International Small Cap Investing

Unlocking Alpha Opportunities in an Underutilized Asset Class

Author

Vivian Ning
Quantamental Research
312-233-7148
vning@spglobal.com

The year 2018 was a tumultuous one for U.S. equity investors: the Russell 1000 and 2000 indices made new all-time highs late in Q3, only to give back all calendar-year gains in Q4, with declines of 20% and 14%, respectively. A confluence of worries triggered the decline, including global economic weakness, rising U.S. interest rates, and a U.S./China trade war. With both U.S. and international stocks in turmoil, international small caps outperformed in Q4, with the MSCI ACWI ex-US small cap index outperforming the Russell 1000 by 2.4%, the Russell 2000 by 8.8%, and the MSCI ACWI ex-US mid/large cap index by 3.0%.

Institutional investors typically overlook or underweight small cap equities in global mandates for a number of reasons, including a higher risk level (relative to large caps), a lack of operational history, liquidity, and information/data gaps which make it challenging to make informed investment decisions. However, investors who are willing to embrace the risk in small cap investing also stand to reap the benefits of allocating to this asset class – potentially earning higher risk-adjusted performance and portfolio diversification.

In this report, we examine international small cap performance across various themes and provide actionable insights for both fundamental and quantitative investors, by identifying key drivers of small cap stock performance. We explore alpha potential from various data sources – including S&P Capital IQ Financials, S&P Global Ownership data, and SNL Bank fundamental data. Our findings include:

- **Valuation and Shareholder Yield Based Signals:** Investing in companies with high free cash flow yield, earnings yield, dividend yields, and stock buybacks generated positive annualized long-short active returns ranging from 4.5% to 10.1% (Europe), 8.8% to 12.7% (Asia ex-Japan) and 3.6% to 11.0% (Japan), respectively; all significant at the 1% level (Exhibit 5).

- **Quality and Profitability Based Signals:** Firms with higher levels of profit margins, higher operating efficiency, healthy leverage, and consistent earnings growth significantly outperformed their counterparts ranging from 3.2% to 7.9% (Europe), 4.3% to 9.1% (Asia ex-Japan) and 2.4% to 10.6% (Japan) annually (Exhibit 7).

- **Liquidity and Volatility Based Signals:** Selecting highly liquid and less volatile stocks yielded active long-short returns in Europe (7.9%), Asia ex-Japan (11.2%) and Japan (8.2%) annually with significance at the 1% level (Exhibit 9).

- **Institutional Sentiment Based Signals:** A composite of institutional ownership strategies yielded annualized long-short active returns in Europe (5.7%), Asia ex-Japan (8.4%) and Japan (6.7%), with significance at the 1% level (Exhibit 11).

- **Industry Specific Banking Signals**: Composites of Valuation and Quality strategies built upon the CAMELS (bank-specific) framework and SNL Financials generated active annual returns of 5.3% and 6.3%, respectively, significant at the 1% level (Exhibit 14).

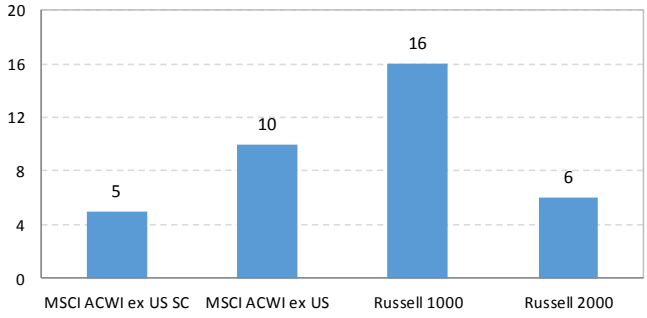
- **Performance is robust across different regimes and liquidity bands**: Most strategies remain significant and effective when backtested across various scenarios.
    - Before and after global financial crisis (Appendix B)
    - In various liquidity bands (Appendix C)
    - Across different regions or country (Appendix D)

1. Introduction – Why International Small Cap Equities

Since the 1970s, small cap investing has been accepted as an essential part of a well-diversified investment program. Research has shown that global small cap companies offer faster growth, greater diversification and consistent outperformance versus larger cap companies over the past several decades. Even though international small cap stocks make up 20% (in market cap) of the BMI developed and emerging market (BMI DM+EM) universe, they are substantially underweighted in institutional investors' portfolios. According to the S&P Global Ownership data international small cap stocks represent only 6% of total institutional investors' equity assets (Appendix A).

There are several potential reasons for this underinvestment: small caps are perceived as more volatile and risky, and are assumed to be of lower quality than large cap companies. In addition, analyst coverage for small caps is low. On average, only 5 analysts cover each company in the MSCI ACWI ex US SC [1], versus 10 analysts in the MSCI ACWI ex US (Exhibit 1). About 20% of companies in the MSCI ACWI ex US SC have no analyst coverage. Given the breadth and depth of the international small cap asset class (more than 4,300 stocks across 46 countries), there can be significant research costs incurred to invest in this space.

Exhibit 1. Average Analyst Coverage: MSCI ACWI ex US SC, MSCI ACWI ex US, Russell 1000, and Russell 2000 (September, 2018)



Source: S&P Capital IQ's Global Estimates Database. Data as of September 30, 2018.

Despite the issues highlighted above, investing in small cap equities has delivered a superior return to investing in large cap stocks, in both absolute and risk-adjusted basis (Exhibit 2). Small cap universe as represented by the MSCI ACWI ex USA SC has generated a better risk-adjusted performance compared to its large peers as represented by MSCI ACWI ex USA across various holding periods.

Exhibit 2. Annualized Returns (%) and Information Ratios (8/01/2008-9/30/2018)

	Annualized Returns				Information Ratios		
	1 Year	3 Year	5 Year	10 Year	3 Year	5 Year	10 Year
MSCI ACWI ex USA SC	2.24	11.65	6.52	9.11	1.07	0.61	0.48
MSCI ACWI ex USA	1.76	9.97	4.12	5.18	0.92	0.37	0.29

Source: MSCI and S&P Global Market Intelligence Quantamental Research. Data as of September 30, 2018.

Other benefits of investing in international small cap equities include:

- **Portfolio diversification:** The MSCI ACWI ex USA small cap index had a 0.67 correlation with the Russell 1000, versus a 0.81 correlation with the Russell 2000 (January 2014 – September 2018).
- **Breadth offering significant opportunity to capture inefficiencies:** The MSCI ACWI ex USA Small Cap Index includes approximately 4,300 non-U.S. small cap stocks across 46

[1] MSCI ACWI ex US SC: MSCI All Country World Index ex US Small Cap

countries. The breadth and depth of this universe offers active managers an opportunity to exploit mispricing and inefficiencies in this unique space.

- **Similar risk profile as U.S small cap, but higher quality:** While risk-adjusted performance over longer term for international small cap are comparable to that of U.S. small caps, quality metrics are actually better (Exhibit 3). International small caps, on average, have higher returns on capital, higher long-term growth, lower debt, and cheaper valuations than U.S. small caps.

- **Growth opportunities at attractive valuations:** Although the International Monetary Fund (IMF) cut its global growth forecasts to 3.7% for 2019 due to trade tensions between the U.S. and its trading partners (with larger downward revision for emerging market), it's still about 1.2% higher than that of U.S. economy (IMF predicts that U.S. GDP growth will slow to 2.5% next year due to waning tax cut benefits and the trade war with China). Historically, international small caps have traded at a much lower premium[2] (6.5%) versus premium for U.S. small caps (45%) for the past 10 years. Despite these growth expectations, the current premium for international small caps is 8%, compared with U.S. small caps premium of 44% (Q3 2018).

Exhibit 3. Quality Characteristics and Long Term Growth

Quality Metrics (median, as of 9/30/2018)	BMI DM&EM ex US SC	Russell 2000
Return on Assets (ROA)	4.1%	1.8%
Return on Equity (ROE)	9.0%	7.1%
Long-Term Debt / Common Equity	26.7%	40.4%
P/E Ratio	18.2X	35.5X
Dividend Yield	2.3%	2.0%
Long Term EPS Growth[3]	14.0%	13.2%

Source: S&P Global Market Intelligence Quantamental Research. Data as of September 30, 2018

2. Universe and Methodology

We use the following universes for signal construction and testing:

- S&P BMI Developed Small Cap Markets Europe ('BMI DM SML Euro')
- S&P BMI Developed Small Cap Markets Asia Pacific, excluding Japan ('BMI DM SML Asia ex JP')
- S&P BMI SML Japan ('BMI SML JP')
- S&P BMI Emerging Small Cap Market ('BMI EM SML')

The sample data period is from January 1995 to September 2018 for company fundamental data, from December 2004 to September 2018 for institutional ownership data, and from June 2007 to September 2018 for SNL financial data (used for international banks).

All returns presented in this paper are equal-weighted averages, calculated as the difference between individual stock total return (adjusted for dividends and cash distributions) and the relevant benchmark total return, with additional Fama-French 4-factor adjustment. The forward excess

[2] Premium is based on median P/E of small cap and large cap stocks (median P/E of SML – median P/E of LRG) / median P/E of LRG

[3] Long Term EPS Growth: is the average of the available third-party analysts' estimates for the three- to five-year EPS growth.

returns are in USD and winsorized at three standard deviations. All rankings for the Valuation and Quality sections relative to their economic sectors (GICS level I).

3. Strategy Formulation and Empirical Results

We categorize strategies into four investment themes: Valuation and Shareholder Yield, Quality and Profitability, Liquidity and Volatility, and Institutional Sentiment.

3.1 Valuation and Shareholder Yield

Factors tested in this category are listed below:

Exhibit 4. Valuation Factor Definitions

Factor/Signal	Definition	Sort Order
Free Cash Flow to Price (**FCFP**)	The ratio of trailing four quarter free cash flow per share to current stock price	D
Free Cash Flow to Equity (**FCFEqt**)	The ratio of trailing four quarter free cash flow per share to average book value of common equity over the same period	D
Earnings to Price (**EP**)	The ratio of trailing four-quarter per share to current stock price	D
Book to Price (**BP**)	The factor is a ratio of book value to market value of common equity	D
1Y Change in Free Cash Flow per Share (**1YChgFCF**)	The percentage change from a year ago in trailing four quarter free cash flow per share	D
1Y Change in Shares Outstanding (**1YChgShrOS**)	The percentage change in common shares outstanding from four quarters ago to the current quarter	A
Dividends to Price Ratio (**DivP**)	The ratio of trailing four quarter dividends per share to current stock price	D

Over the 23-year test period, all signals and associated composites posted positive annualized long-only and long-short active returns across three BMI developed regions (Exhibit 5). The valuation composite (Valuation_Com) is simply an equal-weighted blend of the five signals shown for each region.

Exhibit 5. Valuation Performance Summary – BMI DM SML (Jan. 1995 – Sep. 2018)

Region	Factor/Signal	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Active Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Europe	DivP	Jan-95	264	5.63%***	1.25	67%***	9.50%***	0.040***
	EP	Jan-95	264	4.94%***	1.95	73%***	10.07%***	0.040***
	1YChgFCF	Jan-95	204	3.01%***	1.01	64%***	4.53%***	0.017***
	FCFEqt	Jan-95	235	2.92%***	1.22	64%***	8.46%***	0.029***
	1YChgShrOS	Jan-95	261	2.03%***	0.97	62%***	5.82%***	0.015***
	Valuation_Com	**Jan-95**	**264**	**6.09%*** **	**2.49**	**77%*** **	**13.28%*** **	**0.049*** **
	1YChgFCF	Jan-95	105	6.87%***	1.20	66%***	8.81%***	0.031***

Asia ex Japan	DivP	Jan-95	125	5.74%***	0.71	60%***	10.25%***	0.059***
	FCFEqt	Jan-95	119	5.27%***	1.11	64%***	12.70%***	0.040***
	EP	Jan-95	125	5.00%***	0.95	62%***	11.51%***	0.041***
	1YChgShrOS	Jan-95	123	1.72%**	0.45	56%**	9.23%***	0.022***
	Valuation_Com	**Jan-95**	**125**	**6.91%*** **	**1.47**	**69%*** **	**16.65%*** **	**0.058*** **
Japan	DivP	Jan-95	200	5.38%***	1.43	73%***	10.20%***	0.050***
	BP	Jan-95	200	5.16%***	1.42	67%***	10.99%***	0.043***
	FCFP	Jan-95	182	3.73%***	0.65	64%***	3.80%**	0.029***
	EP	Jan-95	200	3.02%***	0.85	65%***	5.13%***	0.031***
	1YChgShrOS	Jan-95	195	1.30%**	0.48	58%***	3.56%***	0.011***
	Valuation_Com	**Jan-95**	**200**	**5.63%*** **	**1.71**	**72%*** **	**12.48%*** **	**0.052*** **

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

Corporate free cash flows unlike profits (via accruals) are more difficult to manipulate, so it is not surprising that investors prefer small cap entities that are able to generate positive cash flows, especially those entities that show year-on-year growth in cash flow metrics. Given information/data gaps in the small cap space, companies may use dividends to signal their ability to generate profits and cash flows. Dividend payments account for about 30% of total return of international small cap in the past 10 years.

1-year change in shares outstanding was one of the consistent indicators across all regions. In recent times, there has been a shift from dividends to shares buybacks as a tax efficient way to return capital to shareholders. A reduction in shares outstanding also tends to lift EPS making the stock attracting from an earnings yield basis.

While book-to-price was one of the best signals we tested in Japan, the performance of the factor was weak in other regions. Prior research suggests that there is a missing link between Japanese company fundamentals and investment efficiency due to the bank-centered financial system[4] and cross-shareholding based corporate governance[5] in Japan. Investors might consider book value as a more reliable measure of financial performance compared to earnings related metrics, as the latter is more sensitive to variations in company performance in a given year[6].

3.2 Quality and Profitability

Investing in quality companies is intuitively appealing; the quality premium has been well documented[7]. Asness, Frazzini, Israel, Moskowitz and Pedersen (2015) found that high-quality small caps outperform their low-quality peers[8]. Given a high degree of variability in quality among small cap companies, 'quality control' (by avoiding low quality junk stocks) becomes a critical way to increase risk-adjusted returns.

[4] Biddel and Hilary (2006), Baik et al. (2010)
[5] Mizanru and Bremer (2016)
[6] See Chan, Hamao, and Lakonishok (1990)
[7] Sloan, R. G. (1996), Chan et al. (2001),
[8] Asness, Frazzini, Israel, Moskowitz and Pedersen (2015)

Quality can be measured in a variety of ways, including profitability levels and earnings growth consistency. Small companies with higher profit margins, better operating efficiency, solid balance sheets, disciplined financial and strong management (measured through returns on capital) should outperform. We tested a number of quality related signals (Exhibit 6) based on this investment hypothesis.

Exhibit 6. Quality Factor Definitions

Factor/Signal	Definition	Sort Order
Industry Group Relative Asset Turnover (**IndRel_AssetTurn**)	The ratio of trailing twelve month sales to total Assets measured on industry group relative basis (GICS level II)	D
Cash Flow based Accruals (**AccrualRatioCF**)	Defined as the ratio of difference of income and cash flow (operating and investing) to net operating assets	D
1Y Change in Operating Margin (**Chg1YOPM**)	The percentage change from a year ago in trailing four quarter operating margin	D
ROE 20 Quarter Standard Deviation (**ROEStddev**)	This factor is measured as the standard deviation of ROE (return on equity) going twenty quarters back	A
Return on Assets (**ROA**)	The ratio of trailing four quarter after-tax net operating profit to average total assets over the same period	D
Total Debt to EBIT (**TDtoEBIT**)	Ratio of total debt to EBIT (earnings before interest and taxes)	A
Retained Earnings to Total Assets (**REToAst**)	The ratio of retained earnings to total assets	D
Gross Profit to Total Assets (**GrossProfitttoTA**)	Gross profit to total assets	D
Tobin's Q (**TobinQ**)	This ratio of a company's market value divided by total assets.	A

Over the testing period, our results are consistent (Exhibit 7) with most signals generating statistically significant performance metrics across all regions. Small cap investors should be wary of companies that have taken on a significant amount of debt relative to their ability to service/pay down the debt. The Debt to EBIT ratio measures a company's financial leverage and ability to pay off its debt. The efficacy of gross profit to total assets was documented by Novy-Marx (2013), who argued that investors should prefer companies with productive assets. Our results confirm that the efficacy of gross profit to total assets extends to global small caps as the factor delivered strong performance metrics in Europe and Asia ex Japan.

Asset turnover (measured on an industry relative basis) is another effective metric in the small cap universe, especially in Europe and Asia ex Asia. This metric measures how effectively companies are able to use their assets to generate sales - a low ratio may indicate the company has a higher proportion of unproductive assets compared to its peers, or the company is facing a headwind in growing sales.

A few of the metrics we tested in Japan showed promising results, with Tobin's Q being the strongest factor. It yielded an annualized long-short spread of 10.59%.

Exhibit 7. Quality Performance Summary – BMI DM SML (Jan. 1995 – Sep. 2018)

Region	Factor/Signal	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Active Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Europe	TDtoEBIT	Jan-95	233	2.63%***	1.06	60%***	7.59%***	0.028***
	ROA	Jan-95	258	2.58%***	0.99	61%***	7.91%***	0.032***
	GrossProfitttoTA	Jan-95	259	2.21%***	0.93	63%***	4.83%***	0.018***
	Chg1YOPM	Jan-95	242	1.37%***	0.64	58%**	3.20%***	0.013***
	IndRel_AssetTurn	Jan-95	261	1.30%***	0.68	56%**	4.41%***	0.016***
	Quality_Com	**Jan-95**	**261**	**2.79%*** **	**1.20**	**64%*** **	**8.35%*** **	**0.031*** **
Asia ex Japan	IndRel_AssetTurn	Jan-95	123	3.97%***	0.95	63%***	9.14%***	0.031***
	GrossProfitttoTA	Jan-95	121	3.10%***	0.63	63%***	8.94%***	0.037***
	TDtoEBIT	Jan-95	106	2.61%***	0.62	58%***	9.08%***	0.036***
	ROA	Jan-95	125	1.88%**	0.42	57%**	7.06%***	0.031***
	Chg1YOPM	Jan-95	107	1.86%*	0.35	55%*	4.27%**	0.017***
	Quality_Com	**Jan-95**	**125**	**4.26%*** **	**1.00**	**64%*** **	**12.36%*** **	**0.045*** **
Japan	TobinQ	Jan-95	200	4.90%***	1.37	66%***	10.59%***	0.041***
	RETOAst	Jan-95	200	2.05%**	0.46	55%*	6.21%***	0.031***
	ROEStddev	Jan-95	194	1.25%*	0.35	52%	4.18%**	0.031***
	AccrualRatioCF	Jan-95	158	1.20%	0.35	51%	2.66%	0.019*
	TDtoEBIT	Jan-95	176	0.77%	0.21	53%	2.45%*	0.021***
	Quality_Com	**Jan-95**	**200**	**5.81%*** **	**1.53**	**69%*** **	**12.80%*** **	**0.053*** **

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

3.3 Liquidity and Volatility

Liquidity has rarely been treated as an investment style. Most investors use liquidity as a risk (not an alpha) signal. In general, small caps tend to be more risky and less liquid than large caps. Therefore, the liquidity premium is supposed to be more pronounced in the small cap space. Zhao (2016) reported that a change in liquidity has historically offered an attractive risk-reward tradeoff globally. More importantly, the strategy had a low correlation to commonly used stock selection signals such as price momentum, earnings yield or earnings quality. Empirical research also shows that low volatility stocks tend to deliver higher average returns compared to their high volatility counterparts[9].

Our research examined the change in stock-level liquidity and low volatility signals as defined in Exhibit 8. We take three month average for each liquidity signal to make the factor more stable and reduce factor turnover. Our findings (Exhibit 9) are consistent with previous research[10].

[9] Blitz and van Vliet (2007), Frazzini and Pedersen (2011)
[10] Bali, Peng, Shen and Tang (2012)

Exhibit 8. Liquidity and Volatility Factor Definitions

Factor/Signal	Definition	Sort Order
3M Average of Volatility adjusted 12m Change in Amihud Liquidity (**12mChgLiq_Amihud**)	3 month average of 12-month change in the average of a stock's daily Amihud liquidity (defined as the absolute value of its daily return divided by its daily dollar volume) during that month divided by the 12-month volatility of average Amihud liquidity	A
3M Average of Volatility adjusted 12m Change in Shares Turnover (**12mChgLiq_ShrTO**)	3 month average of 12-month change in the average of a stock's daily turnover (defined as stock's daily volume traded divided by its shares outstand) during that month divided by the 12-month volatility of shares turnover	D
12M Annual Volatility (**12mVolatility**)	Annualized volatility based on 12-month daily return	A

The 12-month change in Amihud liquidity and shares turnover metrics generated significant annualized long-short returns and ICs across all three regions and markets. Bali, Peng, Shen and Tang (2013), found that the stock market underreacts to stock level liquidity shocks and these shocks predict stock prices up to 6-montsh in future. The 12-month change in Amihud is a proxy for liquidity shock.

The low volatility premium is well documented and the factors we constructed to capture this premium were effective across all markets/regions. There are a couple of theories that explain the low volatility premium. According to Bake, Bradley and Wurgler (2010) and Frazzini and Pedersen (2011), the volatility premium can be explained by investors' irrational behavioral – "preference for lotteries".

Exhibit 9. Liquidity and Volatility Performance Summary – BMI DM SML (Jan. 1995 – Sep. 2018)

Region	Factor/Signal	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Europe	12mChgLiq_Amihud	Jan-95	264	2.48%***	0.85	60%***	5.48%***	0.015***
	12mVolatility	Jan-95	264	1.46%**	0.40	53%	7.62%***	0.034***
	12mChgLiq_ShrTO	Jan-95	264	1.10%*	0.37	57%**	3.32%***	0.01***
	Liq & Vol_Com	**Jan-95**	**264**	**2.78%*** **	**1.00**	**60%*** **	**7.96%*** **	**0.028*** **
Asia ex Japan	12mVolatility	Jan-95	126	5.12%***	0.67	57%**	16.79%***	0.075***
	12mChgLiq_ShrTO	Jan-95	126	1.20%	0.23	53%	4.27%**	0.013***
	12mChgLiq_Amihud	Jan-95	126	0.99%	0.20	51%	4.17%**	0.014***
	Liq & Vol_Com	**Jan-95**	**126**	**5.34%*** **	**0.84**	**61%*** **	**11.16%*** **	**0.044*** **
Japan	12mVolatility	Jan-95	201	2.06%*	0.30	52%	10.19%***	0.061***
	12mChgLiq_Amihud	Jan-95	201	0.97%	0.26	56%**	4.23%***	0.012***
	12mChgLiq_ShrTO	Jan-95	200	0.88%	0.25	51%	4.47%***	0.010***
	Liq & Vol_Com	**Jan-95**	**201**	**3.80%*** **	**0.91**	**59%*** **	**8.20%*** **	**0.039*** **

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

The combined liquidity and volatility signals generated the strongest results across all regions, with all performance metrics significant at the 1% level.

3.4 Institutional Sentiment

Measuring sentiment using sell-side analyst opinion in the small cap space may be difficult due to limited (or 'zero') coverage from analysts. However, sentiment can be measured using the holdings of institutional investors - institutional investors should own more (less) of a stock if they have a positive (negative) view on the company. We have previously demonstrated the efficacy of metrics constructed from institutional ownership data in Ning (2016). The research demonstrated that the 'IO' signals are complementary to fundamental and technical signals commonly used by investors.

Exhibit 10. Institutional Ownership Factor Definitions

Factor/Signal	Definition	Sort Order
Total Ownership Level	Percentage of company shares owned by total institutional shareholders	D
Ownership Breadth Stability_Buyers (**BreadthStab**)	Measured by stability of number of buyers. It is a standardized measure of the average number of institutional investors holding a firm's shares	D
Ownership Concentration	Ratio of shares held by top 5 institutional investors to shares held by all institutional investors	A
Investment Duration	Weighted-average length of time that institutional investors have held a stock in their portfolios	D

We tested the signals in Exhibit 10 and our results are detailed in Exhibit 11. Over our testing window, the 'IO' signals performed best in BMI Asia SML market – three of the four signals yielded significant annualized positive long-only active returns.

Exhibit 11. Institutional Sentiment Performance Summary – BMI DM SML (Mar. 2005 – Sep. 2018)

Region	Factor/Signal	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Active Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Europe	Concentration	Mar-05	273	1.85%*	0.44	56%	4.87%***	0.025***
	InvestDuration	Mar-05	227	1.66%	0.21	57%*	3.17%	0.018***
	Ownership Level	Mar-05	270	1.45%	0.21	54%	3.39%	0.016**
	BreadthStab	Mar-05	269	1.00%	0.37	57%*	3.36%**	0.019***
	InstSenti_Com	**Mar-05**	**273**	**2.34%****	**0.62**	**60%*****	**5.68%*****	**0.027*****
Asia ex Japan	InvestDuration	Mar-05	148	4.52%***	0.82	59%**	4.83%**	0.025***
	BreadthStab	Mar-05	168	3.69%***	0.86	58%*	6.76%***	0.032***
	Ownership Level	Mar-05	169	2.70%*	0.49	59%**	6.27%**	0.034***
	Concentration	Mar-05	169	2.12%	0.38	57%*	4.47%**	0.031***
	InstSenti_Com	**Mar-05**	**169**	**4.68%*****	**1.14**	**67%*****	**8.44%*****	**0.041*****
Japan	BreadthStab	Mar-05	220	2.45%***	0.96	66%***	7.11%***	0.031***
	Concentration	Mar-05	225	1.98%**	0.53	54%	6.02%***	0.030***
	InvestDuration	Mar-05	197	1.96%*	0.62	60%**	2.56%	0.022***
	Ownership Level	Mar-05	217	0.96%	0.34	54%	2.57%*	0.016***
	InstSenti_Com	**Mar-05**	**220**	**2.48%*****	**1.06**	**66%*****	**6.74%*****	**0.036*****

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

Given the data and information gap among small cap companies, institutional investors' sentiment (represented by their ownership) provides an additional source of information, which can be complimentary to the information contained in financial statements.

Ownership breadth and concentration metrics are the best two signals in Japan. Higher ownership concentration likely indicates a closed corporate governance system, which can result in less information available to outside investors, a higher potential for inside trading, and can inhibit stock returns. Conversely, increased institutional ownership can alleviate some of the concerns regarding the bank-centered and cross-shareholding based corporate governance in Japan.

3.5 Industry Specific Banking Signals

The banking industry is unique and highly regulated globally. Some of the commonly used stock selection signals, such as cash flow and accruals related measures, cannot be directly applied to the banking industry due to the nature of banks' assets and liabilities. SNL Bank fundamental data provides a rich set of bank specific data items. Ning et al. (2017) documented a positive relationship between financial ratios constructed from SNL Bank fundamental data and future stock returns. The investment strategies in their work were categorized according to industry standard – CAMELS[11] frame work.

The signals we tested for this research are listed in Exhibits 12 and 13.

Exhibit 12. Bank Valuation Factor Definitions

Factor/Signal	Definition	Sort Order
Core EPS / Price	Core earnings per share on a diluted basis divided by price. Core income is net income after taxes and before extraordinary items, less net income attributable to non-controlling interest, gain on the sale of held to maturity and available for sale securities, amortization of intangibles, goodwill and nonrecurring items. The assumed tax rate is 35%	D
Dividend Yield	The trailing 4-quarter sum of common dividends declared per share divided by the current share price	D
Dividends Payout Ratio	The trailing 4-quarter sum of total dividends paid per share divided by the 4-quarter sum of diluted earnings per share before extraordinary items	A

[11] CAMELS: is a recognized international rating system that bank supervisory authorities use in order to rate financial institutions according to six factors (Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, Sensitivity) represented by its acronym.

Exhibit 13. Bank Quality & Profitability Factor Definitions[12]

Factor/Signal	Definition	Sort Order
Risk-Based Capital Ratio (**TotRisk-bsdCptlRatio**) [CA]	Ratio of total risk-based capital to total risk-weighted assets	D
Problem Loan / Total Equity & Reserves (**ProbLn/TotEqt&Reserve**) [AQ]	Problem loans divided by the sum of total equity and reserves for loan losses	A
Loan Loss Reserve / Average Total Risk Weighted Asset (**LLR/AvgTRWA**) [AQ)	Loan loss reserves divided by average total risk weighted assets	A
1 Year Change in Net Interest Income to Average Asset (**1YrChgNetIntInc/AvgAst**) [PF]	The 1-year change in the ratio of net interest income to average assets	D
Pre-Prevision Earnings Growth (**Pre-PrevisnEarningsGW**) [GW]	The 1-year growth rate of pre-provision earnings per share	D

Our results (Exhibit 14) are a reflection of our test period: over the past 10 years, on average over 90% of banks in BMI DM SML universe paid dividends. Paying dividends not only indicates a guaranteed return investors would earn, it also serves as an indicator of underlying financial strength or weakness during the crisis. The 3-factor combined composite generated impressive results across all metrics – long-only active return, long-short return, IC, and hit rate (all statistically significant at the 1% level.)

Exhibit 14. Banking Signal Performance Summary – BMI DM SML Bank (Sep. 2008 – Sep. 2018)

Theme	Factor/Signal	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Hit Rate	Ann. Long/Short Return	Avg. 1-Month IC
Valuation	Dividend Yield	Sep-08	18	3.47%	0.46	61%**	8.60%***	0.048***
	Dividend Payout Ratio	Sep-08	18	2.22%	0.40	52%	4.75%**	0.022*
	Core EPS to Price	Sep-08	18	0.09%	0.01	52%	3.76%	0.020*
	Bank_Valuation	**Sep-08**	**18**	**5.28%*** **	**0.78**	**68%*** **	**11.53%*** **	**0.043*** **
Quality & Profitability	TotRisk-bsdCptlRatio	Sep-08	18	4.28%*	0.50	60%**	6.30%*	0.031**
	ProbLn/TotEqt&Reserve	Sep-08	17	3.35%	0.40	53%	8.82%**	0.026*
	LLR/AvgTRWA	Sep-08	16	1.89%	0.24	56%	9.39%**	0.034**
	Pre-PrevisnEarningsGW	Sep-08	16	1.59%	0.25	50%	8.39%**	0.026**
	1YChgNetIntInc/AvgAst	Sep-08	15	1.42%	0.17	55%	7.15%**	0.030**
	Bank_Quality&Profit	**Sep-08**	**18**	**6.27%*** **	**0.84**	**56%**	**13.25%*** **	**0.050*** **

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

Most of quality and profitability signals we tested demonstrated weak long-only returns, but strong long-short returns. European banks have struggled with a sovereign debt crisis and bad loans over the last 10 years and many still have books with legacy assets from the global financial crisis. Japanese banks have also faced issues such as low to negative interest rates, shrinking population (banking business is fundamentally dependent on demographics), and lately the severe threats

[12] CA: capital adequacy, AQ: asset quality, PF: profitability, GW: growth

from mobile payments. Therefore, downside protection by avoiding "bad" banks (signaled by deterioration in profit, limited capital reserve, and high problem loan and loan loss reserve ratios) has been a key to a successful stock selection strategy within the small bank universe.

4. A Robustness Check for "Investability"

To ensure the robustness of the small cap strategies we highlighted in the previous sections, we backtested the same strategies under various scenarios. For all tests in this section, we use the composites as proxies to represent the signals reported in previously.

4.1 Are the Strategies Effective Before and After Global Financial Crisis

We broke down the analysis period into two – the period before (1995 - 2007) and after (2008 – 2018) the global financial crisis. Given the limited history for SNL banking and ownership data, we only tested valuation, quality, liquidity and volatility in this section. The results indicated that all strategies yielded economic and statistically significant long-only and long-short active returns (Appendix B).

4.2 Do the Strategies Work in Various Liquidity Bands

The universes we used in this study are based on S&P Global BMI Developed small cap markets. This universe contains a number of illiquid securities that could be challenging for institutional investors to trade. To address this concern, we backtested these strategies by excluding the bottom 25%, 50%, or 75% of securities with lowest liquidity (defined by past 66 days' average dollar trading volume). The performance summary for these tests is detailed in Appendix C. Most of the strategies still show strong efficacy across all three regions and various markets.

4.3 Do the Strategies Work in Different Regions and Country

Investors should invest anywhere in the world where the most attractive investment opportunities can be found. Do these small cap strategies work effectively at the global level? We extended our backtest to two global universes – BMI EM SML and the Russell 2000. Summary results are detailed in Appendix D and they show that the majority of strategies are still effective.

Note: We also backtested the bank specific strategies built on SNL Bank fundamental data in various time frames (Appendix E) and BMI EM SML Bank universe (Appendix F). The results show that the bank strategies worked equally well in the different time frames we used.

5. Data

5.1 SNL Bank Fundamental Data

The SNL Bank fundamental database covers 14,000 banking institutions, spanning global markets: the Americas, Asia Pacific, Europe, the Middle East, and Africa. Bank fundamental coverage provides detailed insights into performance analysis, asset quality, regulatory capital, and deposit/loan composition.

Data types covered include:

- Balance sheet (gross and net loans, reserves, available for sale (AFS), held to maturity and trading securities, derivative assets and liabilities, deposits, off-balance-sheet commitments etc.)
- Income statement, including comparable pre-impairment operating profit, impairment detail and yield/cost information
- Detailed credit quality metrics, including problem loans, impairments and provisions
- Regulatory capital details, including core Tier 1, total capital and risk-weighted assets, plus the associated capital ratios
- Consolidated as well as unconsolidated data available when relevant and applicable

5.2 Institutional Ownership Data

The S&P Global Ownership database covers over 55,000 public and private companies comprised of more than 25,000 institutional investment firms and 44,000 mutual funds. Historical data begins in 2004 for most items. 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 the calendar quarter, we lag the period-end-date based ownership data by 2 months in all backtests. Non-U.S. countries have different filing practices for institutional investment managers; to be conservative; we lagged all data items by 12 months for all non-U.S. countries.

6. Conclusion

In this report, we use an empirical approach to identify a variety of fundamental and technical strategies that have historically been predictive of global small cap stock performance. As one of the less efficient asset classes, global small caps provide active managers with diversification benefits, as well as the opportunity to improve risk-adjusted returns. Our research shows that small cap returns have historically been driven not only by fundamental quality and valuation, but also by institutional sentiment (institutional ownership-based signals). In addition, both liquidity and volatility metrics provide important alpha signals that can aid managers in identifying global small cap stocks likely to outperform. Our research suggests that multi-factor strategies built upon diversified data sources provide a well-rounded approach to stock selection in the global small market cap space.

Appendix

Appendix A. Percent of Size Exposure in the BMI Index and Proportion of International Small/Mid/Large Cap Assets under Management (BMI non-US DM+EM: Dec. 2017)

Region / Market Cap (in $ Million)	% of Total BMI DM/EM Market Cap	% of Total Assets under Management
BMI DM - mid / large (>$2,000)	44%	63%
BMI DM - small (<=$2,000)	17%	4%
BMI EM - mid / large (>$2,000)	36%	31%
BMI EM - small (<=$2,000)	3%	2%
Total	100%	100%

Source: S&P Global Ownership Database. Data as of September 30, 2018.

Appendix B. Small Cap Strategy Before and After Global Financial Crisis: BMI DM SML (Start Date – Sep. 2018)

	Region	Analysis Time Frame	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Value & ShareHD Yield	Europe	1995-2007	Jan-95	266	5.29%***	2.22	79%***	11.29%***	0.042***
		2008-2018	Jan-08	265	7.12%***	2.81	76%***	15.84%***	0.056***
		1995-2018	Jan-95	264	6.09%***	2.49	77%***	13.28%***	0.049***
	Asia ex Japan	1995-2007	Jan-95	72	5.56%***	1.05	64%***	12.27%***	0.044***
		2008-2018	Jan-08	190	8.54%***	2.25	75%***	22.11%***	0.074***
		1995-2018	Jan-95	126	6.91%***	1.47	69%***	16.65%***	0.058***
	Japan	1995-2007	Jan-95	187	6.92%***	2.06	77%***	15.21%***	0.061***
		2008-2018	Jan-18	218	3.61%***	1.26	65%***	9.22%***	0.042***
		1995-2018	Jan-95	201	5.41%***	1.71	72%***	12.48%***	0.052***
Quality & Profitability	Europe	1995-2007	Jan-95	268	2.17%***	0.91	61%***	6.84%***	0.024***
		2008-2018	Jan-08	265	3.53%***	1.57	68%***	10.20%***	0.039***
		1995-2018	Jan-95	266	2.79%***	1.20	64%***	8.35%***	0.031***
	Asia ex Japan	1995-2007	Jan-95	73	3.86%***	0.81	63%***	8.55%***	0.036***
		2008-2018	Jan-08	189	4.98%***	1.24	67%***	17.20%***	0.057***
		1995-2018	Jan-95	126	4.26%***	1.00	64%***	12.36%***	0.045***
	Japan	1995-2007	Jan-95	187	5.72%***	1.22	68%***	11.56%***	0.052***
		2008-2018	Jan-08	218	3.92%***	1.13	65%***	11.15%***	0.038***
		1995-2018	Jan-95	200	5.11%***	1.18	67%***	11.38%***	0.046***
Liquidity & Volatility	Europe	1995-2007	Jan-95	269	3.45%***	1.09	61%***	8.74%***	0.027***
		2008-2018	Jan-08	265	2.22%***	0.88	59%**	7.06%***	0.028***
		1995-2018	Jan-95	267	2.78%***	1.00	60%***	7.96%***	0.028***
	Asia ex Japan	1995-2007	Jan-95	73	5.05%**	0.64	56%	11.22%***	0.044***
		2008-2018	Jan-08	190	5.63%***	1.51	66%***	11.15%***	0.044***
		1995-2018	Jan-95	126	5.34%***	0.84	61%***	11.16%***	0.044***
	Japan	1995-2007	Jan-95	187	5.51%***	1.13	63%***	11.50%***	0.048***
		2008-2018	Jan-08	218	2.07%**	0.59	55%	4.37%**	0.027***
		1995-2018	Jan-95	201	3.80%***	0.91	59%***	8.20%***	0.039***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 09/30/2018.

Appendix C. Small Cap Strategy in Different Liquidity Bands: BMI DM SML (1995 – Sep. 2018)

	Region	Analysis Time Frame	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Value & Share Holder Yield	Europe	25%	Jan-95	66	3.88%***	1.10	65%***	8.58%***	0.037***
		50%	Jan-95	132	4.82%***	1.73	68%***	11.17%***	0.041***
		75%	Jan-95	198	5.44%***	2.15	74%***	12.38%***	0.045***
		100%	**Jan-95**	**264**	**6.09%*** **	**2.49**	**77%*** **	**13.28%*** **	**0.049*** **
	Asia ex Japan	25%	Jan-95	31	5.64%***	0.69	59%***	12.22%***	0.042***
		50%	Jan-95	62	6.92%***	1.09	66%***	16.76%***	0.054***
		75%	Jan-95	94	6.84%***	1.33	65%***	17.09%***	0.056***
		100%	**Jan-95**	**126**	**6.91%*** **	**1.47**	**69%*** **	**16.65%*** **	**0.058*** **
	Japan	25%	Jan-95	51	4.79%***	1.05	64%***	10.24%***	0.046***
		50%	Jan-95	101	6.23%***	1.59	69%***	13.01%***	0.052***
		75%	Jan-95	151	5.82%***	1.70	71%***	12.87%***	0.053***
		100%	**Jan-95**	**201**	**5.41%*** **	**1.71**	**72%*** **	**12.48%*** **	**0.052*** **
Quality & Profitability	Europe	25%	Jan-95	67	1.71%**	0.46	53%	4.82%***	0.022***
		50%	Jan-95	133	1.85%***	0.66	60%***	5.78%***	0.026***
		75%	Jan-95	199	2.38%***	1.01	62%***	7.40%***	0.029***
		100%	**Jan-95**	**266**	**2.79%*** **	**1.20**	**64%*** **	**8.35%*** **	**0.031*** **
	Asia ex Japan	25%	Jan-95	31	3.57%**	0.47	56%*	10.80%***	0.034***
		50%	Jan-95	62	4.96%***	0.85	59%***	14.07%***	0.044***
		75%	Jan-95	93	4.34%***	0.88	63%***	13.28%***	0.045***
		100%	**Jan-95**	**126**	**4.26%*** **	**1.00**	**64%*** **	**12.36%*** **	**0.045*** **
	Japan	25%	Jan-95	51	4.58%***	0.73	60%***	11.72%***	0.048***
		50%	Jan-95	101	5.82%***	1.05	65%***	12.75%***	0.050***
		75%	Jan-95	152	5.72%***	1.19	64%***	12.53%***	0.048***
		100%	**Jan-95**	**200**	**5.11%*** **	**1.18**	**67%*** **	**11.38%*** **	**0.046*** **
Liquidity & Volatility	Europe	25%	Jan-95	67	1.35%*	0.36	48%	3.77%**	0.01*
		50%	Jan-95	133	1.98%***	0.65	57%**	5.42%***	0.015***
		75%	Jan-95	200	2.40%***	0.77	59%***	6.70%***	0.022***
		100%	**Jan-95**	**267**	**2.78%*** **	**1.00**	**60%*** **	**7.96%*** **	**0.028*** **
	Asia ex Japan	25%	Jan-95	31	4.08%**	0.44	54%	11.41%***	0.036***
		50%	Jan-95	62	5.58%***	0.69	60%***	11.86%***	0.037***
		75%	Jan-95	94	5.29%***	0.76	59%***	10.24%***	0.039***
		100%	**Jan-95**	**126**	**5.34%*** **	**0.84**	**61%*** **	**11.16%*** **	**0.044*** **
	Japan	25%	Jan-95	51	4.86%***	0.81	57%**	11.64%***	0.036***
		50%	Jan-95	101	4.02%***	0.85	56%**	9.21%***	0.035***
		75%	Jan-95	152	3.97%***	0.89	59%***	8.89%***	0.037***
		100%	**Jan-95**	**201**	**3.80%*** **	**0.91**	**59%*** **	**8.20%*** **	**0.039*** **
Institutional Sentiment	Europe	25%	Mar-05	69	2.09%*	0.43	59%**	5.95%***	0.023***
		50%	Mar-05	137	2.14%*	0.49	62%***	6.51%***	0.028***
		75%	Mar-05	206	2.00%**	0.51	61%***	5.57%***	0.027***
		100%	**Mar-05**	**273**	**2.34%** **	**0.62**	**60%*** **	**5.68%*** **	**0.027*** **
	Asia ex Japan	25%	Mar-05	43	7.35%***	1.07	62%***	13.07%***	0.049***
		50%	Mar-05	86	5.77%***	1.16	59%**	11.66%***	0.047***
		75%	Mar-05	129	4.84%***	1.03	63%***	10.32%***	0.045***
		100%	**Mar-05**	**169**	**4.61%*** **	**1.12**	**66%*** **	**8.32%*** **	**0.040*** **
	Japan	25%	Mar-05	55	2.51%**	0.58	57%*	9.53%***	0.045***
		50%	Mar-05	110	2.72%***	0.87	60%***	8.92%***	0.043***
		75%	Mar-05	166	2.53%***	0.88	61%***	8.06%***	0.041***
		100%	**Mar-05**	**220**	**2.48%*** **	**1.06**	**66%*** **	**6.74%*** **	**0.036*** **

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 9/30/2018.

Appendix D. Small Cap Strategy in Different Regions/Country: BMI EM SML and Russell 2000 (1995 – Sep. 2018)[13]

Inv. Theme	Region for Ori. Strategy Built for	Region	Test Start Date	Average Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Active Hit Rate	Ann. Long/Short Return	Avg. 1-Month IC
VL & SY	Euro & AsiaxJP	EM	Jan-95	212	7.55%***	1.30	71%***	17.69%***	0.051***
		Rus 2000	Jan-95	389	5.20%***	1.27	61%***	13.14%***	0.038***
	Japan	EM	Jan-95	212	9.31%***	1.52	72%***	18.51%***	0.048***
		Rus 2000	Jan-95	389	6.16%***	1.54	65%***	16.51%***	0.043***
QL & PF	Euro & AsiaxJP	EM	Jan-95	211	3.41%***	0.59	60%***	10.77%***	0.041***
		Rus 2000	Jan-95	389	6.52%***	1.94	71%***	13.86%***	0.031***
	Japan	EM	Jan-95	212	8.71%***	1.05	70%***	15.51%***	0.047***
		Rus 2000	Jan-95	389	6.26%***	1.94	71%***	13.86%***	0.031***
L&V	All Regions	EM	Jan-95	213	4.78%***	0.71	63%***	8.51%***	0.029***
		Rus 2000	Jan-95	389	2.81%***	0.93	57%**	9.48%***	0.033***
IO	All Regions	EM	Jan-95	310	0.18%	0.04	49%	2.7%	0.016***
		Rus 2000	Jan-95	389	3.87%***	0.88	65%***	12.04%***	0.031***

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 9/30/2018.

Appendix E. Bank Specific Strategy with Different Testing Periods: BMI DM SML Bank (Start – Sep. 2018)

	Portfolio	Analysis Time Frame	Test Start Date	Avg. Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Hit Rate	Ann. Long/Short Return	Average 1-Month IC
Value	Quintile Portfolio	2008-2018	Sep-08	19	5.07%**	0.73	68%***	11.84%***	0.044***
		2010-2018	Jan-10	19	5.04%***	0.81	69%***	11.36%***	0.045***
		2013-2018	Oct-13	19	7.45%***	1.21	70%***	11.79%***	0.057***
	Tertile Portfolio	2008-2018	Sep-08	32	4.06%***	0.83	64%***	7.20%***	0.044***
		2010-2018	Jan-10	32	3.64%***	0.82	64%***	7.27%***	0.045***
		2013-2018	Oct-13	32	5.41%***	1.13	65%**	9.59%***	0.057***
Quality and Profitability	Quintile Portfolio	2008-2018	Sep-08	19	5.13%**	0.72	57%	11.45%***	0.046***
		2010-2018	Jan-10	19	4.38%**	0.68	53%	11.23%***	0.042***
		2013-2018	Oct-13	19	5.70%**	0.76	54%	12.04%***	0.049**
	Tertile Portfolio	2008-2018	Sep-08	32	4.11%**	0.75	58%*	7.83%**	0.046***
		2010-2018	Jan-10	31	3.54%**	0.77	56%	8.01%***	0.042***
		2013-2018	Oct-13	32	4.49%**	0.91	57%	9.53%***	0.049**

[13] VL: valuation; SY: shareholder yield; QL: quality; PF: profitability; L&V: liquidity and volatility; IO: institutional ownership

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 9/30/2018.

Appendix F. Bank Specific Strategy: BMI EM SML Bank (Sep. 2008 – Sep. 2018)

Investment Theme	Back Test Start Date	Average Quintile Count	Ann. Long-Only Active Return	Ann. Long-Only Info Ratio	Long-Only Active Hit Rate	Ann. Long/Short Return	Average 1-Month IC
VL	Sep-08	16	5.48%**	0.67	55%	5.52%	0.027*
QL & PF	Sep-08	16	4.54%**	0.45	56%	5.60%	0.028*

*** 1% level of significance; ** 5% level of significance; * 10% level of significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and 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. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 9/30/2018.

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Our Recent Research

January 2019: Value And Momentum: Everywhere, But Not All the Time

"Momentum" and "Value" strategies have had well-documented return premia in multiple geographies and asset classes (Asness, Moskowitz, & Pedersen 2013). Average monthly returns to momentum are larger than average returns to value, caveated by large pullbacks ("crashes") in the momentum portfolio. Practitioners often include both approaches in their investment strategy.

Highlights include:

- Dynamically weighting value and momentum strategies by a function of the trailing volatility in the momentum portfolio produces a superior information ratio (IR), total return, and lower maximum drawdown compared to a naïve equal weighting.
- Results are consistent in six regions (U.S., Europe, Asia Ex-Japan, Japan, Latin America, and Emerging Markets) and in multiple robustness checks. We maintain dollar neutrality and persistent leverage of 1.0 in all specifications.
- Monte Carlo simulation supports the conclusion that the shift of tail density from left- to right-tail drives the performance improvements. That is, large drawdowns are avoided.

November 2018: Forging Stronger Links: Using Supply Chain Data in the Investing Process

Highlights include:

Supply chain data can greatly enrich the investment process. Many of the insights gleaned from the supply chain can extend beyond what may be immediately obvious to investors. This report leverages the Panjiva content set, focused on global maritime shipping, to draw out seven major investment use cases. Working examples are provided from previously published research, including links to underlying reports, for each instance.

- Lower latency, higher frequency and finer granularity vs. financial data
- Detection of anomalous activity
- Risk event impact assessment
- Automated channel checks
- Industry deep dives
- Capital markets activities
- Thematic trading candidate identification

September 2018: Their Sentiment Exactly: Sentiment Signal Diversity Creates Alpha Opportunity

Investors sometimes view sentiment signals as interchangeable: one indicator is the same as the next. Our research shows that this is far from the case.

Highlights include:

- Companies where management is both positive/optimistic and fact-focused outperform historically.
- Hedge fund sentiment confirms and complements management sentiment.
- Market sentiment surrounding earnings calls amplifies the effectiveness of earnings transcript-based signals.
- Analyst sentiment, as reflected in target price/recommendation changes, adds an important voice to ownership-based signals.

September 2018: Natural Language Processing – Part II: Stock Selection: Alpha Unscripted: The Message within the Message in Earnings Calls

Highlights include:

- Sentiment-based signals: Firms whose executives and analysts exhibited the highest positivity in sentiment during earnings calls outperformed their counterparts. Firms with the largest year-over-year positive sentiment change and firms with the strongest positive sentiment trend outperformed their respective counterparts.
- Behavioral-based signals: Firms whose executives provided the most transparency by using the simplest language and by presenting results with numbers outperformed their respective counterparts.
- Sentiment- and behavioral-based signals are not subsumed by commonly used alpha and risk signals.
- Positive language from the unscripted responses by the executives during the Q&A drove the overall predictability of the positive sentiment signal.
- The sentiment of CEOs has historically been more important than the sentiment of other executives.
- The aggregate sentiment of analysts historically enhanced the predictability of the 3-month FY1 EPS analyst revision signal.

July 2018: A Case of 'Wag the Dog'? - ETFs and Stock-Level Liquidity
Highlights include:

- We present an ETF price impact model, which posits single-day impact of up to 370 bps / day on an individual security and up to 250 bps / day on the index itself. Analyses indicate the effect is transitory and reverses over a period of 3-5 trading days.
    - The Feb 2018 market correction was accompanied by a $25B outflow of assets from ticker SPY, the SSGA S&P 500 Trust ETF. Modeling suggests that as much as one-third of the pullback was due to price pressure from ETF trading and that securities more sensitive to ETF flow underperformed.
    - Sensitivity to ETF flow is used to build a risk model, which generates improved performance in a historical optimization. We offer a method for estimating ETF sensitivity for funds, using the S&P Global Ownership dataset.

June 2018: The (Gross Profitability) Trend is Your Friend
Trend strategies based on changes in stock price or earnings are widely used by investors. In this report, we examine the performance of a trend strategy derived from gross profitability ("GP"). Gross profitability trend ("GPtrend"), was proposed by Akbas et al. who argued that the trajectory of a firm's profitability is just as important as the level (GP). We define GPtrend as the year-on-year difference in either quarterly or trailing twelve month GP, where GP is calculated as revenue minus cost of goods sold, divided by total assets. Our back-tests confirm that GPtrend has historically been an effective stock selection signal globally, with the added benefit of low to moderate correlation with commonly used investment strategies.

May 2018: Buying the Dip: Did Your Portfolio Holding Go on Sale?
'Buy the Dip' ("BTD"), the concept of buying shares after a steep decline in stock price or market index, is both a Wall Street maxim, and a widely used investment strategy. Investors pursuing a BTD strategy are essentially buying shares at a "discounted" price, with the opportunity to reap a large pay-off if the price drop is temporary and the stock subsequently rebounds. BTD strategies are especially popular during bull markets, when a market rally can be punctuated by multiple pullbacks in equity prices as stock prices march upwards.

March 2018: In the Money: What Really Motivates Executive Performance?
Beginning with the 2018 proxy season, U.S. companies are required to report the ratio of CEO pay to median worker pay. According to The Wall Street Journal1, CEO pay ratios so far have ranged from just 32 times to over 900 times the average worker's salary.

This S&P Global Market Intelligence report, explores which types of compensation motivate top

executives to boost shareholder returns, and the fundamental characteristics of companies in which executives are motivated to boost stock performance.

February 2018: The Art of (no) Deal: Identifying the Drivers of Cancelled M&A Deals

Terminated deals impact capital market participants in various ways. Predicting deals that are likely to be canceled is of interest to both M&A advisers and equity investors. This report identifies several drivers of cancelled deals, including size, deal proportionality, perceived price discount, CEO age, and regulatory risk, and concludes with a model built from four of these drivers.

January 2018: U.S Stock Selection Model Performance Review

Starting with the U.S. Election in November 2016, the S&P 500 Index has registered 14 consecutive months of positive returns. Only once has the S&P 500 had a longer run of positive returns since 1959. Coincident with strong equity returns, U.S. stocks began to trade on the basis of their own idiosyncratic factors, as opposed to sector or common factor risk. All 4 of our U.S strategy models returned positive long-only returns in 2017. This report reviews the performance of all 4 models during the year.

September 2017: Natural Language Processing - Part I: Primer

Given the growing interest in NLP among investors, we are publishing this primer to demystify many aspects of NLP and provide three illustrations, with accompanying Python code, of how NLP can be used to quantify the sentiment of earnings calls. The paper is laid out into four sections:

- **What is NLP:** We demystify common NLP terms and provide an overview of general steps in NLP.
- **Why is NLP Important:** Forty zettabytes (10^21 bytes) of data are projected to be on the internet by 2020, out of which more than eighty percent of the data are unstructured in nature, requiring NLP to process and understand
- **How can NLP help me:** We derive insights from earnings call transcripts measuring industry-level trends or language complexity.
- **Where do I start:** Code for each use is enclosed, enabling users to replicate the sentiment analysis

July 2017: Natural Language Processing Literature Survey

In client conversations, Natural Language Processing (NLP) and the analysis of unstructured data is a topic of regular conversation. S&P Global Market Intelligence offers several unstructured datasets garnering market attention. The first is earnings call transcripts, with unique speaker id's to identify who is speaking on the call. The second data set is the text content in the 10-K. In advance of a publication of Quantamental primer on NLP next month which will take readers through the process of handling unstructured data and generating sentiment scores, we offer this literature survey. What follows are ten papers that the team has identified as being of particular interest to investors on this topic.

June 2017: Research Brief: Four Important Things to Know About Banks in a Rising Rate Environment

With the Fed signaling further rate hikes ahead, bank investors may want to know which investment strategies have worked best in a rising rate environment historically. This paper leverages our empirical work on the SNL Bank fundamental data to aid investors in selecting bank stocks as rates rise.

April 2017: Banking on Alpha: Uncovering Investing Signals Using SNL Bank Data

This study leverages S&P Global Market Intelligence's SNL Financial data to answer three questions of importance to bank investors: 1. Which widely-used investment strategies have historically been profitable? 2. Which lesser-known strategies deserve wider attention? 3. How do

these strategies perform across varying macro environments: rising vs. falling interest rates and above- vs. below-average financial stress?

March 2017: Capital Market Implications of Spinoffs
Spinoff activities have picked up in recent years. In 2015, more than $250 billion worth of spinoff transactions were closed globally - the highest level in the last 20 years. This report analyzes the short- and long-term performance of spun-off entities and their parent companies in the U.S. and international markets. We also examine a related but distinct corporate restructuring activity – equity carve-outs, which separate a subsidiary through a public offering.

January 2017: U.S. Stock Selection Model Performance Review 2016
2016 proved to be a challenging year for active investing. Against a backdrop of a sharp selloff in equities at the beginning of the year and political uncertainty over the course of the year, valuation was the only fundamental investing style that delivered positive excess returns. In this report, we review the performance of S&P Global Market Intelligence's four U.S. stock selection models in 2016.

November 2016: Electrify Stock Returns in U.S. Utilities

October 2016: **A League of their Own: Batting for Returns in the REIT Industry - Part 2**

September 2016: A League of their Own: Batting for Returns in the REIT Industry - Part 1

August 2016: Mergers & Acquisitions: The Good, the Bad and the Ugly (and how to tell them apart)

July 2016: Preparing for a Slide in Oil Prices -- History May Be Your Guide

June 2016: Social Media and Stock Returns: Is There Value in Cyberspace?

April 2016: An IQ Test for the "Smart Money" – Is the Reputation of Institutional Investors Warranted?

March 2016: Stock-Level Liquidity – Alpha or Risk? - Stocks with Rising Liquidity Outperform Globally

February 2016: U.S. Stock Selection Model Performance Review - The most effective investment strategies in 2015

January 2016: What Does Earnings Guidance Tell Us? – Listen When Management Announces Good News

December 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 6

November 2015: Late to File - The Costs of Delayed 10-Q and 10-K Company Filings

October 2015: Global Country Allocation Strategies

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

September 2015: Research Brief: Building Smart Beta Portfolios

September 2015: Research Brief – Airline Industry Factors

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

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

July 2015: Research Brief – Liquidity Fragility

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

May 2015: Investing in a World with Increasing Investor Activism

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

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

March 2013: Follow the Smart Money - Riding the Coattails of Activist Investors

February 2013: Stock Selection Model Performance Review: Assessing the Drivers of Performance in 2012

January 2013: Research Brief: Exploiting the January Effect Examining Variations in Trend Following Strategies

December 2012: Do CEO and CFO Departures Matter? - The Signal Content of CEO and CFO Turnover

November 2012: 11 Industries, 70 Alpha Signals -The Value of Industry-Specific Metrics

October 2012: Introducing S&P Capital IQ's Fundamental Canada Equity Risk Models

September 2012: Factor Insight: Earnings Announcement Return – Is A Return Based Surprise Superior to an Earnings Based Surprise?

August 2012: Supply Chain Interactions Part 1: Industries Profiting from Lead-Lag Industry Relationships

July 2012: Releasing S&P Capital IQ's Regional and Updated Global & US Equity Risk Models

June 2012: Riding Industry Momentum – Enhancing the Residual Reversal Factor

May 2012: The Oil & Gas Industry - Drilling for Alpha Using Global Point-in-Time Industry Data

May 2012: Case Study: S&P Capital IQ – The Platform for Investment Decisions

March 2012: Exploring Alpha from the Securities Lending Market – New Alpha Stemming from Improved Data

January 2012: S&P Capital IQ Stock Selection Model Review – Understanding the Drivers of Performance in 2011

January 2012: Intelligent Estimates – A Superior Model of Earnings Surprise

December 2011: Factor Insight – Residual Reversal

November 2011: Research Brief: Return Correlation and Dispersion – All or Nothing
October 2011: The Banking Industry

September 2011: Methods in Dynamic Weighting

September 2011: Research Brief: Return Correlation and Dispersion

July 2011: Research Brief - A Topical Digest of Investment Strategy Insights

June 2011: A Retail Industry Strategy: Does Industry Specific Data tell a different story?

May 2011: Introducing S&P Capital IQ's Global Fundamental Equity Risk Models

May 2011: Topical Papers That Caught Our Interest

April 2011: Can Dividend Policy Changes Yield Alpha?

April 2011: CQA Spring 2011 Conference Notes

March 2011: How Much Alpha is in Preliminary Data?

February 2011: Industry Insights – Biotechnology: FDA Approval Catalyst Strategy

January 2011: US Stock Selection Models Introduction

January 2011: Variations on Minimum Variance

January 2011: Interesting and Influential Papers We Read in 2010

November 2010: Is your Bank Under Stress? Introducing our Dynamic Bank Model

October 2010: Getting the Most from Point-in-Time Data

October 2010: Another Brick in the Wall: The Historic Failure of Price Momentum

July 2010: Introducing S&P Capital IQ's Fundamental US Equity Risk Model