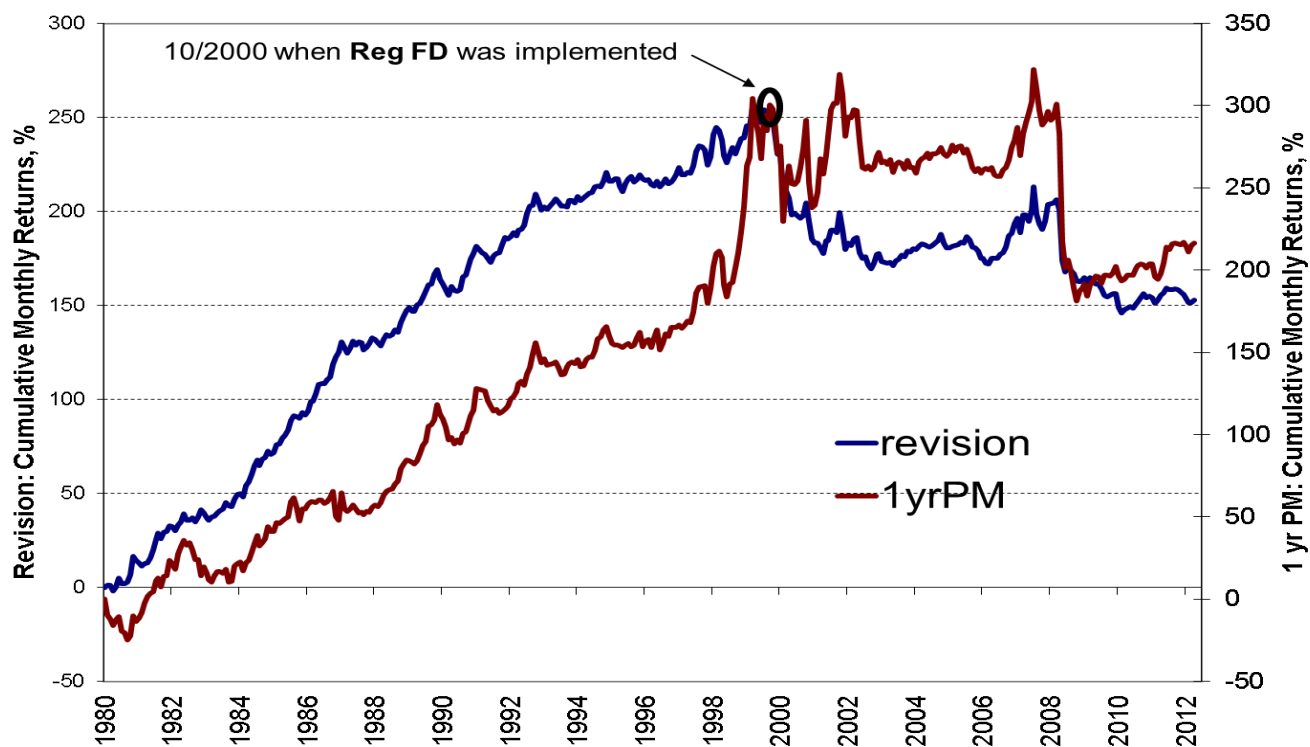
Data liberation & risk model re-think triggered elevation of stock correlation



Note: Shows the spread between 21-day stock correlation within sector and 21-day volatility of Russell 1000 index, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in Russell 1000 universe using 21-day total returns and these correlations are averaged over all GICS 10 sectors. Period of analysis is from 2 January 1987 through 1 May 2013.

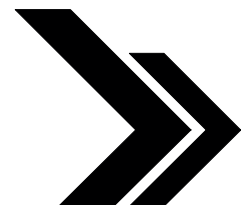
Source: Instinet, Russell, Compustat, IDC.

The power of regulation in harming alpha

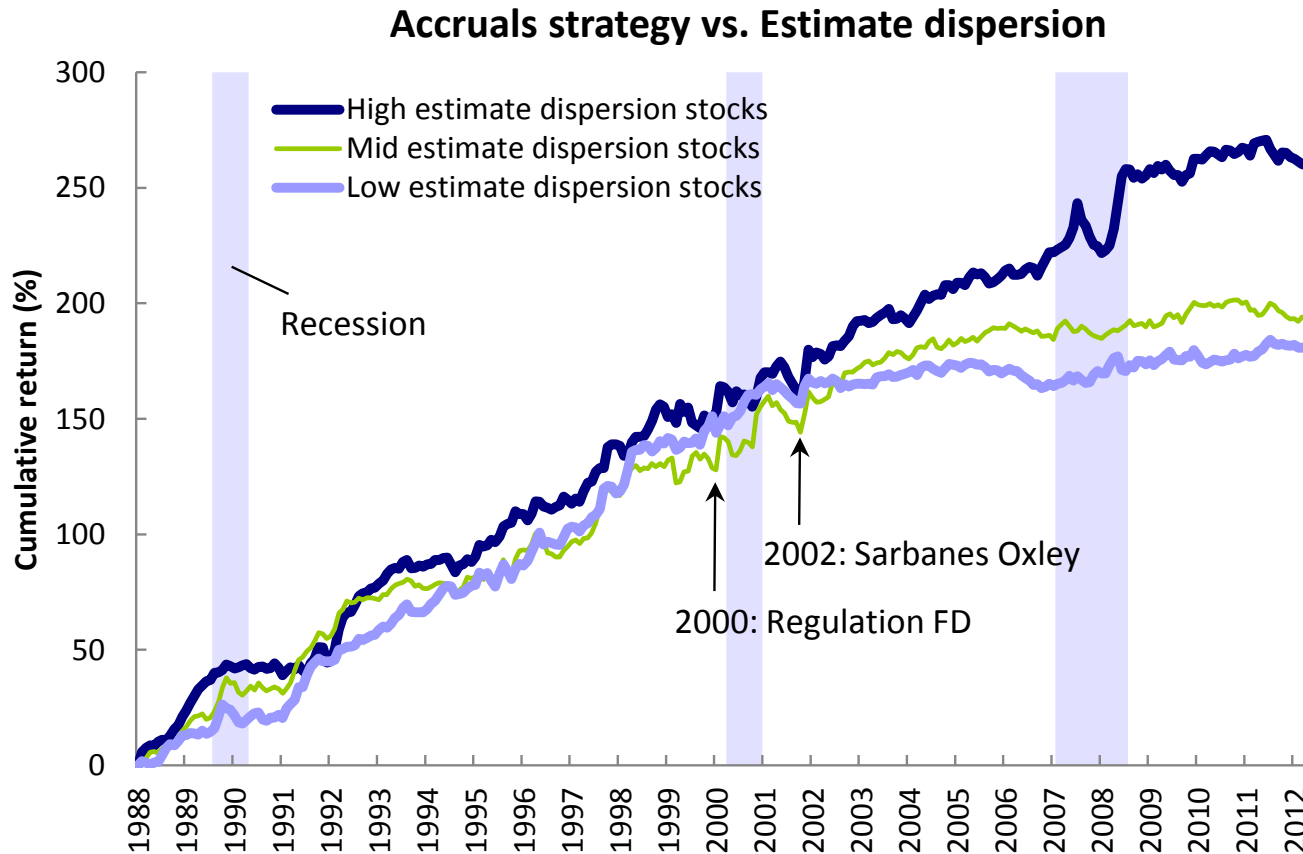


Note: Shows returns to analyst up down revisions (blue line, FY1 I/B/E/S up estimates minus down estimates, divided by total number of estimates) and returns to one-year price momentum (red line, last twelve months' returns minus last month's), excluding transaction costs. Universe is Russell 1000. Last data as of March 2013. Transaction costs are not considered.

Source: Instinet., Compustat, IDC, Russell, I/B/E/S



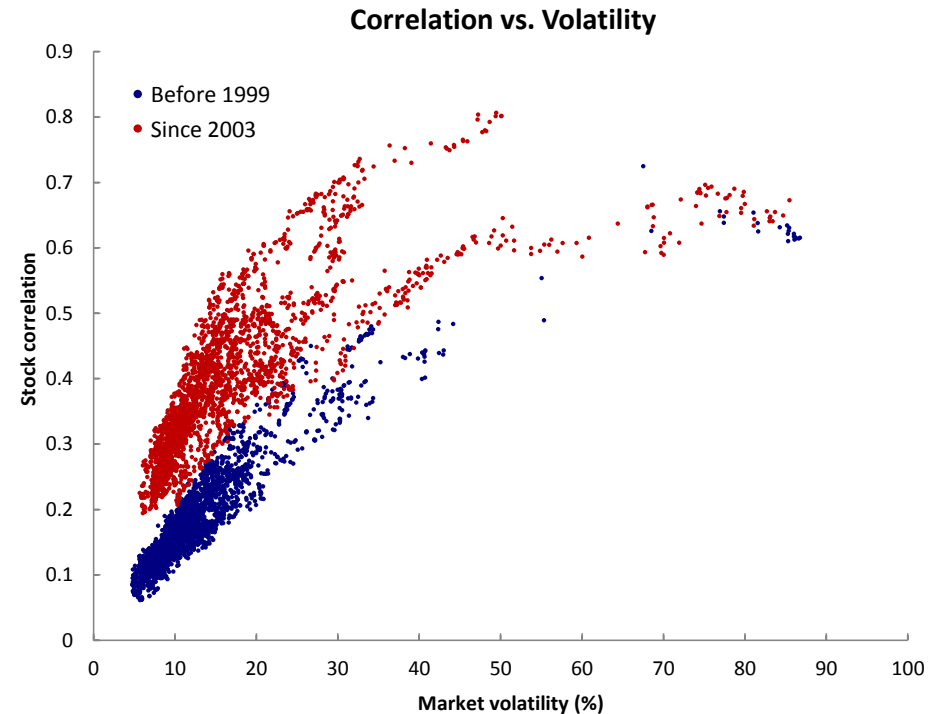
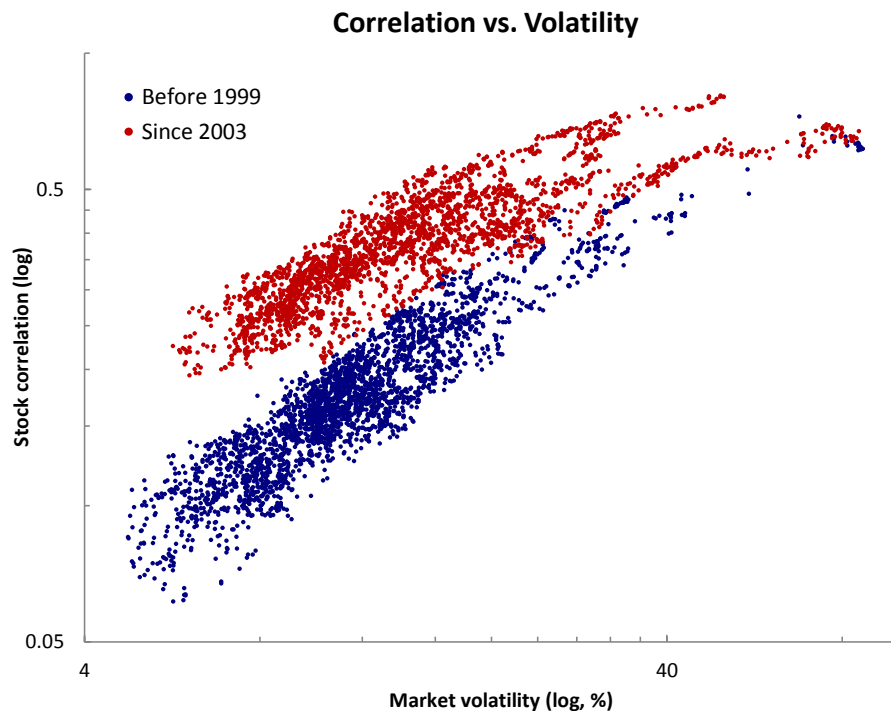
Accruals; Reg FD & increased disclosure of *reliable* financial data



Note: Universe is Russell 3000. Shows cumulative monthly returns to accruals (equally weighted quintile spread) in each of three groups categorized by level of dispersion of analyst estimates for current-year earnings (deflated by the absolute value of mean estimate). Accruals are based on Sloan's (1996) definition using three-month change in trailing four-quarter average in financial statements, not using 12-month change in annual financial statements as Sloan originally used. Period of analysis is from January 1989 through April 2013. Transaction costs are not considered.

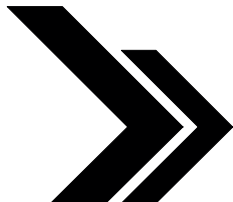
Source: Instinet, Compustat, IDC, Russell, I/B/E/S, NBER.

Correlation as function of volatility; elevated in the past decade

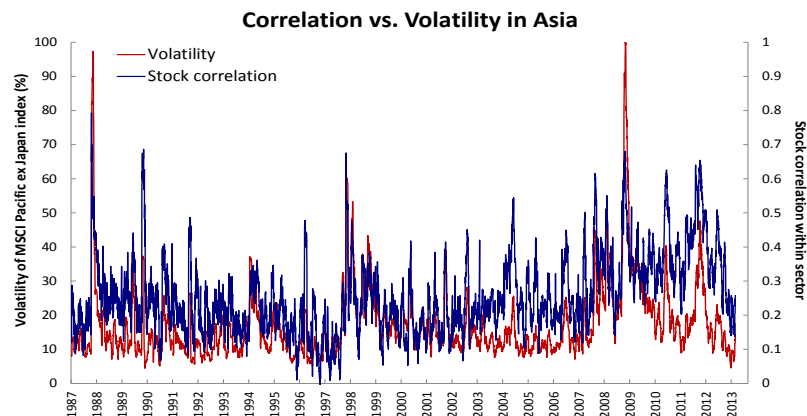
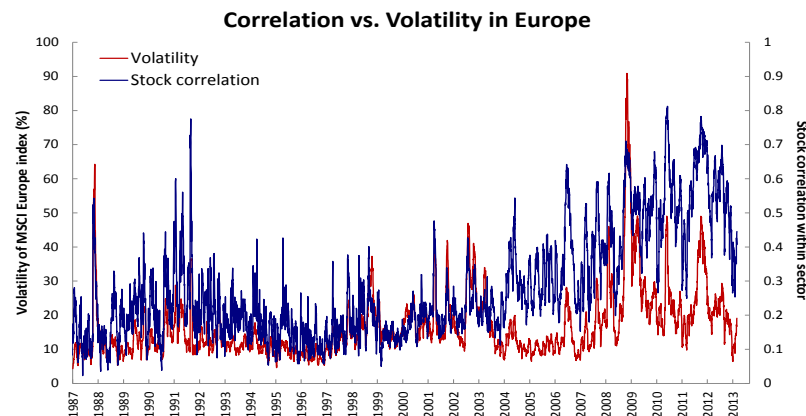
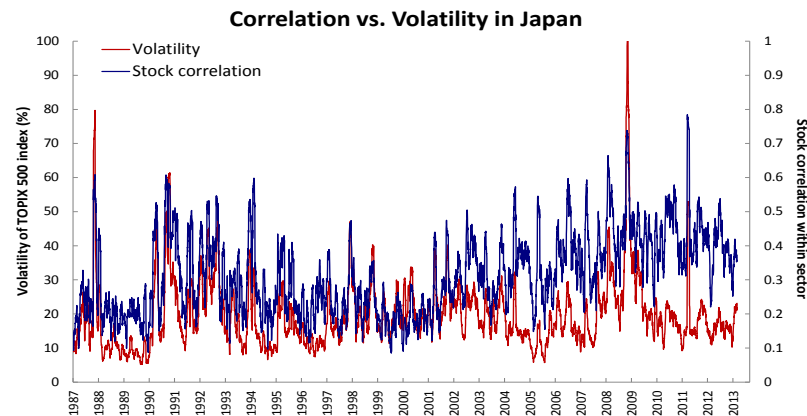
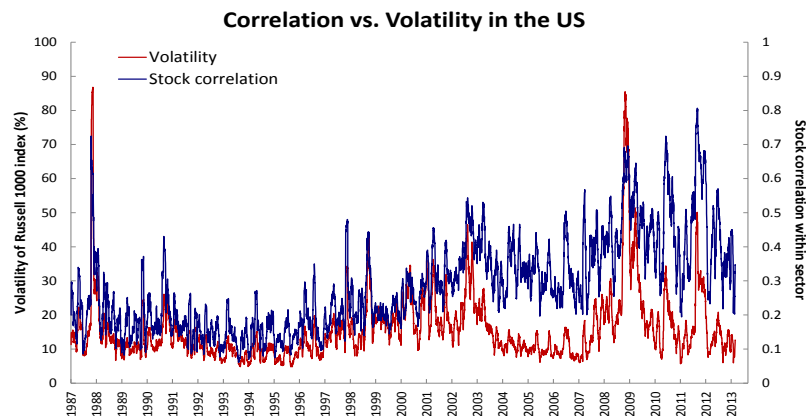


Note: Shows scatter plots based on daily time-series data of 21-day volatility of Russell 1000 index and 21-day stock correlation within sector, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in the Russell 1000 universe using 21-day total returns and these correlations are averaged over all GICS 10 sectors. Dark blue dots correspond to data from January 1987 through December 1998, while red dots correspond to data from January 2003 through 1 May 2013. Left panel uses log scale for both axes, while bottom panel uses linear.

Source: Instinet, Russell, S&P, Compustat, IDC.



Stock correlation vs. market volatility in developed markets



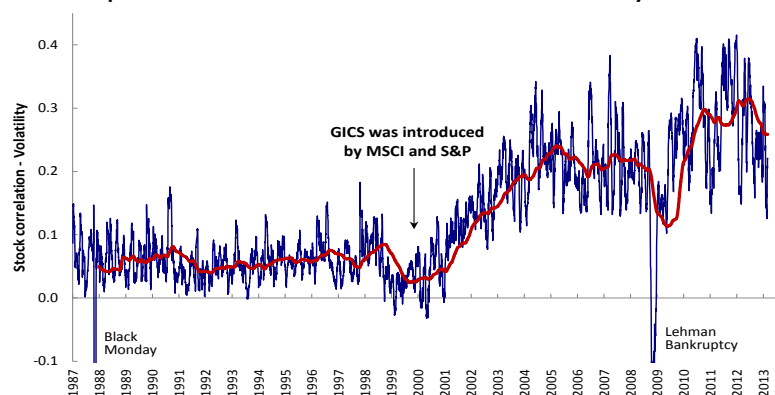
Note: Shows 21-day volatility of market index (annualized) and 21-day stock correlation within sector in each region, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in the universe and averaged over all GICS 10 sectors. Universes are Russell 1000 for the US, MSCI Europe for Europe, MSCI Pacific ex Japan for Asia, and Nomura 400 before 1993 and TOPIX 500 afterward for Japan. Period of analysis is from 2 January 1987 through 28 February 2013.

Source: Instinet, MSCI, Russell, Compustat, IDC.

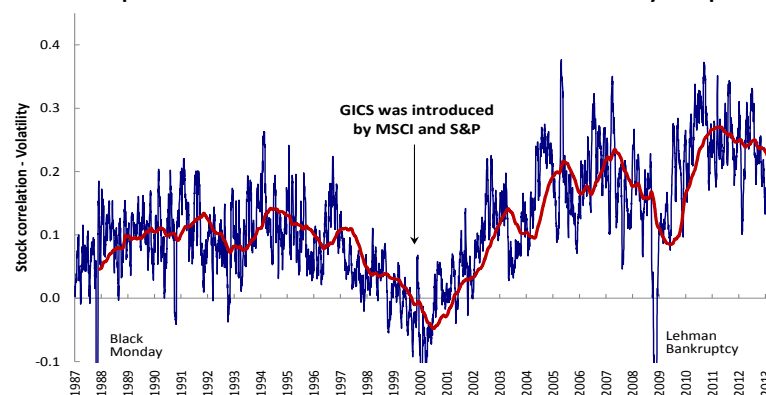


Spread between stock correlation and market volatility in developed markets

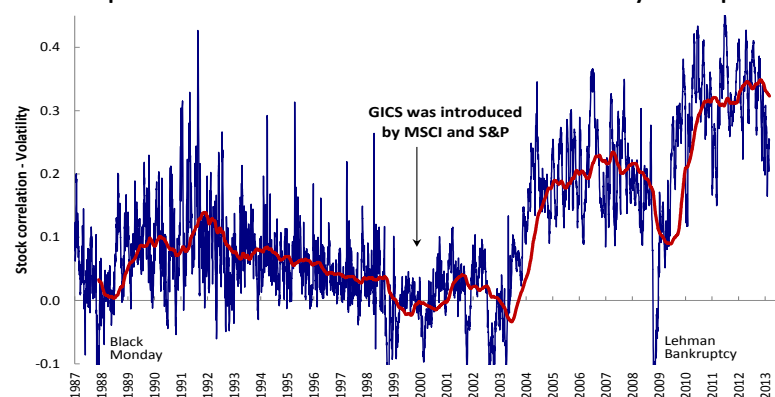
Spread between stock correlation and market volatility in the US



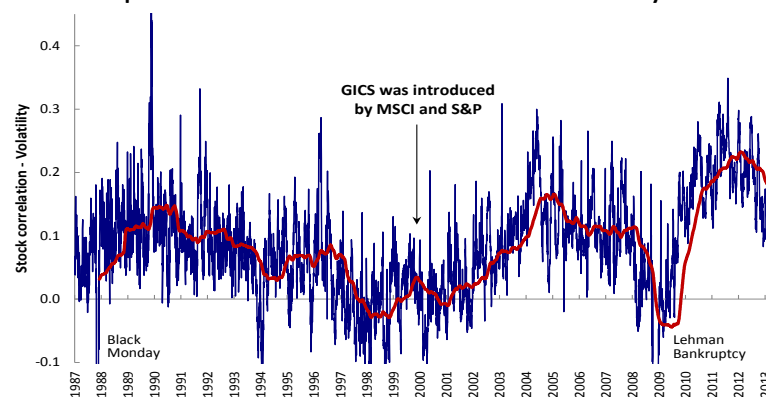
Spread between stock correlation and market volatility in Japan



Spread between stock correlation and market volatility in Europe



Spread between stock correlation and market volatility in Asia

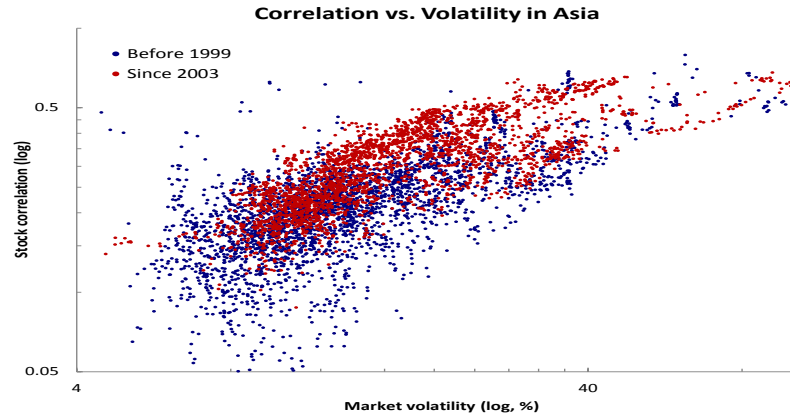
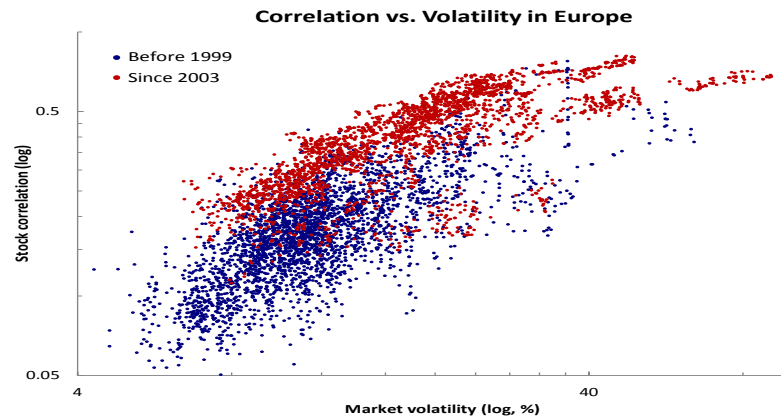
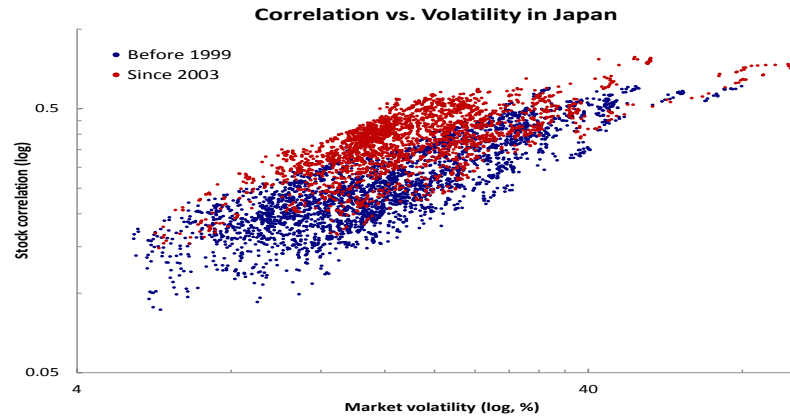
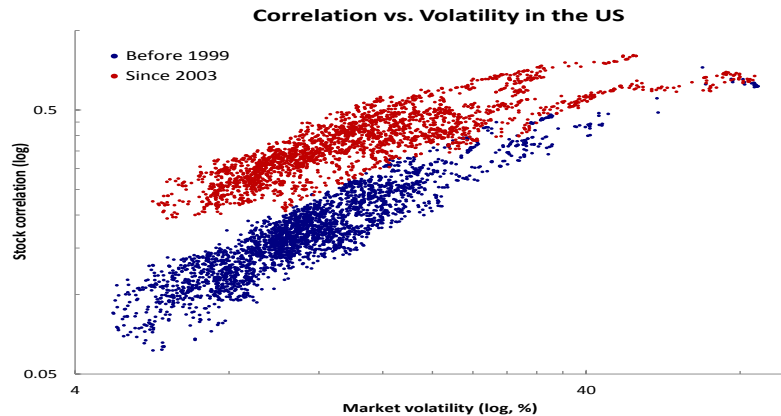


Note: Shows the spread between 21-day volatility of market index (annualized) and 21-day stock correlation within sector in each region, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in the universe and averaged over all GICS 10 sectors. Universes are Russell 1000 for the US, MSCI Europe for Europe, MSCI Pacific ex Japan for Asia, and Nomura 400 before 1993 and TOPIX 500 afterward for Japan. Period of analysis is from 2 January 1987 through 28 February 2013.

Source: Instinet, MSCI, Russell, Compustat, IDC.



Correlation as function of volatility has been elevated in the past decade across developed markets

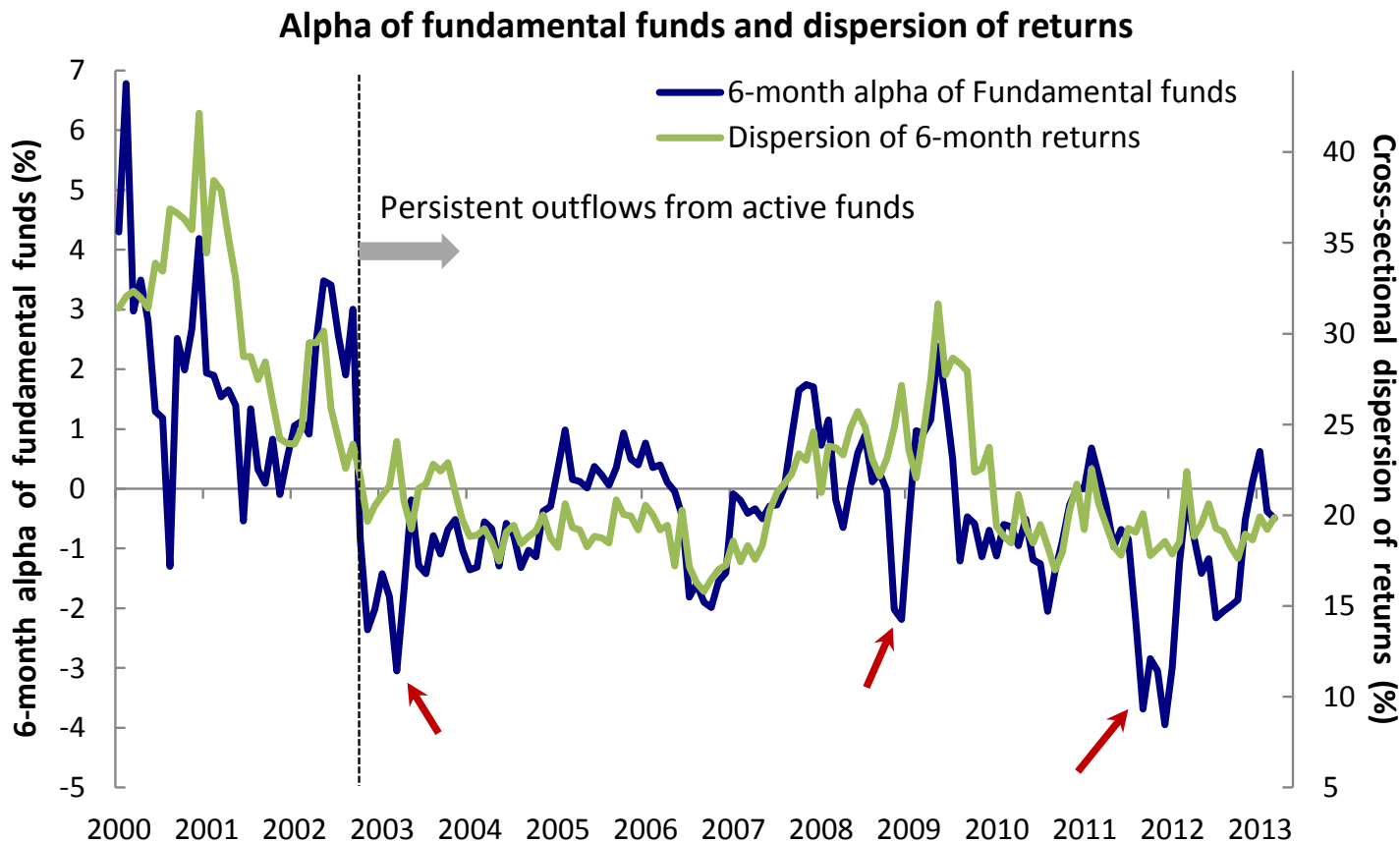


Note: Shows scatter plots based on daily time-series data of 21-day volatility of market index (annualized) and 21-day stock correlation within sector, where the averages of all pair-wise stock correlations are calculated within GICS 10 sectors in each universe and averaged over all GICS 10 sectors. Universes are Russell 1000 for the US, MSCI Europe for Europe, MSCI Pacific ex Japan for Asia, and Nomura 400 before 1993 and TOPIX 500 afterward for Japan. Dark blue dots correspond to data from January 1987 through December 1998, while red dots correspond to data from January 2003 through 28 February 2013.

Source: Instinet, MSCI, Russell, Compustat, IDC.



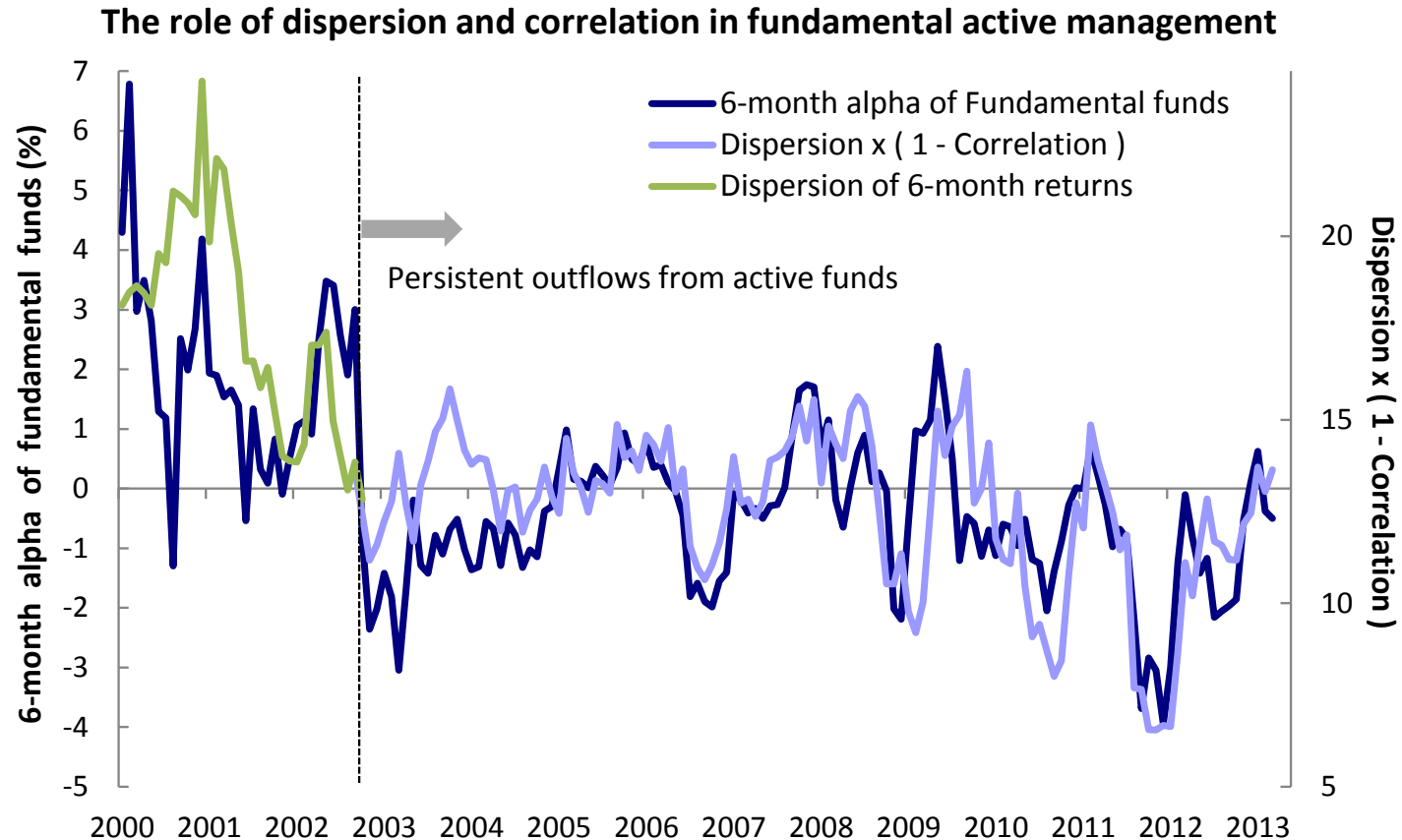
Fundamental performance – stock return dispersion part of the story



Note: Shows six-month rolling excess return (relative to the benchmark, after fees) in large-cap core equity funds (long-only) that are managed based on fundamental methodologies (dark blue line) and the cross-sectional dispersion (standard deviation) of six-month total returns in Russell 1000 (green line). Currently there are 43 funds in this fundamental core universe. Period of analysis is from January 2000 through March 2013.

Source: Nomura Securities International, Inc., Bloomberg, S&P, Russell

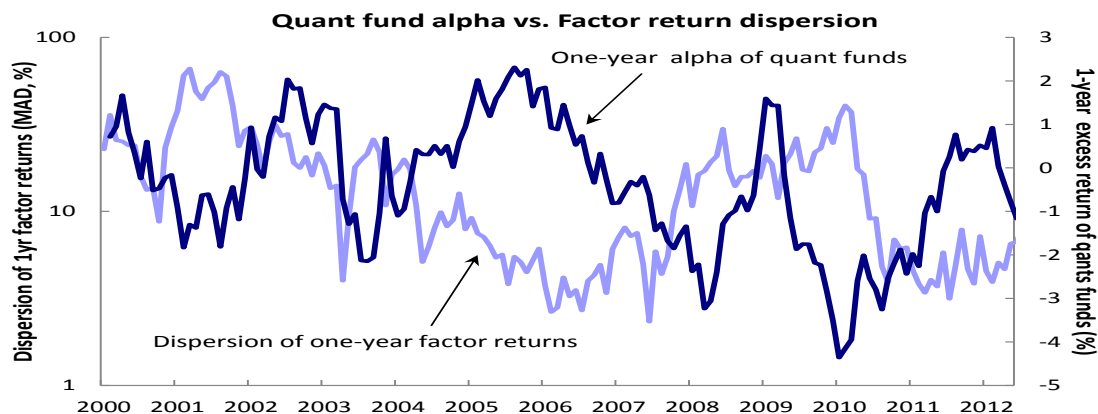
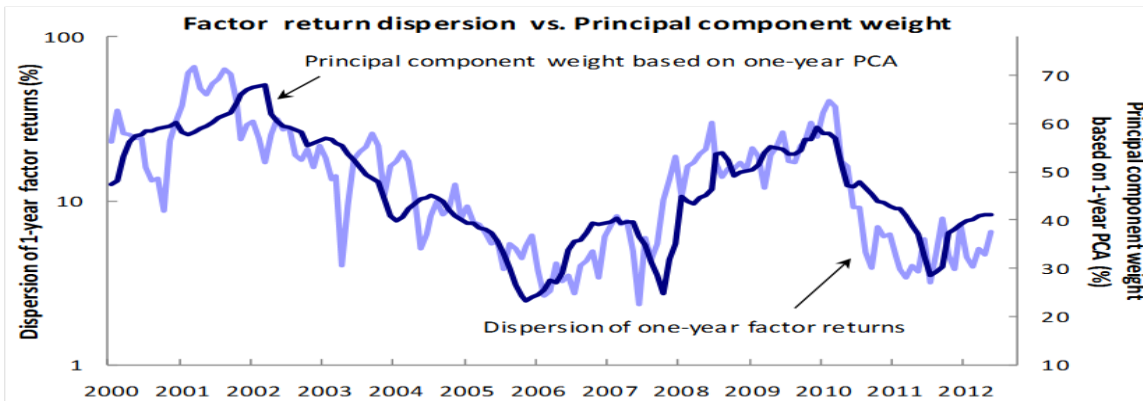
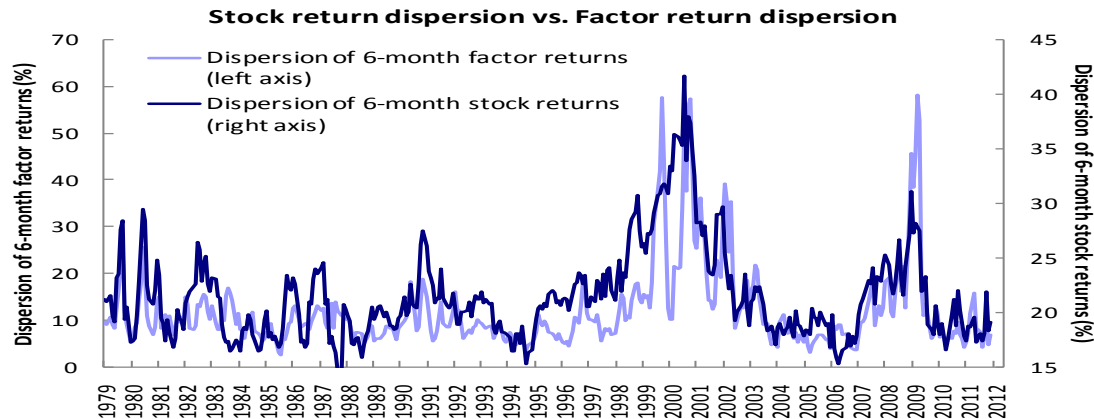
Successful fundamental managers need high return dispersion & low stock correlation



Note: ark blue line shows (1) six-month rolling excess return (relative to the benchmark, after fees) in large-cap core equity funds (long-only) that are managed based on fundamental methodologies, while green line shows (2) cross-sectional dispersion (standard deviation) of six-month total returns multiplied by a constant before 2003. In the bottom panel, light blue line shows (3) cross-sectional dispersion (standard deviation) of six-month total returns multiplied by $(1 - \text{six-month average pair-wise stock correlation})$ in the Russell 1000 since 2003. Currently there are 41 funds in this fundamental core fund universe. Period of analysis is from January 2000 through March 2013

Source: Instinet, Bloomberg, Russell, Compustat, IDC

Factor return dispersion and quant performance

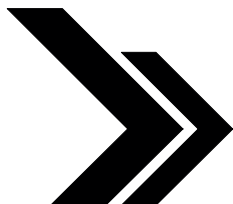


Note: (Top) Shows standard deviation of one-year stock return in Russell 1000 (after excluding anomalous returns over 100%) and standard deviation of one-year factor returns based on 22 representative factors in Russell 1000

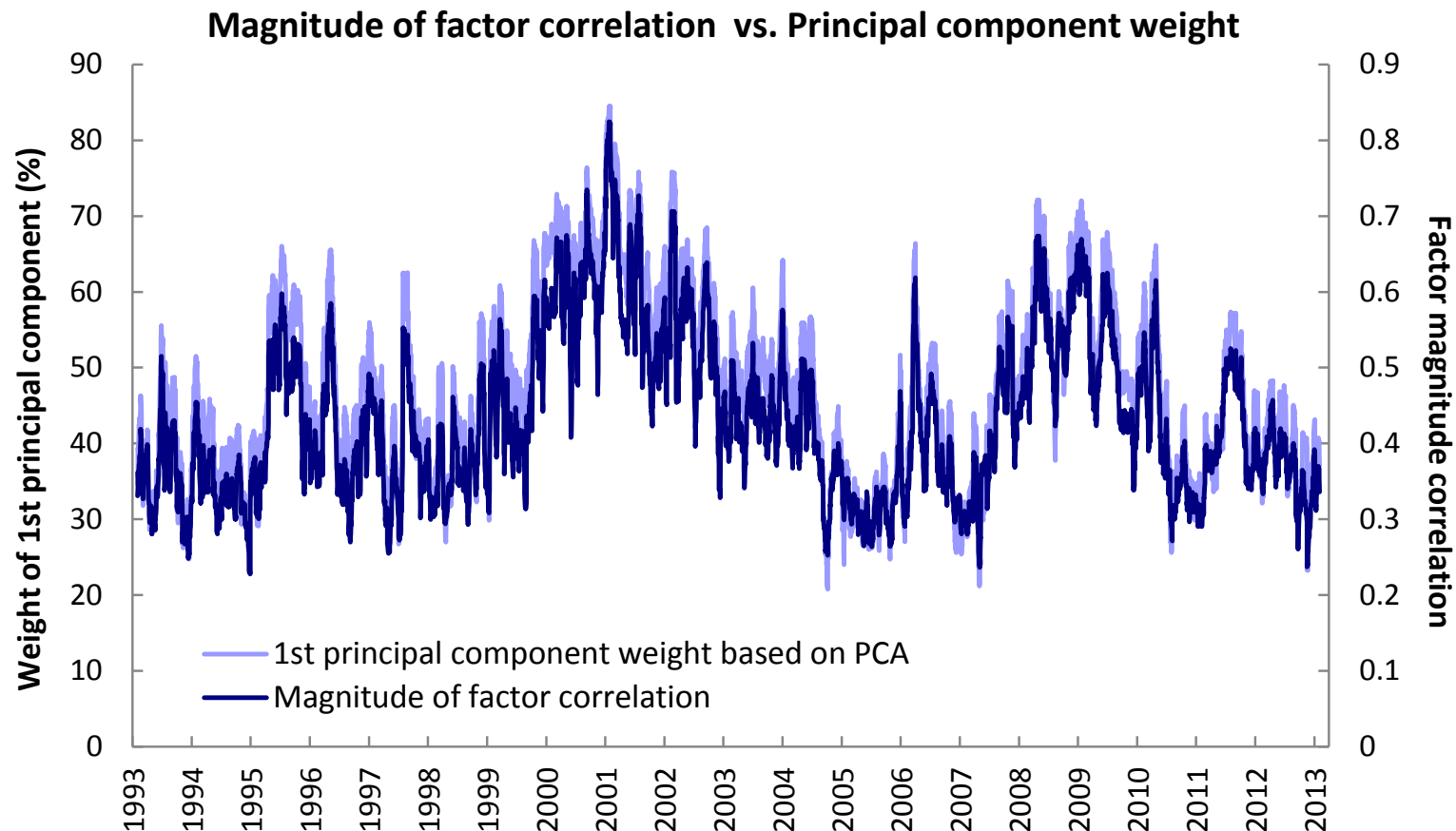
(Middle) Shows MAD (median absolute deviation) of one-year factor returns based on 22 representative factors in Russell 1000 as factor return dispersion, overlaid with one-year rolling excess return (relative to the benchmark) in large-cap core equity funds (long-only) that are managed based on quantitative methodologies as quant fund alpha.

Bottom : Show MAD (median absolute deviation) of one-year factor returns based on 22 representative factors in Russell 1000 as factor return dispersion (light blue line) and the first principal component weight based on one-year (250-day) PCA applied to 22 representative factors in Russell 1000 (dark blue line).

Source: Instinet, IDC, I/B/E/S, Compustat, Russell.
Period of analysis is from January 2000 through May 2012.



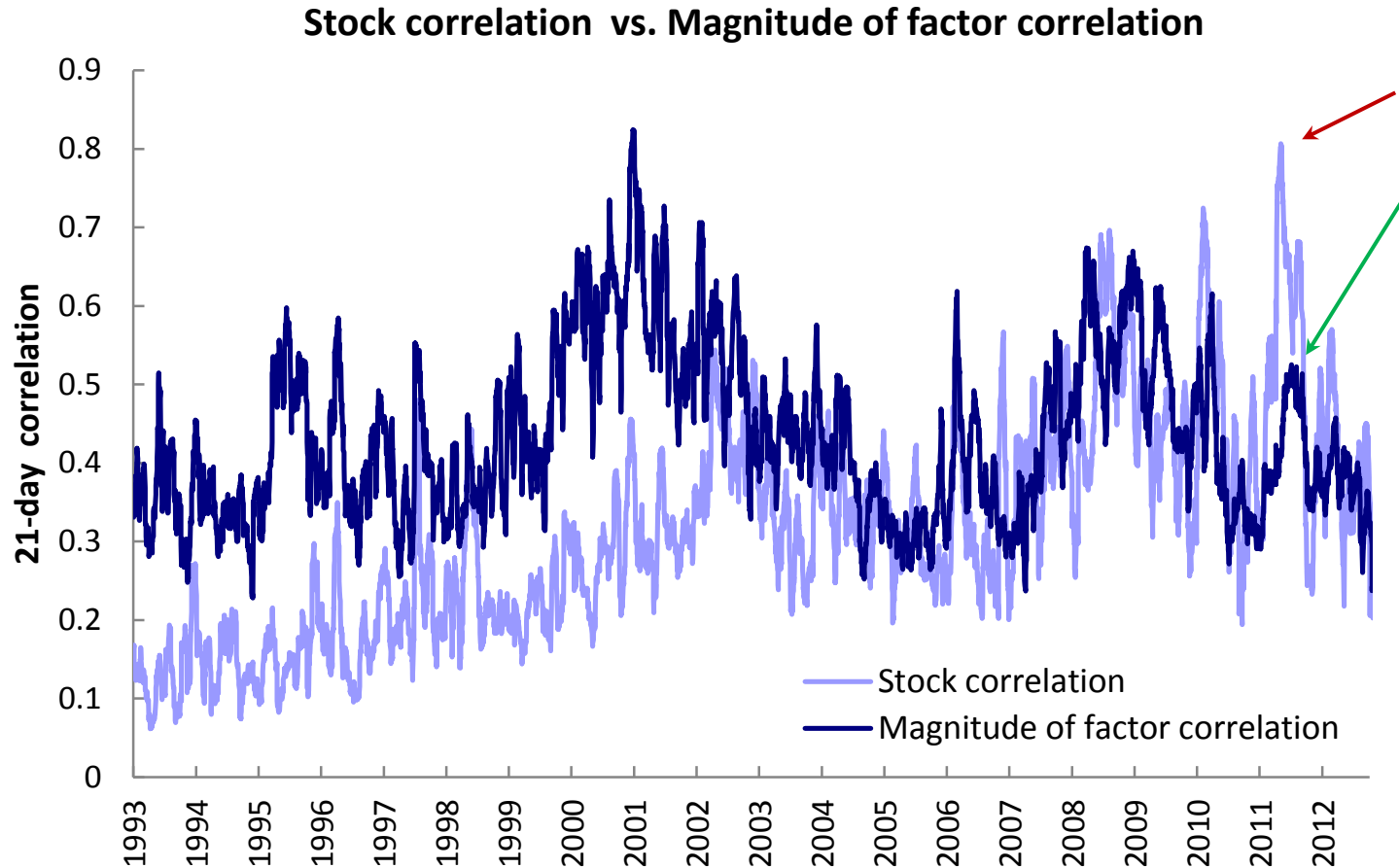
Magnitude of the correlation of factor returns matters for diversity



Note: Shows weight of first principal component based on 21-day PCA using 22 representative factor returns (light blue line) together with 21-day pair-wise absolute factor correlation based on 22 representative factor returns in Russell 1000 universe (dark blue line). Period of analysis is from 30 April 1993 through 1 May 2013.

Source: Instinet, S&P, Russell, I/B/E/S, Compustat, IDC.

Stock correlation and magnitude of factor correlation not in synch

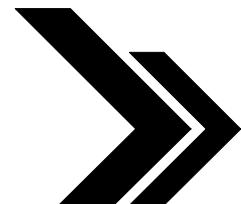


Note: Light blue line shows average of 21-day stock correlation within sector (GICS 10 sector) in Russell 1000 universe, while dark blue line shows the average of 21-day all pair-wise absolute factor correlation among 22 representative factor returns in Russell 1000 universe. Period of analysis is from 30 April 1993 through 1 May 2013.

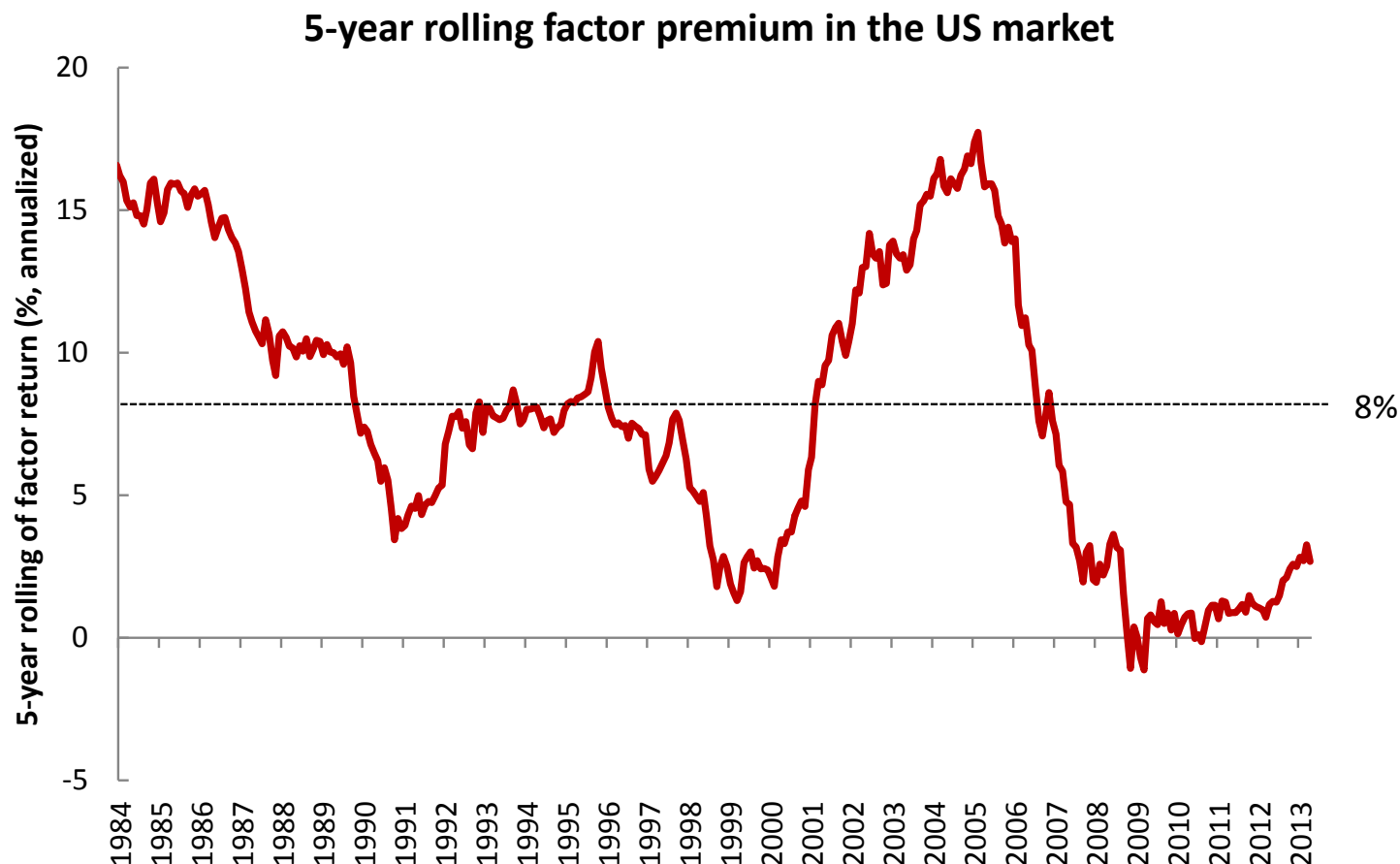
Source: Instinet, Russell, Compustat, I/B/E/S, IDC.

Fundamental investors & quant investors reap different payoffs from the market

- Fundamental managers find idiosyncratic opportunity to accrue alpha**
- Quant managers harvest factor premium**



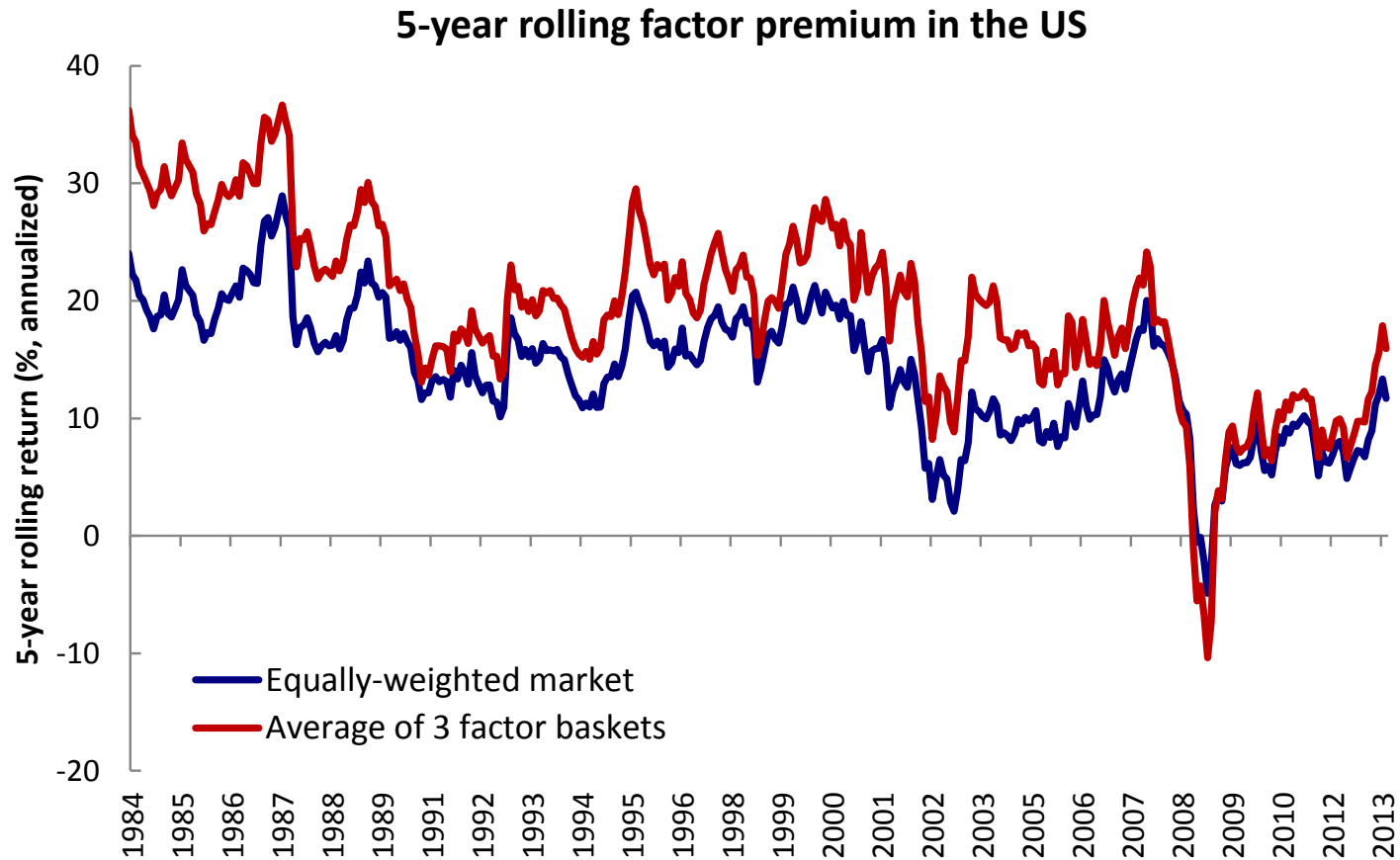
Passive (*long-short*) factor premium has shrunk



Note: Shows five-year rolling annualized returns of averaged 3 factor premia (one-year price momentum, value, and small-cap premium) based on decile spreads in the Russell 1000. Value premium is average of B/P and predicted E/P factor returns. Period of analysis ranges from January 1990 through April 2013.

Source: Instinet, Russell, S&P, I/B/E/S, Compustat, IDC, Bloomberg.

Passive (long-only) factor premium has shrunk



Note: Shows five-year rolling annualized returns of averaged 3 factor long-side baskets (one-year price momentum, value, and small-cap premium) based on equal-weighted decile basket in the Russell 1000. Value basket return is based on average performance of B/P and predicted E/P long-side baskets. Period of analysis ranges from January 1984 through April 2013.

Source: Instinet, Russell, S&P, I/B/E/S, Compustat, IDC, Bloomberg.

CART to identify momentum regime

QUANTITATIVE DESK STRATEGIES

Decision rules to forecast momentum

NOMURA

4 September 2012

Quantitative strategists

Joseph J. Mezrich

joseph.mezrich@nomura.com

1-212-667-9316

Yasushi Ishikawa

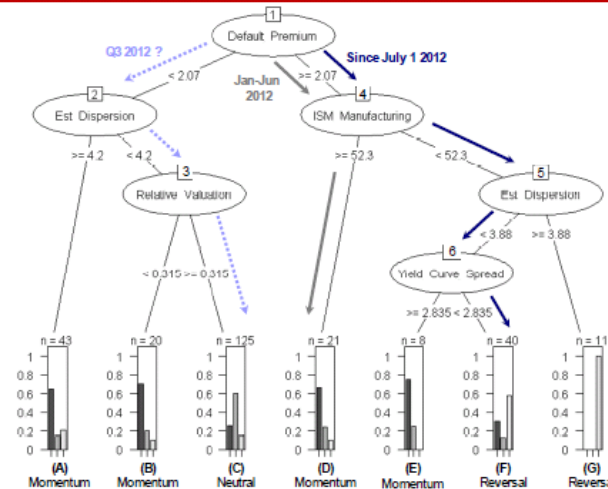
yasushi.ishikawa@nomura.com

1-212-667-1562

Nomura Securities International, Inc.
2 World Financial Center, Building B
New York, N.Y. 10281-1198

- In this note we present a model for forecasting price momentum return using statistically derived decision rules based on a classification and regression tree (CART) algorithm. The model features a "decision tree" that starts by asking whether the market regime is categorized by high or low default risk, and then, in subsequent steps, poses if/then questions that further define the market regime and ultimately lead to a forecast conclusion.
- Importantly, the model's input variables make intuitive sense in terms of investor behavior and are context-dependent—i.e., they change according to the market environment. The model thus differs from multifactor forecast models that assume constant relevancy of variables.
- We show that this model would have predicted the recent reversal of momentum in July 2012 and would have avoided the historic collapse of momentum in 2009. The model is effective for deploying momentum, raising the IR for momentum fourfold in 1990-2012.

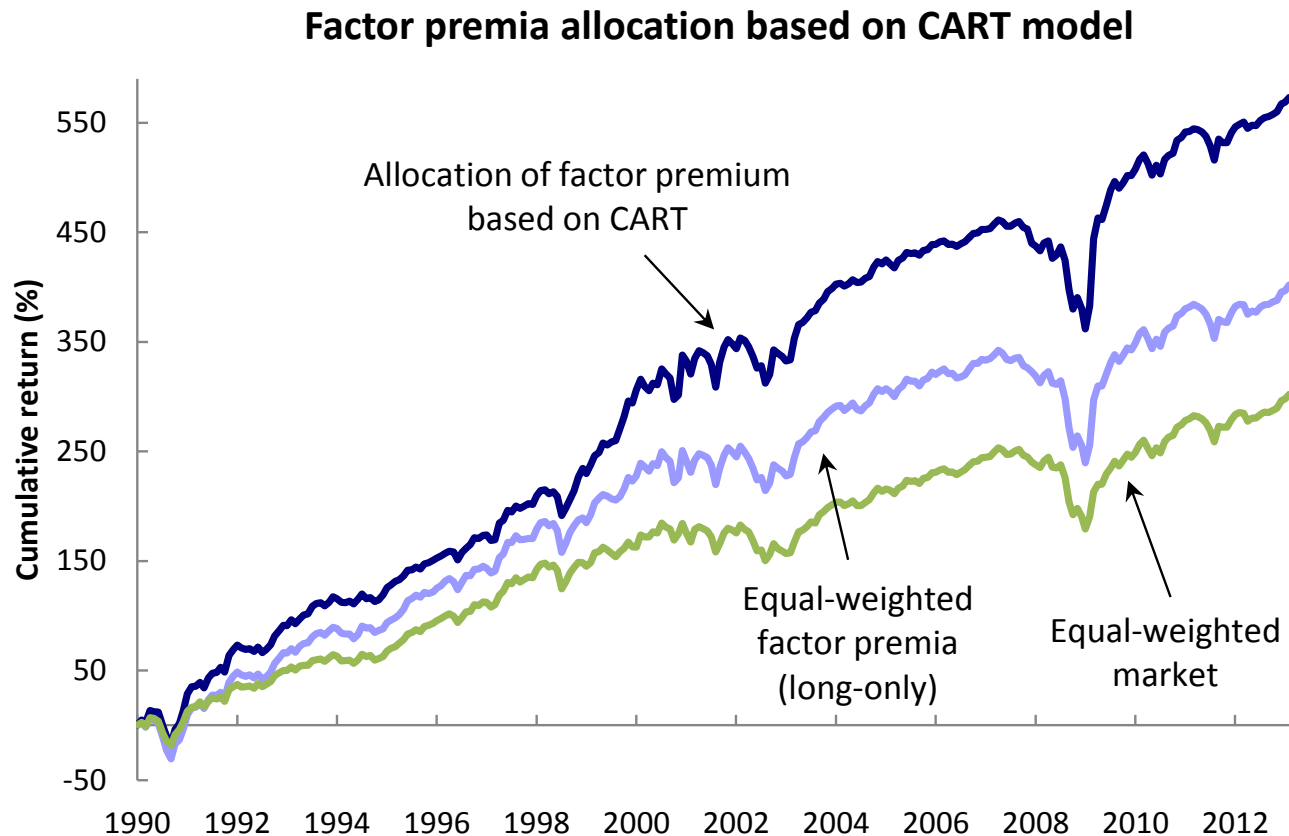
Decision tree to forecast momentum



Note: Shows decision tree for momentum in the Russell 1000 based on CART (Classification and Regression Tree) algorithm using data from January 1990 through July 2012. Three-month forward return of one-year price momentum, which is defined as equal-weighted decile spreads in the Russell 1000 universe, is classified into three regimes: greater than 4% ("momentum"), less than -4% ("reversal"), and between -4% and 4% ("neutral"). Each node queries the macro economic conditions in the beginning of each month, and bar charts at the bottom show the distribution of historical momentum outcomes in the data sample for each terminal node.

Source: Nomura Securities International, Inc., Russell, IDC, S&P, Exshare, I/B/E/S, Bloomberg.

Apply factor investing techniques to a new investment target



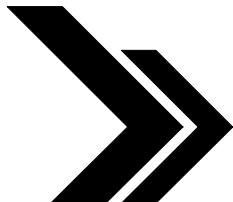
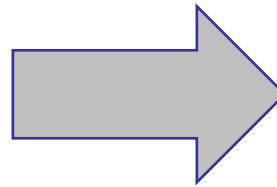
Note: Shows cumulative performance of tactical factor premium allocation to momentum, value, and small cap premia, based on CART (Classification and Regression Tree) using data from January 1990 to April 2013, overlaid with equal weighted factor premia (long-side decile baskets). Value basket is composed of B/P and predicted E/P baskets. Cumulative performances in both charts range from January 1990 through April 2013.

Source: Instinet, Russell, S&P, I/B/E/S, Compustat, IDC, Bloomberg.

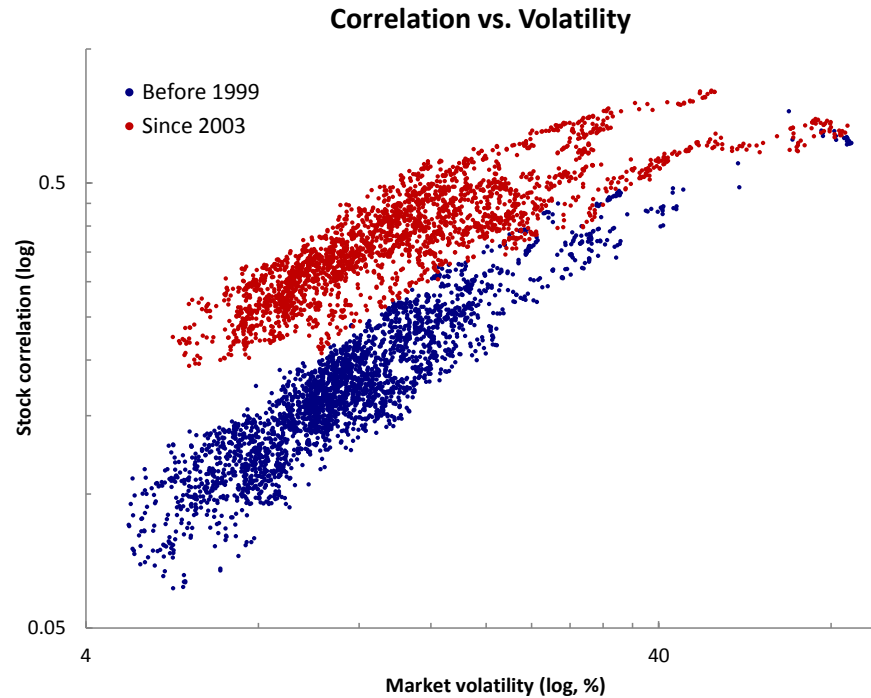
The institutional investment paradigm is in motion

Equity Style Box

Large			
Medium			
Small			
	Value	Blend	Growth

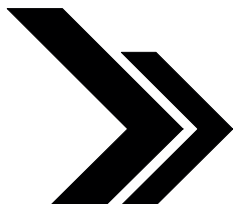


Conclusion



Source: Instinet, Russell, S&P, Compustat, IDC.

- **Paradigm shift due to reduced alpha opportunity**
- **Enter risk premium harvesting / alternative beta**
- **A growing opportunity for quant managers**



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