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An IQ Test for the "Smart Money"

Is The Reputation of Institutional Investors Warranted?

Authors

Vivian Ning, CFA
Quantamental Research
312-233-7148
vning@spcapitaliq.com

Dave Pope, CFA
Managing Director of
Quantamental Research
617-530-8112
dpope@spcapitaliq.com

Li Ma, CFA
Quantamental Research
312-233-7124
lma@spcapitaliq.com

Institutional investors as a group are often referred to as the "smart money". Indeed institutional investors tend to be experienced, well-trained and informed, and have considerable resources available to identify and evaluate potential investment opportunities. Academic studies have confirmed that institutions do have a significant impact on future stock performance[1]. The body of literature predominantly focuses on the U.S. market; little has been done for the global market. This work extends the idea of smart money **globally**, leveraging global ownership data from S&P Global Market Intelligence.

This report explores four classes of stock selection signals associated with institutional ownership ('IO'): Ownership Level, Ownership Breadth, Change in Ownership Level and Ownership Dynamics. It then segments these signals by classes of institutions: Hedge Funds, Mutual Funds, Pension Funds, Banks and Insurance Companies. The study confirms many of the findings from earlier work – not only in the U.S., but also in a much broader geographic scope - that Institutional Ownership may have an impact on stock prices. The analysis then builds upon existing literature by further exploring the benefit of blending 'IO' signals with traditional fundamental based stock selection signals.

In this research we construct factors based on ownership information and then combine the factors into a simple model. All factors and models were tested within the Russell 3000 Index and S&P Global Broad Market Index (BMI), as well as specific country BMI indices, over the June 2004 to December 2015 period.

- **Among the four classes of 'IO' signals, Ownership Dynamics showed the greatest efficacy, both on the long and the short side** [Exhibit 3], after controlling for value, market, size and momentum, and across all geographies (except Japan) [Exhibit 4].

- **In the U.S, 'IO' signals showed varying strength depending on the class of the institution** [Exhibit 6]. Factors constructed based on Hedge Fund activity yielded the strongest results, while those based on Bank and Insurance Companies holdings yielded the weakest.

- **Results generated by larger institutional investors were stronger than those generated by smaller institutional investors**, independent of institution type [Exhibit 7].

- **In examining institutional ownership signals among non-U.S. countries/regions, we observed statistically significant return spreads** – although the factors are generally less effective compared to those in the U.S [Exhibit 8].

- **Strategies constructed using ownership data generally show low correlation with signals constructed from fundamental data sets in the U.S** [Exhibit 9]; blending 'IO' signals with fundamental signals improved the annualized information ratio[2] (by 34%), long-only return (by 23%), and long-short return (by 32%) compared to a standalone fundamental strategy among Russell 3000 companies [Exhibit 10].

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[1] See Lichtenberg and Pushner (1994); Sasaki and Yonezawa (2000); Miyajima, et al., (2002); Sakai and Asaoka (2003); Gompers and Metrick (2001); Ovtcharova (2003); Jiambalvo (2002); Cai and Fang (2003); Chen, Hong, and Stein (2002); Dimitrov and Gatchev (2010); Dimitrov and Gatchev (2010).

[2] Information Ratio calculated on monthly excess returns to the volatility of those returns.

1. Introduction

Institutional investors have increased their holdings of global equities over the last two decades [Exhibit 1]. Since 2005, institutions have held over 70% of all publicly listed stocks in the U.S, with a modest uptrend over time. In developed European countries, Japan, and emerging countries, institutional holdings, while significantly lower than in the U.S., have increased by over 60% since 2005. We have also observed an increase in the number and diversity of institutional investors [Appendix A].

Exhibit 1: Global Aggregated Institution Ownership[3]
Russell 3000 and S&P Global BMI Indices (January 2005 – December 2015)
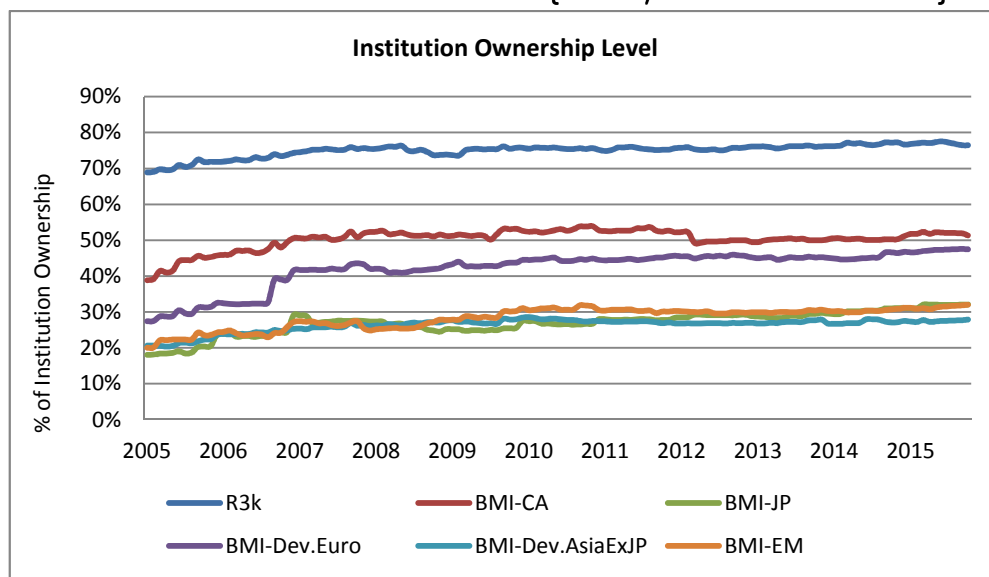
Source: S&P Global Market Intelligence Quantamental Research[4]. Results are as of 12/31/2015.

Institutional investors' large global presence has a considerable influence on both corporate decisions [increased monitoring, voting, regulatory initiatives, and ownership engagement] and stock price behavior[5] [improved efficiency of financial markets]. Although there is a growing body of empirical research on the relation between institutional ownership and future stock performance, the majority is U.S. focused. One reason may be the poor coverage in the typical database of global ownership data. In this report, we examine institutional ownership using the global ownership data from S&P Global Market Intelligence that collects the ownership information filed by institutional investment firms, mutual funds and insiders/individual owners[6] worldwide.

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[3] The legend in the chart represents the following markets - R3k: Russell 3000; BMI-CA: Canada BMI; BMI-JP: Japan BMI; BMI-Dev.Euro: BMI Developed mkt. Europe; BMI-Dev.AsiaExJP: BMI Developed mkt. Asia Ex Japan; BMI-EM: BMI Emerging mkt.

[4] The data date for all exhibits in this report is as of 12/31/2015, unless otherwise indicated.

[5] See Shelifer and Vishny (1986); Chen et al. (2007); An and Zhang (2013)

[6] See Appendix B and C for the information and coverage on ownership data from S&P Global Market Intelligence.

2. Factors Formulation & Testing

We summarized the relevant academic research and identified a number of factors related to institutional ownership. We grouped the 'IO' factors into four categories: Ownership Level, Ownership Breadth, Change in Ownership Level, and Ownership Dynamics. The complete list of factors is shown in Exhibit 2.

Factor Categories	Factor[8]	Description	Ranking
Exhibit 2: Definition of Institutional Ownership based Factors[7]			
Ownership Level	Total Ownership	Percentage of company shares owned by total institutional shareholders.	Descending[9]
	Foreign Ownership	Percentage of shares held by foreign institutional investors.	Descending
Ownership Breadth	Ownership Breadth Stability	Measured by stability of number of buyers or holders. It is a standardized measure of the average number of institutional investors holding a firm's shares.	Descending
	Change in Ownership Breadth	Quarterly change in number of buyers or holders in %; it measures the change of ownership breadth.	Descending
	Stability of Change in Ownership Breadth	Ratio of change in breadth to the standard deviation of the change.	Descending
Change in Ownership Level	Change in Ownership Level - HF[10]	Change in percent of ownership in Hedge Funds.	Descending
	Stability of Change in Ownership Level - HF	Ratio of change in ownership level in HF to the standard deviation of the change.	Descending
Ownership Dynamics	Ownership Concentration	Ratio of shares held by top 5 institutional investors to shares held by all institutional investors.	Ascending
	Ownership Turnover	Absolute change in shares held by institutional investors to total shares held by all investors.	Ascending
	Investment Duration	Weighted average length of time that institutional investors have held a stock in their portfolios.	Descending
	Net Arbitrage Trading	Defined as the difference between the change of hedge fund holdings and the change of short interest on a stock.	Descending
	Institutions' Best Ideas	Defined as each security's aggregated weight in all mangers' portfolios. It represents portfolio managers' favorite pick.	Descending

Source: S&P Global Market Intelligence Quantamental Research.

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[7] Appendix E shows the explanation for complete list of factors.

[8] Abbreviation for each IO factor is listed in Appendix D.

[9] Descending implies companies with higher factor values are preferred.

[10] HF: Hedge Fund

2.1 Backtest Results – U.S.

We tested these 'IO' factors to determine their effectiveness within the Russell 3000 index. The summary results are detailed in Exhibit 3.

NOTE: All returns presented in this paper are equal-weighted, Winsorized to 3 standard deviations and denominated in USD, unless otherwise stated. Top quintile (Q1) active and long/short return spreads are calculated based on the top and bottom quintiles for each factor. The hit ratio[11] for each performance metric is displayed in parentheses.

Exhibit 3: Institutional Ownership Factor Performance Summary Statistics
Russell 3000 (June 2004 – December 2015)

Factor Categories	Factor	1-month Information Coefficient (Hit Ratio)	1-month Long/Short Return Spread (Hit Ratio)	1-month Average Q1 Active Return (Hit Ratio)	1-month Average Q5 Active Return (Hit Ratio)
Ownership Level	Total Ownership	0.024*** [67%***]	0.32%** [62%***]	0.07% [56%]	-0.25%** [35%***]
	Foreign Ownership	0.014** [61%***]	0.03% [53%]	0.08% [53%]	0.05% [53%]
Ownership Breadth	Ownership Breadth Stability	0.030*** [71%***]	0.52%*** [59%**]	0.26%** [61%***]	-0.26%** [41%**]
	Change in Ownership Breadth	0.01** [61%***]	0.19% [56%]	0.12% [61%***]	-0.07% [46%]
	Stability of Change in Ownership Breadth	0.018* [70%***]	0.36%** [67%***]	0.16%** [64%***]	-0.21% [41%**]
Change in Ownership Level	Change in Ownership Level - HF	0.010*** [59%**]	0.19%*** [60%**]	0.28%*** [65%***]	0.09% [58%*]
	Stability of Change in Ownership Level - HF	0.01*** [62%***]	0.29%** [58%**]	0.28%*** [65%***]	-0.01% [46%]
Ownership Dynamics	Ownership Concentration	0.033*** [67%***]	0.36%* [60%**]	0.17%* [58%*]	-0.19%* [36%***]
	Ownership Turnover	0.033*** [72%***]	0.52%** [60%**]	0.27%** [63%***]	-0.25%* [41%**]
	Investment Duration	0.035*** [69%***]	0.58%*** [63%***]	0.31%*** [61%***]	-0.26%*** [37%***]
	Net Arbitrage Trading	0.017*** [71%***]	0.52%*** [63%***]	0.29%*** [64%***]	-0.23%** [42%*]
	Institutions' Best Ideas	0.049*** [66%***]	0.67%** [57%*]	0.43%*** [61%***]	-0.25% [39%**]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

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[11] Hit ratio is defined as the percentage of times the performance metric (e.g. IC, long-only or long-short return spread) is positive.

Over the 11-year test period, most factors posted positive monthly average equal-weighted return spread and Q1 active return. Both metrics for ten of the twelve factors are statistically significant. Nine out of twelve factors had hit ratios over 60% for Q1 active returns, significant at the 1% level. When we measured the factors' performance by information coefficient [IC], we also observed promising summary statistics: average 1-month IC for all twelve factors was statistically significant at 1% to 5 % level; and 1-month IC hit ratio is also significant at the 1% level. Although most factors show alpha on both long and short side, 'Total Ownership Level' [TOL] only works on the short side. Long only investors might use filter techniques to remove securities with negative TOL signals from their long list.

Exhibit 4 shows the results of 'IO' factors after controlling for market, size, value, and momentum risk premia. Most factors [except Foreign Ownership] still delivered positive 1-month return spread and Q1 active return, with statistical significance.

Factor Categories	Factor	1-month Long/Short Return Spread (Hit Ratio)	1-month Average Q1 Active Return (Hit Ratio)	1-month Average Q5 Active Return (Hit Ratio)
Ownership Level	Total Ownership	0.35%** [60%**]	0.07% [55%]	-0.28%*** [33%***]
	Foreign Ownership	-0.01% [56%]	0.10% [57%*]	0.11% [51%]
Ownership Breadth	Ownership Breadth Stability	0.52%*** [61%**]	0.30%** [67%***]	-0.22%** [45%]
	Change in Ownership Breadth	0.25%*** [64%**]	0.23%*** [66%***]	-0.02% [44%]
	Stability of Change in Ownership Breadth	0.11% [59%**]	0.19%*** [64%***]	0.08% [55%]
Change in Ownership Level	Change in Ownership Level - HF	0.29%** [59%**]	0.26%*** [65%***]	-0.03% [48%]
	Stability of Change in Ownership Level - HF	0.33%** [61%**]	0.27%*** [68%***]	-0.06% [48%]
Ownership Dynamics	Ownership Concentration	0.25%*** [60%**]	0.17%*** [56%]	-0.08%* [44%]
	Ownership Turnover	0.65%*** [64%***]	0.34%*** [66%***]	-0.29%*** [38%***]
	Investment Duration	0.57%*** [72%***]	0.38%*** [69%**]	-0.19%*** [39%**]
	Net Arbitrage Trading	0.36%*** [66%***]	0.21%*** [63%***]	-0.15% [44%]
	Institutions' Best Ideas	0.91%*** [71%***]	0.64%*** [74%***]	-0.27%*** [33%***]

Exhibit 4: Risk Adjusted Summary Performance Statistics for 'IO' Factors Russell 3000 [June 2004 – September 2015]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

Ownership Dynamics is the top performing category in terms of both return spread and IC. Institutions' Best Ideas , Investment Duration, Net Arbitrage Trading, and Ownership Turnover are the top four performing factors when measured in 1-month return spread and its hit ratio, both significant at the 1% level. In Exhibit 5, we present the possible logic behind the best performing factors based on previous studies.

Exhibit 5: Potential Explanation for Top Performing Factors	
Factor	Potential Explanation
Institutions' Best Ideas	A number of studies[12] documented that the institutions' individual holdings can be analyzed to generate alpha. Although there was a broad array of investment opinions among the fund managers, the managers' highest conviction picks or "best ideas' portfolio demonstrated the strongest results.
Investment Duration	Investment Duration is a direct measure of institutional investors' investment horizons and it is correlated with investors' trading behavior[13]. Longer investment duration tends to be associated with strong conviction and higher future stock return.
Net Arbitrage Trading	This factor is similar to "Change in Ownership Level - HF", but takes a step further: it also considers change on the short positions in a stock. Arbitrage trading on either the long- or the short-side alone will result in an imprecise inference about arbitrageurs' views on the stocks in aggregate. However, the net position should capture more comprehensive information and represent a better proxy for arbitrage trading; therefore it is a more powerful predictor of future stock returns[14].
Ownership Turnover	Numerous studies[15] have established that there is a negative relationship between the turnover of institutional ownership and subsequent stock performance – institutions with the highest turnover of ownership earn substantially lower future returns relative to firms with the lowest turnover.

Source: S&P Global Market Intelligence Quantamental Research.

2.1.1   Factor Performance – Manager Type

Not all classes of institutional investors are the same. They have different organizational and governance structures (including policies and procedures), and are subject to different regulatory requirements. They have a wide variety of goals, strategies, and timeframes for their investment; therefore, their investments would be expected to have different characteristics. One significant advantage of ownership data from S&P Global Market Intelligence is that it provides equity holdings at the institution level, which allows researchers to examine the signal effectiveness across different types of institutions.

The institutions covered by the global ownership data from S&P Global Market Intelligence include Traditional investment managers, Foundations, Endowments, Hedge Funds, Insurance companies,

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[12] See Randolph Cohen (2010), Martin, Gerald, and John Puthenpurackal (2008)

[13] See Martijn Cremers, Ankur Pareek, Rutger (2009)

[14] See Yong Chen, Zhi Da, and Dayong Huang (2015)

[15] See Dimitrov and Gatchev (2010); Harrison and Kreps (1978); Scheinkman and Xiong (2003)

Banks, etc. We grouped these institutions into two categories each, according to their investment horizon and risk tolerance. For this analysis, we excluded hedge funds due to their special characteristics; we'll show a hedge-fund based analysis in the next section – 2.1.2.

	Time Horizon	Risk Tolerance
• Traditional Manager, Foundation, & Endowment:	longer	higher
• Bank & Insurance:	shorter	lower

We tested the signal based on Institutional Ownership Level and show the performance characteristics difference for these two types of institutions in Exhibit 6.

Exhibit 6: Performance Summary Statistics for Ownership Level by Institution Type
Russell 3000 (June 2004 – December 2015)

Institution Type	1-month IC (Hit Ratio)	1-month Return Spread (Hit Ratio)	1-month Q1 Active Return (Hit Ratio)	1-month Q5 Active Return (Hit Ratio)
Traditional Manager, Foundation, & Endowment	0.024*** [66%***]	0.30%* [61%***]	0.05% [56%]	-0.25%** [37%***]
Bank & Insurance	0.011* [58%*]	-0.02 [53%]	-0.02% [50%]	0.00% [45%]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

Ownership level based on traditional managers, foundation, and endowment yielded statistically significant monthly return spread (0.3%) and IC (0.024) respectively; the hit ratios for both metrics are also significant at the 1% level. The majority of spread return came from the short side. The ownership level from bank and insurance didn't generate significant excess returns on either long or short side.

2.1.2   Factor Performance – Hedge Funds

Academic researchers and practitioners have long considered hedge funds (HF) as the most rational and sophisticated investors who promptly respond when stock prices deviate from fundamental values[16]. When researchers examine the hedge fund data set, the most commonly asked question is: which hedge funds holdings were most predictive of future stock returns? We examine this idea using the hedge fund data in the global ownership database from S&P Global Market Intelligence.

In previous HF research[17], HF size matters. There is a statistically significant positive relationship between the holdings of large HFs and future stock return, but not for the securities held by small HFs. One possible interpretation is that the return forecasting power of hedge funds is stronger when the funds possess more resources and hence have better access to data, talent, and expertise.

[16] See Brunnermeier and Nagel (2004); Brav et al.(2008); Cao, Liang, Lo (2014)
[17] See Kee-Hong Bae, Bok Baik, and Jin-Mo Kim (2011)

To examine the above hypothesis, we ranked hedge funds based on the size of their portfolio holdings at the end each quarter and separated them into two buckets: the largest and smallest 50% of the HF universe. We then evaluated the factors' performance within each bucket. We tested six 'IO' factors for this purpose. The performance statistics for each bucket is detailed in Exhibit 7.

Exhibit 7: 'IO' Factor Performance Summary Statistics by Hedge Funds' Size
Russell 3000 (June 2004 – December 2015)

Factor Categories	Factor	Buckets	1-month Information Coefficient [Hit Ratio]	1-month Long/Short Spread [Hit Ratio]	1-month Quintile 1 Active Return [Hit Ratio]	1-month Quintile 5 Active Return [Hit Ratio]
Ownership Level	Total Ownership	Largest 50%	0.004 [59%**]	0.26% [64%***]	0.29%** [64%***]	0.03% [40%**]
		Smallest 50%	-0.016*** [44%]	-0.17% [50%]	0.15% [51%]	0.32%*** [55%]
		Diff. btw Large/Small		0.43%*** [60%**]	0.14%* [56%]	-0.29%*** [34%***]
Ownership Breadth	Ownership Breadth Stability	Largest 50%	0.012** [60%**]	0.13% [55%]	0.21%* [59%**]	0.08% [50%]
		Smallest 50%	0.000 [55%]	-0.019% [51%]	0.07% [54%]	0.26%*** [60%**]
		Diff. btw Large/Small		0.32%*** [62%***]	0.14%** [57%*]	-0.18%* [43%*]
Change in Ownership Level	Change in Ownership Level - HF	Largest 50%	0.010*** [56%]	0.22%*** [62%***]	0.43%*** [65%***]	0.21%* [55%]
		Smallest 50%	0.003 [51%]	0.13% [51%]	0.24%* [59%**]	0.11% [49%]
		Diff. btw Large/Small		0.09% [51%]	0.18%*** [59%**]	0.10% [56%]
Ownership Dynamics	Ownership Concentration	Largest 50%	0.023*** [61%***]	0.22%*** [57%*]	0.27%* [59%**]	0.05% [47%]
		Smallest 50%	0.002 [54%]	-0.14% [50%]	0.09% [56%]	0.24%** [68%***]
		Diff. btw Large/Small		0.37%*** [61%***]	0.18%** [54%]	-0.19% [39%***]
	Ownership Turnover	Largest 50%	0.006** [62%***]	0.24%** [59%**]	0.24%*** [57%*]	0.00% [41%**]
		Smallest 50%	- 0.001 [44%]	-0.05% [53%]	0.18%* [59%**]	0.23%** [59%**]
		Diff. btw Large/Small		0.29%** [57%*]	0.06% [53%]	-0.23%*** [38%***]
	Institutions' Best Idea	Largest 50%	0.041*** [66%***]	0.72%** [63%***]	0.49%*** [68%***]	-0.23% [37%***]
		Smallest 50%	0.005 [54%]	-0.22% [54%]	0.00% [48%]	0.22%*** [65%***]
		Diff. btw Large/Small		0.94%** [64%***]	0.49%* [58%*]	-0.45%*** [34%***]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

For all factors tested, the signals based on the largest HFs showed better performance for all factors, compared to the signals built on the smallest HFs. The Q1 active return and hit ratio based on 'Largest Funds' were all positive and statistically significant. However, the same metrics were only significant for 2 of the 6 factors for 'Small Funds'. The difference of 1-month average Q1 returns between the largest and the smallest funds is positive in five of six factors, statistically significant at 1% to 10 % level. We repeated this test using all non-HF institutional types and also observed slightly better performance from large non-HFs compared to its small counterparties [Appendix F]. Our analysis confirmed that there is more valuable information embedded in large hedge fund data. Based on the HF data, the top performing factors are Change of Ownership Level and Institutions' Best Idea when measured by Q1 active return.

2.2 Backtest Results – Non-U.S. Markets

We extended our factor research to global markets, testing the same 'IO' signals in Canada, Japan, Developed Europe, Developed Asia ex Japan, and Emerging Asia using the respective BMI indices. Exhibit 8 shows the performance statistics among these markets.

NOTE: For non-U.S. markets look-ahead bias is a significant concern, since filing regulations[18] vary widely. We discuss how data lagging for non-U.S. markets is handled, to account for potential look-ahead bias, in Section 4 [Data and Universe Definition].

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[18] Form 13F: Initial quarterly holdings/notice report filed with the SEC by Institutional Investment Managers with over $100 million in U.S. equities; contains portfolio-based information. Form 13F is the main source for U.S. institutional ownership information. Form 13F is required to be filed within 45 days of the end of a calendar quarter. Data on global holdings is supplied by the S&P Global Market Intelligence global database of mutual fund portfolios, some of which were tracked down manually as well as extensive research in foreign annual reports and international notification notices.

Exhibit 8: 'IO' Factors Performance Summary Statistics by Country/Region
S&P Global BMI (June 2004 – December 2015)
1-Month Information Coefficient (Hit Ratio)

Factor Categories	Factor	Canada	Japan	DM Europe	DM Asia Ex JP	EM Asia
Ownership Level	Total Ownership	0.031*** [66%***]	0.021*** [60%**]	0.043*** [71%***]	0.044*** [71%***]	0.033*** [62%***]
	Foreign Ownership	0.001 [52%]	0.022*** [64%***]	0.024*** [63%***]	0.025*** [57%*]	0.019* [58%*]
Ownership Breadth	Breadth Stability	0.046*** [63%***]	0.031*** [64%***]	0.024*** [62%***]	0.046*** [70%***]	0.028*** [63%***]
Change in Ownership Level	Change in Ownership Level	0.000 [47%]	0.008* [56%]	0.008*** [59%**]	0.008 [59%**]	0.000 [46%]
Ownership Dynamics	Ownership Concentration	0.034*** [65%***]	0.031*** [58%*]	0.029*** [66%***]	0.042*** [64%***]	0.024*** [65%***]
	Ownership Turnover	0.042*** [65%***]	0.019*** [63%***]	0.028*** [71%***]	0.036*** [64%***]	0.025** [57%*]
	Investment Duration	0.030*** [57%*]	0.018** [58%*]	0.022*** [66%***]	0.024*** [63%***]	0.024*** [64%***]
	Institutions' Best Ideas	0.052*** [66%***]	0.013* [58%*]	0.041*** [68%***]	0.043*** [68%***]	0.031** [59%**]

1 - Month Quintile 1 Active Return (Hit Ratio)

Factor Categories	Factor	Canada	Japan	DM Europe	DM Asia Ex JP	EM Asia
Ownership Level	Total Ownership	0.40%*** [60%**]	0.20%** [58%*]	0.34%*** [62%***]	0.31%*** [63%***]	0.33%* [61%**]
	Foreign Ownership	0.024% [54%]	0.38%* [58%*]	0.22% [54%]	0.11% [56%*]	0.23% [58%*]
Ownership Breadth	Breadth Stability	0.29%* [55%]	0.12% [57%*]	0.17%* [58%*]	0.31%* [64%***]	0.32%** [61%**]
Change in Ownership Level	Change in Ownership Level	-0.06% [48%]	-0.05% [48%]	0.09% [54%]	0.07% [59%**]	-0.01% [46%]
Ownership Dynamics	Ownership Concentration	0.37%*** [60%**]	0.13% [53%]	0.21%** [56%]	0.20%* [55%]	0.09% [51%]
	Ownership Turnover	0.43%** [58%*]	0.09% [56%]	0.21%*** [64%***]	0.23%*** [56%]	0.21% [57%*]
	Investment Duration	0.44%** [60%**]	0.17% [51%]	0.17%* [59%*]	0.40%* [62%***]	0.38%** [63%**]
	Institutions' Best Ideas	0.47%*** [60%***]	0.13%* [59%**]	0.22%** [60%**]	0.21%** [62%***]	0.23% [58%*]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

Our analysis shows that the 'IO' strategies in non-U.S. markets were generally not as strong as in the U.S. This is likely due to the extended lag applied to the ownership metrics outside the U.S. [Section 4].

The best performing factor in terms of both IC and Q1 active return was 'Total Ownership' in Ownership Level. 'Total Ownership' had positive average 1-month ICs and Q1 active returns across all regions tested, with all values and their hit ratios statistically significant.

All four factors in Ownership Dynamics yielded positive and significant ICs among non-U.S. countries/regions; Q1 active returns are positive in Canada, DM. Europe, and DM. Asia Ex Japan. The weakest factor is 'Change in Ownership Level' based on both IC and Q1 active return. Some signals' effectiveness further weakened when we looked at the performance on risk-adjusted basis [Appendix G]. 'Total Ownership Level' was still the best performing factor after risk adjustment outside the U.S. markets; and 'Change of Ownership Level' was the weakest.

3. Blending 'IO' signals with Fundamental Based Model

3.1 Multi-Factor Model – U.S.

How different are institutional ownership based factors from fundamental/technical signals? In order to capture the fundamental signals' diversity, we use six style composites [Valuation, Historical Growth, Earnings Quality, Capital Efficiency, Analyst Expectations, and Price Momentum][19] in S&P Capital IQ Alpha Factory Library [AFL][20] to represent a range of common fundamental and technical strategies.

Exhibit 9 shows the 1-month signal rank correlation matrix among each 'IO' factor and AFL style composite. The ownership based factors have a low correlation [below 0.3] with all six style composites. Given this low correlation, we expect that 'IO' signals can be used to improve the return performance of stand-alone fundamental strategy.

Exhibit 9: Signal Rank Correlation Matrix
Russell 3000 (June 2004 – December 2015)

	Analyst Expectations	Capital Efficiency	Earnings Quality	Historical Growth	Price Momentum	Valuation
Total Ownership	0.046	0.051	0.030	0.042	0.012	0.045
Foreign Ownership	-0.022	0.095	0.092	0.044	-0.005	0.088
Ownership Breadth Stability	-0.090	0.171	0.094	-0.034	-0.034	0.219
Change in Ownership Level – HF	-0.001	-0.003	0.000	-0.021	-0.027	-0.007
Ownership Concentration	0.038	0.246	0.163	0.135	0.035	0.177
Ownership Turnover	-0.006	0.281	0.141	0.082	0.004	0.216
Investment Duration	0.019	0.164	0.098	0.064	0.011	0.138
Net Arbitrage Trading	0.046	0.009	0.017	-0.015	-0.005	0.017
Institutions' Best Ideas	0.067	0.286	0.228	0.156	0.078	0.068

Source: S&P Global Market Intelligence Quantamental Research.

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[19] See Appendix G for a list of factors in each style composite. In rest of paper, we use the abbreviation for all 6 style composites: Valuation - 'VL'; Historical Growth - 'GW; Capital Efficiency - 'CE'; Earnings Quality - 'EQ'; Analyst Expectations - 'AE'; Price Momentum - 'PM'.

[20] S&P Capital IQ Alpha Factory Library consists of 500+ stock selection signals with associated metrics such as information coefficients and factor return spreads.

To test the hypothesis that 'IO' signals can improve fundamental strategy performance, we constructed a simple fundamental stock selection model by equally weighting the six style composites (shown above). We then constructed an 'IO' model by equally weighting six 'IO' signals: Stability of Ownership Breadth, Change of Ownership Level-Hedge Fund, Investment Duration, Net Arbitrage Trading, Ownership Concentration, and Turnover. Finally we blended the two sets of signals by equally weighting the fundamental composites (from fundamental model) and 'IO' composites (from 'IO' model) to arrive with the combined model (Fund + IO). Exhibit 10 shows the summary performance for all three models.

Exhibit 10: Model Performance Summary: 'IO', Fundamental, and Combined Signals
Russell 3000 (June 2004 – December 2015)

Model	Average 1-month IC (Hit Ratio)	Average 1-month Spread (Hit Ratio)	Average 1-month Q1 Active Return (Hit Ratio)	Average 1-month Q5 Active Return (Hit Ratio)
Fundamental Model	0.038*** (76%***)	0.73%*** (70%***)	0.34%*** (71%***)	-0.38%*** (34%***)
IO Model	0.039*** (76%***)	0.76%*** (68%***)	0.37%*** (70%***)	-0.39%** * (32%**)
Fundamental + IO Model	**0.051*** (81%***)**	**0.96%*** (71%***)**	**0.42%*** (77%***)**	**-0.54%** * (31%**)**

Annualized Information Ratio

	Q1	Q5	Long-Short Spread
Fundamental Model	0.99	-0.82	1.00
IO Model	1.56	-1.08	1.52
Fund + IO Model	**1.15**	**-1.21**	**1.34**

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

The fundamental and 'IO' based models had similar performance based on all statistics (IC, return spread, Q1 and Q5 active returns). However, the annualized information ratio for both Q1 and Q5 (bottom quintile) from the 'IO' Model were higher than those of the Fundamental Model. The combined model (Fund + IO) is superior in terms of all performance metrics to the standalone fundamental model. For example, we see an increase of average monthly quintile spread of 23 basis points (bps) (from 0.73% to 0.96%). The additional alpha came from both long (0.34% to 0.42%) and short (-0.38% to -0.54%) return perspective, suggesting that 'IO' signals might help long only investors to capture additional alpha and improve portfolio performance; and they can also be used as useful screen in avoiding potential underperforming stocks. The combined model's turnover was also reduced by 13%.

3.2 Multi-Factor Model – Global

Although the 'IO' signals seem less effective among non-U.S. markets, there might be some benefit of combining 'IO' with fundamental strategies given the low correlation between the two sets of signals [Appendix I].

We tested the same model as we did in the U.S. for Canada, Japan, DM. Europe, DM. Asia Ex Japan, and EM. Asia, respectively. Exhibit 11 summarizes the models' performance for each country/region.

Exhibit 11: Model Performance Summary by 'IO', Fundamental, and Combined Signals
S&P Global BMI (June 2004 – December 2015)

Country / Region	Models	Average 1-month IC [Hit Ratio]	Average 1-month Return Spread [Hit Ratio]	Average 1-month Q1 Active Return [Hit Ratio]	Average 1-month Q5 Active Return [Hit Ratio]
Canada	Fundamental	0.058*** [75%***]	1.36%*** [70%***]	0.67%*** [70%***]	-0.69%*** [32%***]
	IO	0.057*** [73%***]	1.24%*** [68%***]	0.48%*** [63%***]	-0.76%*** [31%***]
	Fund + IO	**0.073*** [79%***]**	**1.66%*** [78%***]**	**0.65%*** [68%***]**	**-1.01%*** [30%***]**
DM. Euro	Fundamental	0.064*** [85%***]	1.44%*** [79%***]	0.70%*** [79%***]	-0.74%*** [26%***]
	IO	0.048*** [71%***]	0.88%*** [66%***]	0.30%*** [63%**]	-0.58%*** [31%***]
	Fund + IO	**0.075*** [85%***]**	**1.53%*** [79%***]**	**0.68%*** [77%**]**	**-0.85%*** [21%***]**
DM. Asia EX JP	Fundamental	0.061*** [80%***]	1.59%*** [81%***]	0.68%** [73%***]	-0.90%*** [22%***]
	IO	0.057*** [70%***]	0.92%*** [63%***]	0.36%** [59%**]	-0.56%*** [37%***]
	Fund + IO	**0.078*** [84%***]**	**1.70%*** [80%***]**	**0.71%*** [71%***]**	**-0.99%*** [20%***]**
Japan	Fundamental	0.032*** [68%***]	0.60%*** [67%*]	0.25% [64%***]	-0.34%* [31%***]
	IO	0.037*** [65%***]	0.54%*** [59%**]	0.18% [53%]	-0.36%*** [34%***]
	Fund + IO	**0.046*** [70%***]**	**0.77%*** [65%***]**	**0.33% [61%**]**	**-0.45%** [31%***]**
EM. Asia	Fundamental	0.043*** [68%***]	1.03%*** [63%***]	0.46%*** [66%**]	-0.57%*** [32%***]
	IO	0.041*** [63%***]	0.71%* [60%**]	0.47%** [60%**]	-0.25% [41%**]
	Fund + IO	**0.059*** [69%***]**	**1.16%*** [64%***]**	**0.61%*** [69%***]**	**-0.55%*** [36%***]**

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

We see an improvement in average 1 month IC from the combined model across all global markets; the largest increase of 44% was in Japan. The combined model (Fund + IO) generated slightly better Q1 and Q5 active returns in DM. Asia ex Japan, EM. Asia and Japan compared to the stand alone fundamental model. For DM. Europe, and Canada, we observed an increase of Q5 active returns, but slightly lower Q1 active returns. Long-only investors might be able to use the 'IO' signals as a screen to remove or further investigate the securities with lower 'IO' ranks from their portfolios.

4. Data & Universe Definition

We used the global ownership database from S&P Global Market Intelligence for this study. The data covers over 55,000 public and private companies comprised of more than 25,000 institutional investment firms and 44,000 mutual funds. The data history is available beginning 2004 for most data items; all data items are listed in Appendix B. The universes we used for all backtests in this report are the Russell 3000 Index (for the U.S. market) and S&P Global Broad Market Index (BMI) (for non-U.S. markets). Appendix C shows coverage for the number of securities in ownership database relative to the number of securities in the respective indices for the following regions: U.S, Canada, Developed markets Europe, Developed markets Asia ex Japan, Japan, and Emerging markets.

In the U.S, ownership information is sourced from Form 13F. Since Form 13F is required to be filed within 45 days of the end of calendar quarter, we lagged the period-end-date based ownership data by 2 months in all backtests for U.S companies. Non-U.S. countries have different filing practices for institutional investment managers (shown in Appendix J); to be conservative, we lagged all data items by 12 months for all non-U.S. countries.

5. Summary

In this report, we demonstrated that the global ownership data from S&P Global Market Intelligence contains valuable information for facilitating an investment process. The 'IO' signals constructed from this content set are complementary to fundamental and technical signals commonly used by investors, and generated statistically significant return spreads and Q1 active returns in Russell 3000 over our back test window. Furthermore, our empirical analysis confirmed that combining an 'IO' strategy with fundamental signals can effectively enhance fundamental/technical based alpha – the combined strategies yielded better annualized return spreads, Q1 active returns and information ratios and had lower turnover.

Finally, we examined the 'IO' signals in non-U.S. countries/markets. Although the 'IO' signals across the global markets are less effective compared to those in the U.S., they still generated statistically significant Q1 active returns. When we blended the 'IO' signals with fundamental model, we observed an improvement in ICs and Q5 active returns for all global markets compared to the standalone fundamental model.

Ultimately, we find that 'IO' is a valuable resource of non-traditional alpha. It helps investors to capture additional alpha not embedded in traditional fundamental signals, confirm and screen their investment decisions, and potentially reduce transaction costs.

APPENDIX A

Breadth of Global Institution Ownership
Russell 3000 and S&P Global BMI (January 2005 – December 2015)

Breadth of Insitutional Ownership
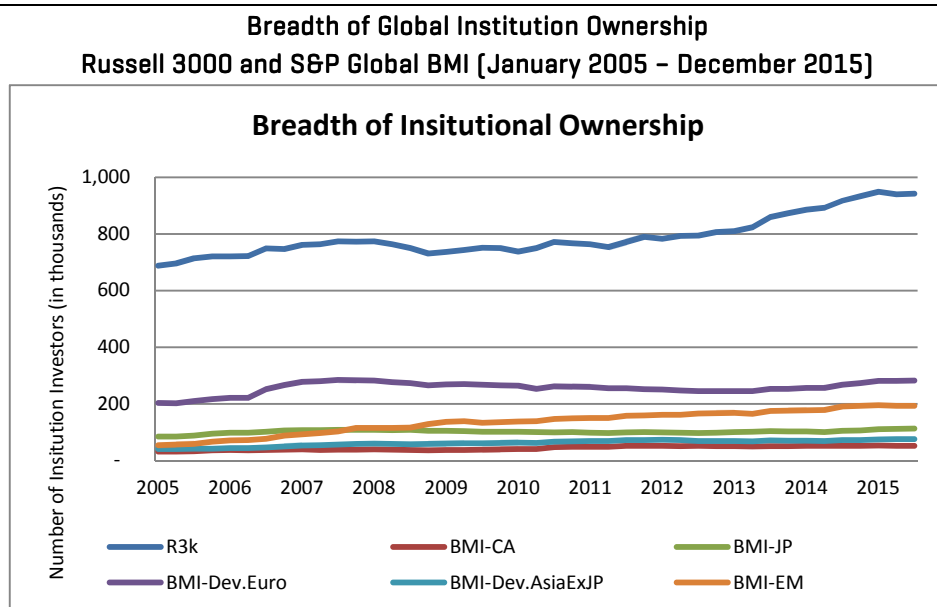
Source: S&P Global Market Intelligence Quantamental Research

APPENDIX B

Ownership Data

S&P Global Market Intelligence provides detailed equity ownership data on public and private companies worldwide, comprising institutional investment firms, mutual funds, and insiders/individual owners. We have a dedicated global research team reviewing over 1,500 documents daily to ensure fast and accurate processing. Our data is sourced from a variety of filings, forms, websites and direct relationships to ensure thorough and comprehensive information. For greater flexibility to our clients, our data is available via the S&P Capital IQ desktop, Excel Plug-In, Xpressfeed, and in our Real-Time Desktop. With our historical data views, security and company-level ownership, peer/comparison breakdowns, screening data points and other essential reports, S&P Global Market Intelligence enables our clients to perform quick and in-depth analysis. Equity ownership for over 55,000 public and private companies comprised of more than 25,000 institutional investment firms, 44,000 mutual funds, and 290,000 insiders/individual owners. History is available back to 2004 for Institutional Ownership and 2008 for Insider Trading Data.

About the Ownership Data Packages from S&P Global Market Intelligence

S&P Global Market Intelligence delivers ownership data through the following packages:

Ownership Summary This package provides aggregate ownership information at both the company and issue level during specified time periods, including shares traded within a period, as well as counts of the counterparties involved. History is available back to 2004.

Ownership Detail This package provides detailed institutional ownership holding information at both the company and issue level, including shares held, transaction sizes, and ranking. History is available back to 2004.

Ownership Portfolio Holdings This package provides detailed ownership holding information at the issue level, including shares held and transaction sizes.

Items covered by Ownership Data

Shares Held	The number of shares of the company held by investors at the end of the period.
Shares Bought	The number of shares of the company purchased by investors during the period.
Shares Sold	The number of shares of the company sold by investors during the period.
Number of New Buyers	The number of investors who opened a new position in the company by purchasing shares during the period.
Number of Buyers	The number of investors who purchased shares of the company during the period.
Number of Sellers	The number of investors who sold shares of the company during the period.
Number of Closed Positions	The number of investors who sold all shares and closed their holding position in the company during the period.
Number of Holders	The total number of investors who own shares of the company.
Percent of Institutional Ownership	The percentage of shares outstanding of the company owned by institutional shareholders.
Change in Percent of Institutional Ownership	The net shares changed as a percent of shares outstanding.

APPENDIX C

Global Coverage of Institutional Ownership
Russell 3000 and S&P Global BMI (January 2005 – December 2015)

Global 'IO' Coverage
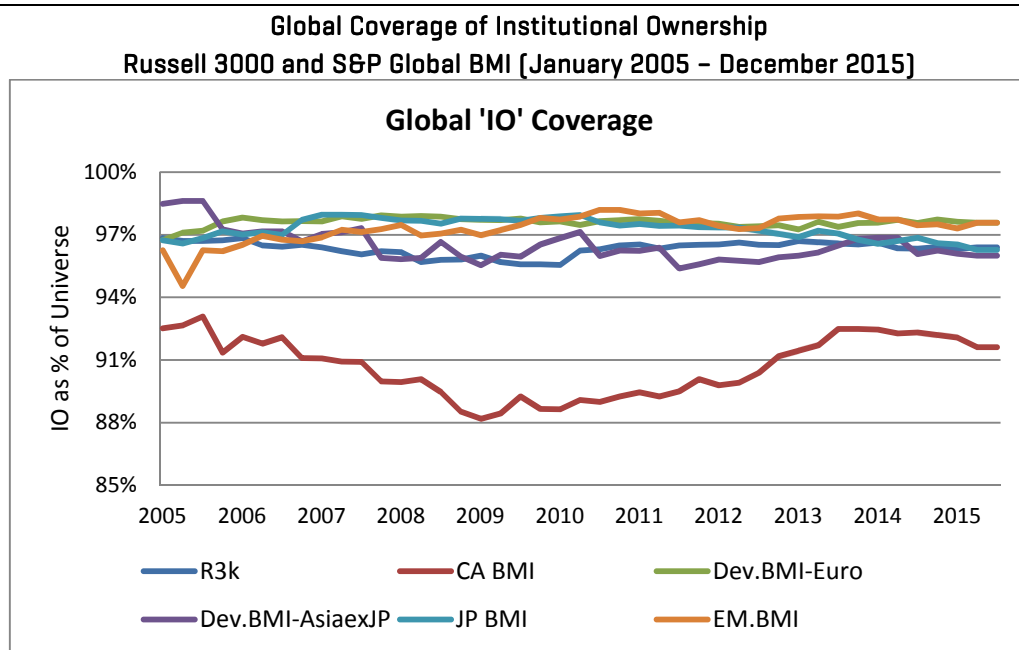
Source: S&P Global Market Intelligence Quantamental Research

APPENDIX D

Abbreviation of 'IO' factors:

Investment Duration	Duration
Net Arbitrage Trading	NAT
Ownership Turnover	TO
Ownership Breadth Stability	Breadth Stability
Change in Ownership Level – HF	Chg of IO
Ownership Concentration	Concentration
Stability of Change in Ownership Breadth	Stab. Of Chg in Breadth
Foreign Ownership	Foreign IO
Institution Ownership Level	IO Level
Stability of Change in IO Level - HF	Stab. Of Chg in IO
Change in Ownership Breadth	Chg in Breadth

APPENDIX E

Factor Categories	Factor	Potential Explanation
Ownership Level	Total Ownership	The positive relationship between the level of institutional ownership and stock performance is due to active surveillance from institutional investors. A general thought is the presence of institutional investors may lead to change in firm behavioral and eventually improve their performance.
	Foreign Ownership	Foreign institutional ownership has positive effect on corporate value and productivity. Foreign investors have been considered desirable for their experience and sophistication, their capital and their potential to influence corporate governance positively.
Ownership Breadth	Ownership Breadth Stability	Breadth of ownership is a proxy for short-sales constraints – the more breadth, the less constrains. Short-sales constraints can exert a significant influence on equilibrium prices and expected returns. When few investors hold long position, this signals that short-sales constraint is binding tightly, and that prices are high relative to fundamentals.
	Change in Ownership Breadth	Decrease in ownership breadth means increase of short-sale constrains; therefore reductions in breadth should forecast lower returns; and vice versa. Increase in ownership breadth would result in higher stock return.
	Stability of Change in Ownership Breadth	A change of ownership breadth with more stability tends to outperform.
Change in Ownership Level	Change in Ownership Level - HF	Hedge Funds are viewed as informed investors. They have superior stock-picking ability.
	Stability of Change in Ownership Level - HF	A change of ownership level with more stability tends to outperform.
Ownership Dynamics	Ownership Concentration	Ownership concentration is one of the indicators of corporate governance. High ownership concentration indicates more closed corporate governance, which results in less information available to outside investors, higher potential for insider trading, and inhibit corporate stock returns.
	Ownership Turnover	Numerous studies have established that there is a negative relationship between the turnover of institutional ownership and subsequent stock performance – institutions with the highest turnover of ownership earn substantially lower future returns relative to firms with the lowest turnover.
	Investment Duration	Investment Duration is a direct measure of institutional investors' investment horizons and it is correlated with investors' trading behavior. Longer investment duration tends to be associated with strong conviction and higher future stock return.

APPENDIX E (Continued)

Factor Categories	Factor	Potential Explanation
Ownership Dynamics (Continued)	Net Arbitrage Trading	This factor is similar to "Change in Ownership Level - HF ", but takes a step further: it also considers change on the short positions in a stock. Arbitrage trading on either the long- or the short-side alone will result in an imprecise inference about arbitrageurs' views on the stocks in aggregate. However, the net position should capture more comprehensive information and represent a better proxy for arbitrage trading; therefore it is a more powerful predictor of future stock returns.
	Institutions' Best Ideas	A number of studies documented that the institutions' individual holdings can be analyzed to generate alpha. Although there was a broad array of investment opinions among the fund managers, the managers' highest conviction picks or "best ideas' portfolio demonstrated the strongest results.

APPENDIX F

IO Factors Performance Summary Statistics by non-Hedge Funds' Size
Russell 3000 (June 2004 – December 2015)

Factor Categories	Factor	Buckets	1-month Information Coefficient [Hit Ratio]	1-month Long/Short Spread [Hit Ratio]	1-month Q1 Active Return [Hit Ratio]	1-month Q5 Active Return [Hit Ratio]
Ownership Level	Total Ownership	Largest 50%	0.027*** [68%***]	0.31%** [64%***]	0.19%* [57%*]	-0.12% [39%***]
		Smallest 50%	-0.012*** [34%***]	-0.19%** [46%]	0.06% [47%]	0.25%*** [65%***]
		Diff. btw Large/Small		0.55%*** [61%***]	0.16% [56%]	-0.39%*** [33%***]
Ownership Breadth	Ownership Breadth Stability	Largest 50%	0.011* [57%*]	0.16% [51%]	0.18% [49%]	0.02% [52%]
		Smallest 50%	0.009* [57%*]	0.04% [49%]	0.18% [54%]	0.14% [60%**]
		Diff. btw Large/Small		0.12% [56%]	0.00% [52%*]	-0.12% [44%]
Ownership Dynamics	Ownership Concentration	Largest 50%	0.032*** [68%***]	0.32%* [59%**]	0.24%* [59%**]	-0.08% [39%***]
		Smallest 50%	0.019** [62%***]	0.04% [54%]	0.23% [54%]	0.19%* [57%*]
		Diff. btw Large/Small		0.31%*** [59%**]	0.03% [56%]	-0.28%*** [33%***]
	Ownership Turnover	Largest 50%	0.026*** [67%***]	0.40%* [57%*]	0.32%*** [58%**]	-0.08% [45%]
		Smallest 50%	0.004 [51%]	-0.05% [47%]	0.13% [54%]	0.18%* [52%*]
		Diff. btw Large/Small		0.45%*** [59%**]	0.19%** [59%**]	-0.26%** [35%***]
	Institutions' Best Ideas	Largest 50%	0.050*** [67%***]	0.69%** [58%*]	0.43%*** [61%***]	-0.026% [38%***]
		Smallest 50%	0.018*** [66%***]	0.39%** [61%***]	0.33%*** [64%***]	-0.06% [37%***]
		Diff. btw Large/Small		0.31% [58%*]	0.11% [57%*]	-0.20%* [41%**]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

APPENDIX G

Risk Adjusted IO Factors Performance Summary Statistics by Country/Region
S&P Global BMI (June 2004 – December 2015)

Factor Categories	Factor	Canada	Japan	DM Europe	DM Asia Ex JP	EM Asia
Ownership Level	Total Ownership	0.37%*** [60%**]	0.13%** [56%]	0.30%*** [67%***]	0.20%** [62%***]	0.34%* [57%*]
	Foreign Ownership	0.38% [53%]	0.16%*** [60%**]	0.12% [56%]	0.05% [54%]	0.18% [55%*]
Ownership Breadth	Breadth Stability	0.36%** [56%*]	0.11%* [52%]	0.11% [55%]	0.23%** [60%**]	0.30%** [63%***]
Change in Ownership Level	Change in Ownership Level	-0.05% [55%]	0.11% [54%]	0.11%* [55%]	0.15%* [62%***]	0.00% [48%]
Ownership Dynamics	Ownership Concentration	0.25% [52%]	0.10%* [59%**]	0.10% [53%]	0.05% [53%]	0.11% [51%]
	Ownership Turnover	0.42%*** [59%*]	0.02% [54%]	0.20%*** [62%***]	0.17%* [56%]	0.24%** [57%*]
	Investment Duration	0.16% [53%]	0.15% [51%]	0.12%* [54%]	0.49%** [63%***]	0.35%** [60%**]
	Institutions' Best Ideas	0.36%*** [60%***]	-0.02% [52%]	0.15%** [55%]	0.11%** [57%*]	0.30%** [57%*]

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level

Source: S&P Global Market Intelligence Quantamental Research. Results are as of 12/31/2015. For the above exhibits, back tested returns do not represent actual trading results and were constructed with the benefit of hindsight. Returns do not include payments of any sales charges or fees. Such costs would lower performance. Indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. It is not possible to invest directly in an index. Past performance is not a guarantee of future results.

APPENDIX H

AFL Style Composite

Style	Factor	Definition
Analyst Expectation	LTG	It is consensus estimate of long-term growth in earnings per share
	EstDiff	The factor measures difference between the number of upward 1month revisions and the number of downward 1 month revisions in analyst estimates of FY1 earnings per share, divided by the number of analyst earnings estimates.
	SUE	The factor is weighted average of number of net upward 1 month revisions in consensus estimate of FY1 earnings per share in current month, and the number of net upward 1 month revisions in the previous month.
	EPSNumRevFY1	The factor is weighted average of number of net upward 1 month revisions in consensus estimate of FY1 earnings per share in current month, and the number of net upward 1 month revisions in the previous month.
Capital Efficiency	ROE	The ratio of trailing four quarter income before extraordinary items available for common equity to average book value of common equity over the same period.
	CFROIC	The factor measures a ratio of trailing four quarter operating net cash flow to average invested capital over the same period.
	LTDE	The ratio of long term debt to total shareholders' equity. It's an indicator of a company's financial leverage.
	CapAcqRatio	The factor is a ratio of trailing four quarter operating cash flow (net of cash dividends) to trailing four quarter capital expenditures. It measures how efficiently a company generates cash from its capital expenditures.
	ShareChg	The percentage change in common shares outstanding from four quarters ago to the current quarter.
Earnings Quality	CashCycle	It's defined as the sum of average receivable collection period and average inventory processing period, minus payables payment period.
	NetProfitMargin	It's defined as the ratio of trailing four quarter income before extraordinary items to trailing four quarter sales.
	WCAccruals	The factor is defined as the change from four quarters ago in non-cash assets, minus the change in current liabilities (excluding short term debt and taxes payable) and minus depreciation, relative to average total assets over the past year.
	AccrualRatioCF	Accrual ratio measures the earning qualities. This is one the two similar definitions that based on cash flow items.
	NIStab	This factor is measured by the ratio of 5-year average of the one year percentage change in Net Income over the mean absolute deviation in the one year percentage change in Net Income going 5 years back.

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APPENDIX H (Continued)

Style	Factor	Definition
Historical Growth	1YChgAstAdjFCF	The 1 year change in trailing four quarter free cash flow, divided by average total assets over the year.
	1YChgAstAdjOCF	The 1 year change in trailing four quarter operating cash flow, divided by average total assets over the year.
	Chg1YAstTO	The percentage change from a year ago in the ratio of trailing four quarter sales to average total assets over the same period.
	SusGrwRate	The product of retention ratio and return on equity.
	Chg1YEPS	The percentage change from a year ago in trailing four quarter earnings per share.
Price Momentum	PM12M1M	The cumulative percentage stock price change from twelve months ago to the current month, minus the percentage price change from the previous month to the current month.
	PM1M	The simple stock return over the past month.
	HL1M	The ratio of the monthly high minus the current price to the current price minus the monthly low price.
	PM5D	This is a short term signal that measures a stock's 5-day price reversal.
	PM9M	The simple stock return over the past nine months.
Valuation	BP	The factor is a ratio of book value to market value of common equity.
	FCFP	The ratio of trailing four quarter free cash flow to average market value of equity over the same period.
	EBITDAEV	The ratio of trailing four quarter earnings before interest, taxes, depreciation and amortization expense to enterprise value.
	EP	The ratio of trailing four-quarter earnings per share to current stock price.
	DivP	The ratio of trailing four quarter dividends per share to current stock price.
	SEV	The ratio of trailing four quarter sales to average enterprise value over the same period.

APPENDIX I

Signal Rank Correlation Matrix S&P Global BMI (June 2004 – December 2015)						
	Analyst Expectations	Capital Efficiency	Earnings Quality	Historical Growth	Price Momentum	Valuation
Total Ownership	-0.015	0.031	0.073	0.031	-0.003	-0.01
Foreign Ownership	-0.019	0.034	0.074	0.034	-0.002	-0.012
Ownership Breadth Stability	0.012	0.024	0.01	0.014	-0.004	-0.01
Change in Ownership Level - HF	-0.028	-0.004	0.054	-0.004	0.008	0.04
Ownership Concentration	-0.035	0.049	0.11	0.049	-0.013	-0.004
Ownership Turnover	-0.009	0.021	0.073	0.021	0.007	0.011
Investment Duration	-0.019	0.043	0.045	0.043	-0.002	-0.029
Institutions' Best Ideas	-0.005	0.088	0.129	-0.03	-0.006	-0.096

Source: S&P Global Market Intelligence Quantamental Research.

APPENDIX J

Percent of Participant Funds in Breakdown of Post PEO[21] Buckets by Countries

Regions	Countries	Post PEO days	% of participants
North America	United States	1-60 days	100%
	Canada	1-90 days	91%
		90-180 days	9%
DM. Europe	Austria	1-90 days	41%
		90-120 days	46%
		>120 days	13%
	Belgium	1-90 days	61%
		90-180 days	21%
		180-240 days	18%
	Denmark	1-60 days	100%
	Finland	<60 days	2%
		60-120 days	98%
	France	1-90 days	53%
		90-270 days	47%
	Germany	1-90 days	26%
		90-120 days	74%
	Greece	1-60 days	100%
	Ireland	1-120 days	100%
	Italy	70-180 days	100%
	Norway	1-60 days	100%
	Portugal	1-90 days	100%
	Spain	1-60 days	100%
	Sweden	1-60 days	80%
		60-90 days	20%
	Switzerland	1-60 days	58%
		60-120 days	42%
	United Kingdom	1-60 days	9%
		60-90 days	62%
		90-120 days	20%
		>120 days	8%

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[21] PEO: Period End Date

APPENDIX J (Continued)

Regions	Countries	Post PEO days	% of participants
DM. Asia	Australia	1-60 days	89%
		60-90 days	11%
	Hong Kong	1-90 days	10%
		90-120 days	90%
	Japan	1-60 days	74%
		60-90 days	26%
	New Zealand	1-60 days	61%
		60-180 days	39%
	Singapore	60-90 days	99%
		>90 days	1%
	South Korea	90 days	100%
EM	Brazil	1-30 days	47%
		30-90 days	53%
	Chile	1-30 days	83%
		60-90 days	17%
	China	1-60 days	50%
		60-90 days	50%
	Hungary	60-120 days	100%
	India	1-30 days	100%
	Indonesia	1-60 days	100%
	Mexico	1-30 days	100%
	Malaysia	1-60 days	2%
		60-90 days	98%
	Pakistan	1-120 days	100%
	Philippines	1-60 days	60%
		60-90 days	40%
	Poland	1-60 days	6%
		60-90 days	94%
	Russia	1-30 days	61%
		30-90 days	39%
	South Africa	1-60 days	100%
	Taiwan	1-30 days	50%
		30-60 days	50%
	Thailand	1-30 days	3%
		30-120 days	97%
	Turkey	1-30 days	20%
		30-120 days	80%

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Our Recent Research

March 2016: [Stock-Level Liquidity – Alpha or Risk? - Stocks with Rising Liquidity Outperform Globally](#)

Most investors do not associate stock-level liquidity as a stock selection signal, but as a measure of how easily a trade can be executed without incurring a large transaction cost or adverse price impact. Inspired by recent literature, such as Bali, Peng, Shen and Tang (2012), we show globally that a strategy of buying stocks with the highest one-year change in stock-level turnover has historically outperformed the market and has outperformed strategies of buying stocks with strong price momentum, attractive valuation, or high quality. One-year change in stock-level turnover has a low correlation (i.e., <0.15) with commonly used stock selection signals. When it is combined with these signals, the composites have yielded higher excess returns and information ratios (IR) than the standalone raw signals.

February 2016: [U.S. Stock Selection Model Performance Review - The most effective investment strategies in 2015](#)

Since the launch of the four S&P Capital IQ® U.S. stock selection models in January 2011, **the performance of all four models (Growth Benchmark Model, Value Benchmark Model, Quality Model, and Price Momentum Model) has been positive each year**. The models' key differentiators – a distinct formulation for large cap versus small cap stocks, incorporation of industry specific information for the financial sector, sector neutrality to target stock specific alpha, and factor diversity – enabled the models to outperform across disparate market environments. In this report, we assess the underlying drivers of each model's performance in 2015 and since inception (2011), and provide full model performance history from January 1987.

January 2016: [What Does Earnings Guidance Tell Us? – Listen When Management Announces Good News](#)

This study examines stock price movements surrounding earnings per share (EPS) guidance announcements for U.S. companies between January 2003 and February 2015 using S&P Capital IQ's Estimates database. Companies that experienced positive guidance news, i.e. those that announced optimistic guidance (guidance that is higher than consensus estimates) or revised their guidance upward, yielded positive excess returns. We focus on guidance that is not issued concurrent with earnings releases in order to have a clear understanding of the market impact of guidance disclosures. We also explore practical ways in which investors may benefit from annual and quarterly guidance information.

December 2015: [Equity Market Pulse – Quarterly Equity Market Insights Issue 6](#)

With commodity prices plunging, global economic trends diverging, and market volatility rising, analyst estimates for 2016 have been revised sharply lower. Yet estimates remain strong in particular regions and sectors, and valuations have moderated. This issue of Equity Market Pulse uses bottom-up trends in estimates and global risk-return and investment strategy performance metrics to address these questions:

- Which global regions and economic sectors have the strongest 2016 growth expectations?
- Where have 12-month estimate revision trends held up the best and worst?
- With investors focusing on the new year, which regions offer the most value?

November 2015: [Late to File - The Costs of Delayed 10-Q and 10-K Company Filings](#)

The U.S Securities & Exchange Commission ("SEC") requires companies to submit quarterly (10-Q) and annual (10-K) financial statements in a timely manner. Companies that cannot file within the statutory period are required to file form 12b-25 with the SEC. In this report we examine the relationship between late filings (form 12b-25s) and subsequent market returns, as well as whether late filings signal deeper fundamental problems within the company. Our results, within the Russell 3000 universe (February 1994 – June 2015), indicate that abnormal returns of late filers is negative prior to and post form 12b-25 filing. Late filers are also typically companies with poor fundamental characteristics relative to peers; investors may want to consider avoiding or short-selling these firms. This report is a continuation of our work in the area of event driven investing, a class of strategies that originate from company specific events.

October 2015: [Global Country Allocation Strategies](#)

In this report, we investigate the efficacy of fundamental, macroeconomic and sentiment-based strategies for country selection across global equity markets. Using point-in-time fundamental and macroeconomic data, we constructed signals at the country level, grouped into five themes: valuation, quality, sentiment, volatility and macro. We examined their performance between January 1999 and November 2014 for the developed and emerging markets in the S&P Global Broad Market Indices Our major findings include:

- Valuation is a common driver of performance in both developed and emerging markets.
- In addition to valuation, we found macro and sentiment based indicators to be effective country selection signals in developed markets.
- We found currency depreciation to be important when emerging market countries were separated into exporting and importing nations.

September 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 5

The Q3 issue of Equity Market Pulse spotlights potential opportunities in Asia, attractive growth and valuations in developed Europe and Japan, and risks associated with rising volatility and elevated 2016 global EPS estimate levels.

September 2015: Research Brief: Building Smart Beta Portfolios

Why is smart beta important? We believe that smart beta is continuing to gain momentum among a variety of constituencies, including ETF providers, asset managers and asset owners. Many asset managers are making smart beta part of their investment processes. European and Canadian public pension funds have been increasingly relying on internalized smart beta, with the largest U.S. pension funds and endowments also adopting the approach. The purpose of this brief is to aid asset managers and owners in building their own "internal" smart beta processes with a focus on portfolio construction and optimization, including how to manage liquidity and turnover constraints and avoid unintended factor bets.

September 2015: Research Brief – Airline Industry Factors

This brief examines S&P Capital IQ's industry-specific factors for the global airline industry. The seven airline industry factors contained in S&P Capital IQ's Alpha Factor Library consist of ratios widely used by airline industry analysts. The factors address airline profitability in terms of growth, capacity utilization, and operating efficiency. By applying the factors to regime analysis, we find:

- During periods of low fuel price increases industry growth factors are most effective.
- During periods of high fuel price growth, efficiency factors stand out.
- During periods of high revenue passenger growth our studies show that both growth and fuel efficiency factors performed well.

August 2015: Point-In-Time vs. Lagged Fundamentals – This time i(t')s different?

The common starting point for alpha discovery and risk analysis is the backtesting of historical company financials using a research database. Whether internally constructed or licensed, research databases can be distinguished by two primary formats – Point in Time and Non-Point in Time. This paper focuses on the major practical differences between Point in Time (PIT) and Non-Point in Time (Non PIT) data for both backtesting and historical research. PIT data is defined by its ability to answer two questions: When was the information known? and What information was known at the time?.

August 2015: Introducing S&P Capital IQ Stock Selection Model for the Japanese Market

Since the launch S&P Capital IQ's four U.S. stock selection models ("US Stock Selection Models Introduction") in January 2011, we released a suite of global stock selection models targeting both developed ("Introducing S&P Capital IQ Global Stock Selection Models for Developed Markets") and emerging markets ("Obtaining an Edge in Emerging Markets"). In this report, we introduce a stock selection model for the Japanese equity market that completes our global model offering.

July 2015: Research Brief – Liquidity Fragility

As liquidity in the bond market becomes increasingly constrained, there has been a growing chorus of concerns raised by Mohamed A. El-Erian, John Paulson, Jamie Dimon, Larry Summers and recently the Federal Reserve. As we learned in the Global Financial Crisis, when liquidity seizes in one market, margin calls are met by raising cash in one of the most liquid markets in the world: the US equity market. How should equity investors be thinking about liquidity in their market?

June 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 4

The Q2 issue of Equity Market Pulse features a spotlight on developed Europe, which has the highest estimated growth rates and most attractive valuations among developed markets.

May 2015: Investing in a World with Increasing Investor Activism

Investor activism has gained mainstream acceptance as activists with larger-than-life personas have waged a string of successful campaigns. Activist hedge funds' assets under management (AUM) have swelled to $120 billion, an increase of $30 billion in 2014 alone. It was among the best performing hedge fund strategies in 2014 as well as over the last three- and five-year periods. In this report, we explore an investment strategy that looks to ride the momentum surrounding the announcement of investor activism. We further explore what, if any, changes to targeted companies activists are able to influence.

April 2015: Drilling for Alpha in the Oil and Gas Industry – Insights from Industry Specific Data & Company Financials

During the recent slide in oil prices, clients frequently asked us which strategies have historically been effective in selecting stocks in declining energy markets. This report answers this question, along with its corollary: which strategies work in rising energy markets? We also explore the value of oil & gas reserve data used by fundamental analysts/investors, but not used in a majority of systematic investment strategies. The analysis in this report should help both fundamental and quantitatively-

oriented investors determine how to best use industry-specific and generic1 investment metrics when selecting securities from a pool of global oil & gas companies.

March 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 3

February 2015: U.S. Stock Selection Model Performance Review - The most effective investment strategies in 2014

January 2015: Research Brief: Global Pension Plans - Are Fully Funded Plans a Relic of the Past?

January 2015: Profitability: Growth-Like Strategy, Value-Like Returns - Profiting from Companies with Large Economic Moats

November 2014: Equity Market Pulse – Quarterly Equity Market Insights Issue 2

October 2014: Lenders Lead, Owners Follow - The Relationship between Credit Indicators and Equity Returns

August 2014: Equity Market Pulse – Quarterly Equity Market Insights Issue 1

July 2014: Factor Insight: Reducing the Downside of a Trend Following Strategy

May 2014: Introducing S&P Capital IQ's Fundamental China A-Share Equity Risk Model

April 2014: Riding the Coattails of Activist Investors Yields Short and Long Term Outperformance

March 2014: Insights from Academic Literature: Corporate Character, Trading Insights, & New Data Sources

February 2014: Obtaining an Edge in Emerging Markets

February 2014: U.S Stock Selection Model Performance Review

January 2014: Buying Outperformance: Do share repurchase announcements lead to higher returns?

October 2013: Informative Insider Trading - The Hidden Profits in Corporate Insider Filings

September 2013: Beggar Thy Neighbor – Research Brief: Exploring Pension Plans

August 2013: Introducing S&P Capital IQ Global Stock Selection Models for Developed Markets: The Foundations of Outperformance

July 2013: Inspirational Papers on Innovative Topics: Asset Allocation, Insider Trading & Event Studies

June 2013: Supply Chain Interactions Part 2: Companies – Connected Company Returns Examined as Event Signals

June 2013: [Behind the Asset Growth Anomaly – Over-promising but Under-delivering](#)

April 2013: [Complicated Firms Made Easy - Using Industry Pure-Plays to Forecast Conglomerate Returns](#).

March 2013: [Risk Models That Work When You Need Them - Short Term Risk Model Enhancements](#)

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