



Start of Something Big: Demystifying the Source of Large Alpha in Small Caps

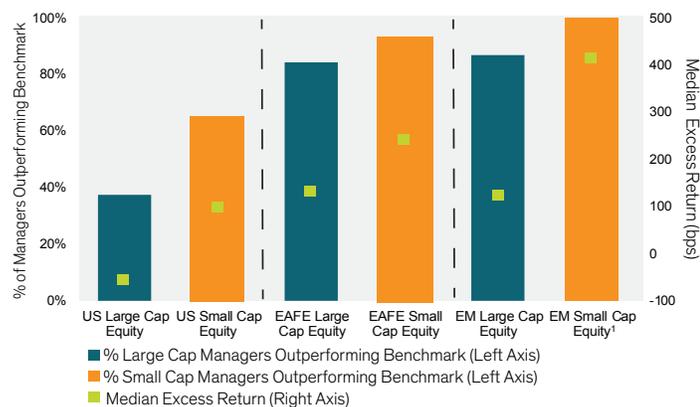
DECEMBER 2016

In Brief

- In a world where alpha can seem increasingly scarce, the case for active management in small caps is strong.
- In some major small-cap markets, it is no longer the asset class as a whole, but the chance for greater alpha that provides the real "premium."
- This alpha opportunity arises from increased mispricings stemming from less investor attention, limited transparency and magnified behavioral biases.
- It is important to understand that alpha is no certainty, as small-cap investing comes with its own risks and costs. For consistent results, investors are best served with a disciplined and skilled manager at the helm.

It is one of the most burning questions investors face today: Where can they find more alpha? Small-cap stocks are regularly viewed as one of the markets' most fertile sources compared to larger capitalization stocks. The past five years' performance (Figure 1) bears out a pattern evident for some time. Across every geographic market, the median outperformance of active small-cap managers relative to their respective benchmarks is significantly higher than for large-cap managers. But what is behind the apparent strength of small-cap alpha? People have a general sense that the small-cap world is riskier and less efficient, but how or whether these characteristics contribute to more alpha opportunities remains unclear.

1/ LARGER ALPHA IN SMALL CAPS: COMPARING FIVE-YEAR ACTIVE MANAGER OUTPERFORMANCE



As of 9/30/2016. Source: QMA, eVestment Alliance. The 5-year gross outperformance was generated using the manager preferred benchmark for all active strategies listed in the following universes: US Large Cap Equity, US Small Cap Equity, EAFE Large Cap Equity, EAFE Small Cap Equity, EM Large Cap Equity, and EM Small Cap Equity. Median Outperformance is the Median Excess Return of Managers Outperforming the benchmark. eVestment Alliance is an outside vendor whose software has been used to create this exhibit. QMA pays a fee for this software. QMA has made efforts to confirm accuracy/reliability of the data provided by eVestment Alliance but we disclaim responsibility for its accuracy or completeness. Past performance is not a guarantee or a reliable indicator of future results.

At QMA, we have always felt it was critical for investors to understand where their returns are coming from to improve their chances of repeating them in the future. So, to investigate a likely reason for large alpha in small caps, we recently conducted a study analyzing the source of returns of our own small cap core equity strategy. Our results reveal the existence of pervasive inefficiencies that create wider spreads and larger mispricings that active managers with a careful process are regularly able to exploit. These findings show capturing alpha in small caps is less mysterious than it may first appear. To us, it is largely a result of having the right process to sort through the voluminous small-cap universe to identify the highest-quality, most undervalued stocks with the most attractive growth prospects, and then having the discipline to wait, week after week, quarter after quarter, for the mispricings to correct.

SEPARATING ALPHA FROM BETA

Part of the confusion around small-cap alpha stems from the fact that small-cap *beta* itself has long been viewed as an important contributor of added portfolio returns. This "small-cap premium" is based on the intuitive observation, first noted over 30 years ago, that smaller companies had higher risk-adjusted returns than larger companies.² Firms with smaller market capitalizations have more limited access to capital. Their revenue streams are typically less diversified, making them more vulnerable to swings in the economy. This implies that small-cap stocks are inherently riskier than large-cap companies and, consequently, also come with higher expected returns as efficient market theory would suggest. What it doesn't explain is why active managers who specialize in small-cap stocks should have more opportunities to outperform their own small-cap benchmarks.

Moreover, in some major small-cap markets like the US, a passively managed allocation to small-cap indexes may not offer as much of a premium as once thought. Although the original early-1980s studies based on data going back to the 1940s showed US small-cap stocks outpacing their large-cap counterparts, the more recent data reveals a more modest effect. Over the past 30 years, the Russell 2000[®] has essentially just matched the performance of the Russell 1000[®]. Periods like 2016 where US small caps significantly outperformed large caps are generally offset by periods like the previous few years when large caps did better. Once volatility is taken into account, the Russell 2000[®] has actually slightly underperformed on a risk-adjusted basis (Figure 2 on next page).

There are a number of theories why this is. Some speculate the small-cap premium may have been arbitrated away over the years as more managers entered the space. Or, that the small-cap premium was really an illiquidity premium that weakened over time

¹ Note that 100% of eVestment EM Small Cap Equity managers beat their benchmark. But keep in mind the sample set in the database (just 19 with a five-year track record) is very small. There may also be a self-selection bias. I.e., since more are younger funds, there is a higher propensity to not report initial poor track records.

² Rolf Banz, "The Relationship between Market Value and Return of Common Stocks," Journal of Financial Economics, 1981.

2/ A SHRINKING US SMALL CAP PREMIUM?

Index Name	Time Period	Arithmetic Return	Standard Deviation	Sharpe Ratio	Compounded Geometric Return
Russell 2000®	30 Year	10.9%	19.3	0.30	9.3%
Russell 1000®	30 Year	11.0%	15.1	0.50	10.2%

As of 9/30/2016.

Source: QMA, eVestment, Frank Russell Company.

QMA has made efforts to confirm accuracy/reliability of the data provided by eVestment Alliance (and for which QMA pays a subscription fee) but we disclaim responsibility for its accuracy or completeness. The Russell® Indices are a trademark/service mark of the Frank Russell Company. Russell® is a trademark of the Frank Russell Company. Past performance is not a guarantee or a reliable indicator of future results.

as small cap stocks became somewhat easier to trade. Another theory suggests there was an upward “survivor’s” bias in the historical data caused by the large number of stocks that routinely fall out of the small-cap index, and so the small-cap premium never really existed at all.³ Supporting these views is the fact that the premium appears to be alive and well outside the US, where the small-cap markets are still much less efficient and liquid and the index attrition rate is even higher.

Regardless, little of this helps explain the preponderance of alpha that is still available in the smaller capitalization ranges of the equities markets all across the globe.

SO, WHERE DOES ALPHA COME FROM?

The sheer size of the small-cap universe seems to offer an appealing explanation. In the US, Russell® has 2,000 companies in its small-cap index, twice as many stocks as in its large-cap index. Internationally, the MSCI EAFE Small Cap Index has 2,217 names, compared to 929 in EAFE Large Cap; the EM numbers are similar: 1,885 to 834. Because there are more small companies in general, there are more companies with attractive value or growth prospects. According to some, this is what makes it easier to unearth promising opportunities and find alpha. What this view overlooks, however, is there are also more companies of all kinds that active managers need to sift through to find the good ones. If alpha equaled breadth, pockets of the small-cap market with fewer names would present comparatively narrower opportunities. Yet, in our international portfolios, we find that countries with smaller pools of small-cap stocks have information coefficients (correlation of stocks’ ratings in our stock selection model to their future returns) consistent with more extensive markets. If breadth is a contributor, it’s only part of the explanation.

To help sift through the small-cap universes, many active managers (ourselves included) use a factor-based model to identify stocks expected to out- and underperform. This widespread use of factors has led to another popular explanation for greater small-cap manager outperformance: that what appears on the surface to be alpha is just another form of beta in disguise. In this view, the factors simply help managers pick riskier value or growth stocks that subsequently deliver a higher return premium than they would in the large-cap space. It is true that almost every active equity manager derives *some* of its returns from risk premia. Small-cap value managers will have some exposure to cheap distressed stocks, for example, and growth managers will have some exposure to high-flying momentum names. But, as our research will suggest, there is also another important dynamic at work.

TOP 5 CONSIDERATIONS WHEN INVESTING IN SMALL CAPS

While the alpha potential in small caps is higher, capturing it is by no means a given. Every aspect of the expanded opportunity set presents its own unique hurdles that small-cap managers need to bridge to outperform consistently.

- **Size of the universe.** To get the most out of the enormous small-cap opportunity set, managers ideally want to generate insights across the whole universe to identify the most attractive opportunities.
- **Low-quality and sparse data.** The same issues that account for low investor attention and transparency increase the need for extensive data integrity checks to overcome the potential for a garbage-in/garbage-out situation. Managers also need to be able to integrate insights from varied data sources to get a more complete picture on each stock.
- **Risk factor concentration.** Those who look to gain an edge in certain sectors or regions can encounter large swings in performance when those segments fall out of favor. Managers need to ensure processes work consistently across all dimensions of the small-cap universe, including countries, sectors, industries, and growth segments.
- **Magnified idiosyncratic shocks.** Small-cap companies’ limited product lines and geographic focus mean that both good and bad news is amplified. Events like takeovers and bankruptcies are also more common. While these can be positive for alpha, diversifying stock bets may reduce the sting of surprises that could turn into one or a few losing positions.
- **Higher transaction costs.** Lower liquidity can increase bid-ask spreads and market impact on costs, which need to be considered when evaluating the return potential of investments. Managers may need to revisit the structure of their portfolios or use certain trading strategies to minimize these risks.

IT’S IN THE MISPRICE

In an effort to cut through the confusion and help tease out where alpha is coming from in small caps, we took a closer look at our own small-cap core stock selection process. We conducted a study to measure the contribution to alpha of mispricing opportunities. We did this by examining the relationship between the returns generated by our stock selection model and an information event that makes mispricings more apparent. We took two approaches: the first examining the relationship between the stock rankings in our model and the reaction of stocks’ prices to earnings announcements; the second looking at the magnitude of the surprise of sell-side research analysts to the earnings reported. We performed our tests on the Russell 2000®, the world’s small-cap market with the most liquidity and analyst coverage, where if anything mispricings should be least prevalent. We focused on earnings announcements, as they are the one type of information event shared by all stocks across every quarter.

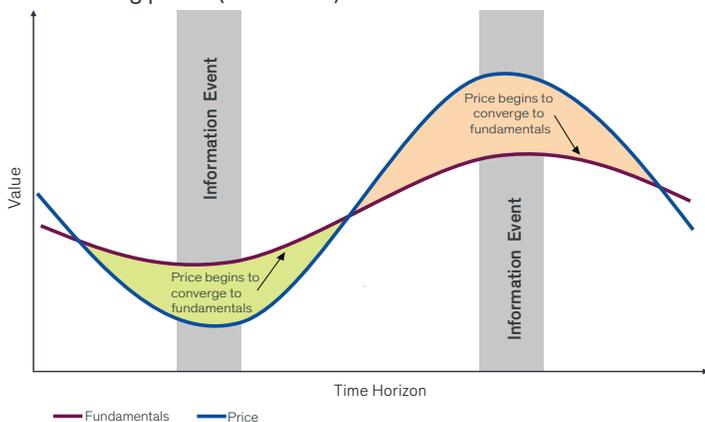
The idea behind Test 1 is that if mispricings exist in the market, they are more likely to correct when market participants realize their mistakes. An information shock such as an earnings announcement should therefore be a learning event that can be a catalyst for a price correction. If this is the case, and our stock selection model is effective at identifying mispricings, then we

³ Alex Bryan, “Does the Small Cap Premium Even Exist?” Morningstar, 2014.

would expect to see a higher proportion of the return from our strategy generated around earnings announcements (Figure 3).

3/ INFORMATION CORRECTION EFFECT

Shocks bring prices (somewhat) more in line with fundamentals



Source: QMA. Shown for illustrative purposes only.

The idea behind Test 2 is that biased prices can arise because of over or underzealous earnings expectations. Analyst earnings surprises can be a proxy for such expectations, reflecting, as they do, the difference between expected and actual earnings. If our model incorporates more powerful insights into company earnings prospects relative to other market participants, then we should observe a positive relationship between our stock rankings and the magnitude of surprises.

In Test 1, we break our total universe of small-cap stocks into quartile rankings based on the combination of factors we use in our stock selection model. This is done at the beginning of each calendar quarter, with rankings remaining fixed throughout. For each quarter, we identify the announcement period as the four-day window starting two days before the earnings announcement. The announcement period therefore covers approximately 6.3% of trading days in a quarter (=4/63). We cumulate stock returns over the announcement period and over the whole quarter, and average each quartile's performance across all calendar quarters. We then look at the ratio of the announcement period to the whole-quarter spread return, and compare these results to the same analysis of our large-cap universe.

We find that approximately 20% of returns from our small-cap stock selection process are generated during announcement periods. This is about three times what we would expect if returns were uniformly distributed through the quarter. Interestingly, when we examine US large caps, we find that the clustering distribution is almost identical. This indicates that a similar mispricing pattern occurs in large caps, with earnings announcements proving to be a valuable learning event for investors in both spaces to correct past mistakes. However, the magnitude of the mispricings are much larger in small caps. We find that the spread in return computed from the earnings announcement window is 81 bps for the small-cap space, compared to 34 bps for large caps, or nearly two-and-a-half times bigger (Figure 4).

We should note, too, that earnings announcements are just one type of information event. If we could somehow analyze other

4/ MISPRICING STATISTICS FOR LARGE AND SMALL CAPS

The gap between the most and least attractive stocks widens even more for small caps

	Return Spread	Analyst Surprise ("SUE") Spread
Large Cap Earnings Announcement Window	34 bps	0.42
Small Cap Earnings Announcement Window	81 bps	0.59

As of 9/30/2016.

Source: QMA. Shown for illustrative purposes only.

material information releases, such as buybacks, dividend initiation announcements, etc. (difficult to do given how irregularly they occur across stocks and quarters), it would fill in more of the mosaic. This is true from both a rankings and a shock standpoint. After all, our rankings are updated daily, so the more frequent the observations, the more accurate a picture it would give us of how the model is reacting and benefitting in real time.

For Test 2 examining magnitude of analyst surprise, we also perform testing on a calendar quarter basis. For each stock, we measure analyst surprise in terms of the commonly used metric Standardized Unexpected Earnings, or "SUE."⁴

Consistent with the outcome of Test 1, we find that analyst surprises are strongest for stocks which rate highest based on our stock selection model, with SUE ranging from 0.36 for the lowest-ranked stocks up to 0.95 for the highest-ranked, a spread of 0.59. When we repeat the analysis in large caps, we find SUE ranges from 0.85 for lowest-ranked stocks to 1.27, a one-third smaller spread, lending further support to the greater alpha potential for those able to overcome the inherent challenges with accurately evaluating small-cap firms.

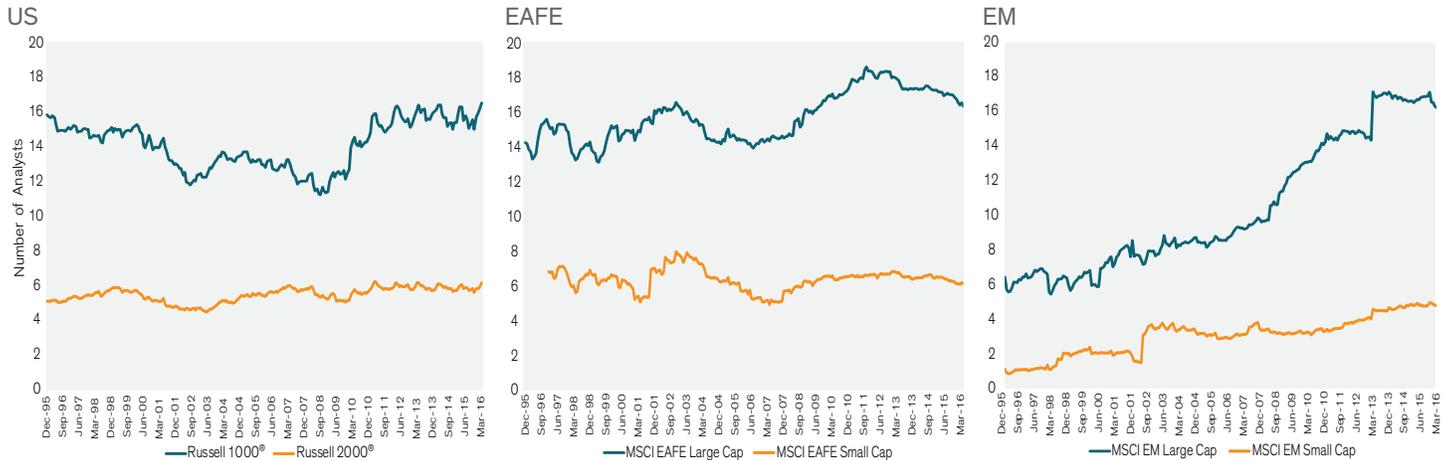
Both tests suggest that a significant portion of the return generated by our quantitative stock selection models in small caps is derived from identifying and systematically exploiting mispriced securities. We can now delve deeper into the dynamics that produce these price dislocations in the small-cap space, and explore how a manager with the technology and skill to consistently process available information can exploit the mispricing opportunities to generate alpha.

Less Investor Attention. Among the variety of sources of inefficiencies in small caps, one commonly cited cause is investor attention. Using sell-side analyst coverage as a proxy for investor scrutiny, we find that large caps are covered by nearly three times as many analysts (16 for the Russell 1000[®] vs. five for the Russell 2000[®]; Figure 5 on next page). Apple, the most covered security in the Russell 1000[®] is covered by 46 analysts, nearly a quarter more than the number that cover Oasis Petroleum, the most widely covered security in the Russell 2000[®]. Two hundred ninety-one stocks in the Russell 2000[®] have no sell-side coverage at all. In EAFE and EM, the differential is even greater. For example, Samsung has 44 analysts covering it, compared to an average of less than five for the MSCI EM Small Cap Index.

This inattention generates a larger payoff to managers who respond in a timely manner to new information. A high level of analyst coverage can accelerate the rate at which information is

⁴ SUE = (Actual EPS – Expected EPS) / (STDEV Expected EPS). Here the actual EPS, or earnings per share, is the EPS reported at the earnings announcements; expected EPS is the consensus EPS forecast for that period; and the standard deviation of expected EPS is the standard deviation of the individual EPS estimates of a particular stock. Similar results were found when using alternative definition of earnings surprises.

5/ SMALL CAP STOCKS ARE FOLLOWED BY FEWER ANALYSTS



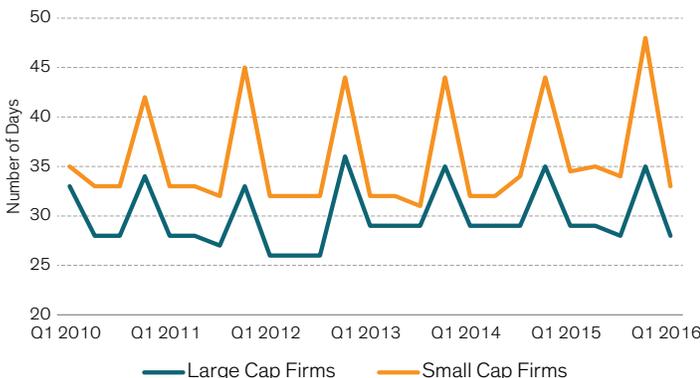
Data from 12/31/1995—3/31/2016. Source: QMA, MSCI, FactSet, Frank Russell Company, Thomson Reuters I/B/E/S. MSCI has not approved, reviewed or produced this report, makes no express or implied warranties or representations and is not liable whatsoever for any data in the report. You may not redistribute the MSCI data or use it as basis for other indices or investment products. The Russell® Indices are a trademark/service mark of the Frank Russell Company. Russell® is a trademark of the Frank Russell Company. Past performance is not a guarantee or a reliable indicator of future results.

incorporated into prices. But when just a handful of analysts follow a company, even today it can take weeks or even months for reports and revisions to filter out into the investing public and get fully reflected in prices. Managers with the ability to pick up on relevant information sooner can thus gain a significant edge. This is particularly the case for fast-growing companies, where our research has shown the price moves are more tied to earnings revisions than they are for slow-growth companies, offering managers a hot spot in which to focus alpha efforts.⁵

Limited Transparency. Small-cap companies disclose material information less frequently and are also slower to disclose it (Figure 6). Even in the US, home of the world’s best-quality small-cap information, large caps announce their earnings six days earlier on average compared to small-cap stocks. Moreover, approximately 30% of small-cap firms choose to forgo earnings conference calls altogether, while only 10% of large caps do so.

This lack of transparency creates uncertainty even among analysts, resulting in an environment where the range of estimates is broad and consensus is minimal. In turn, it leads to a weak anchor for prices, and generally even larger and more frequent mispricings.

6/ AVERAGE NUMBER OF DAYS FOR AN EARNINGS ANNOUNCEMENT AFTER THE END OF THE REPORTING PERIOD Q1 2010 – Q2 2016



As of 3/31/2016. We use 8-Ks to measure company filings. This represents disclosures of material information. Source: QMA, Standard & Poor’s, Securities and Exchange Commission, Frank Russell Company. Russell® is a trademark of the Frank Russell Company.

⁵ James Scott, Margaret Stumpp and Peter Xu, “Behavioral Bias, Valuation and Active Management,” *Financial Analysts Journal*, Vol. 55 (July/August 1999).

This is reflected by the consistently wider span of earnings yields (i.e., earnings to price, or E/P) among small caps compared to large caps (Figure 7 on next page). Similar to the impact of earnings revisions on alpha extraction from fast-growing small cap companies, our research has shown that these E/P spreads are a particularly effective source of alpha signals in slow-growth firms.⁶

Magnified Behavioral Bias. Small companies often have greater potential than large ones for rapid growth. This means the first hint of success can cause investor expectations to skyrocket. If there are enough overconfident investors who partially ignore objective information, prices will deviate from fair valuations. Similarly, small companies are more vulnerable in a downturn, and the slightest signs of difficulty can cause investors to head for the exits.

So-called “anchoring biases” can also be magnified in the small-cap space, due to the cost and effort of accumulating information, which may cause people to be more reluctant to update their beliefs when faced with new developments. All of this magnifies the impact of behavioral effects on prices in small caps. And these biases also contribute hugely to the different types of alpha signals that work best for fast- and slow-growing firms.⁷

USING FACTORS MORE EFFECTIVELY

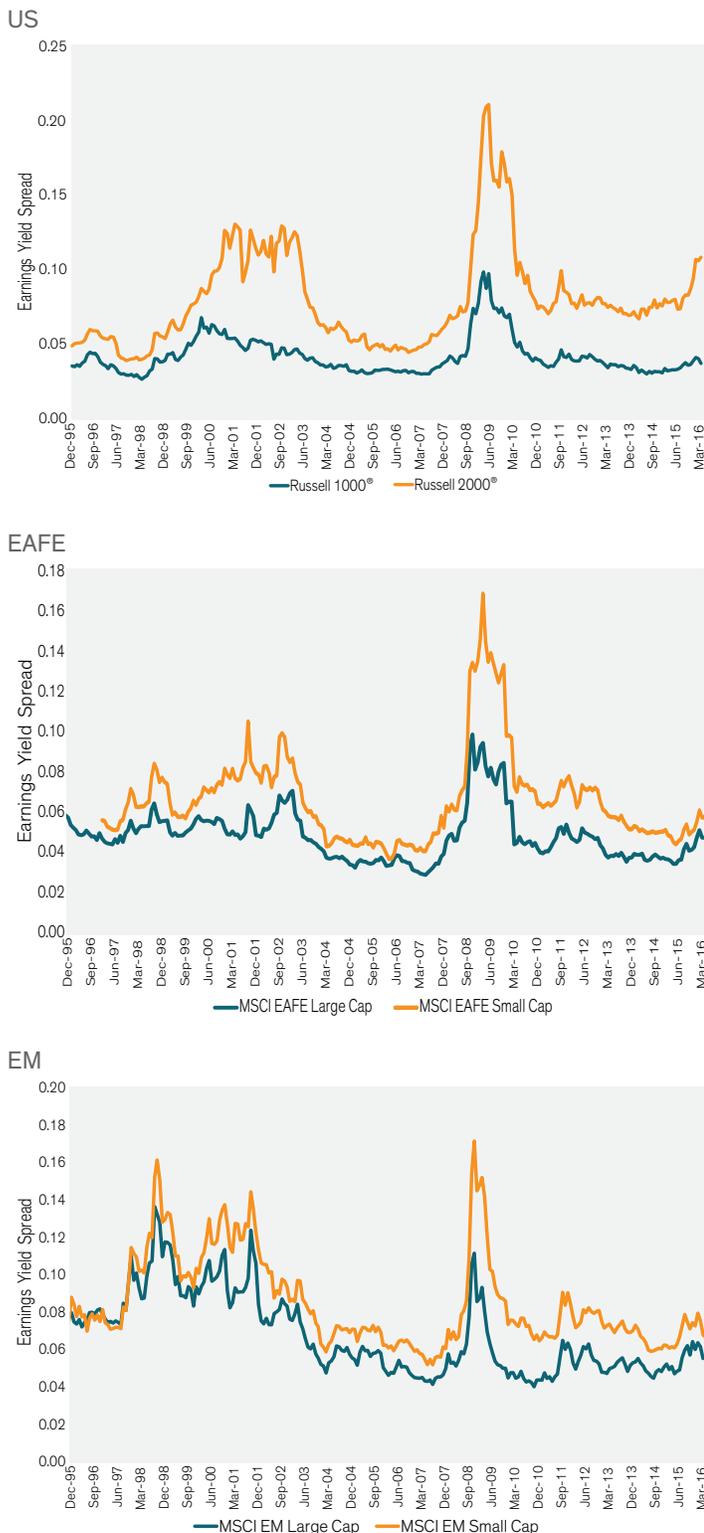
As noted earlier, many small-cap managers use factors in their stock selection process. However, at QMA, we believe that optimizing the use of factors is a matter of understanding which factors will be most effective for which types of stocks.

Our stock selection model is structured on the general idea that fundamentals drive prices, but that prices do not always follow fundamentals. Furthermore, different fundamentals are important for different types of companies – and consequently different types of signals will be more effective at detecting biased prices.

The approach is based on QMA’s seminal *Financial Analysts Journal* publication on the interaction between investors’ behavioral biases and information about companies’ long-term growth rates.⁸ Our study showed that for a slow-growing stock, investors attach little importance to future growth. Any biases investors hold are based on their belief that they know something about the firm that is inconsistent with current earnings. On the

^{6,7,8} James Scott, Margaret Stumpp and Peter Xu, “Behavioral Bias, Valuation and Active Management,” *Financial Analysts Journal*, Vol. 55 (July/August 1999).

7/ THE RANGE OF EARNINGS YIELDS IS WIDER AMONG SMALL CAPS Earnings/Price Spread (75th - 25th Percentile)



Data from 12/31/1995—3/31/2016.

Source: QMA, MSCI, FactSet, Frank Russell Company, Thomson Reuters I/B/E/S. MSCI has not approved, reviewed or produced this report, makes no express or implied warranties or representations and is not liable whatsoever for any data in the report. You may not redistribute the MSCI data or use it as basis for other indices or investment products. The Russell[®] Indices are a trademark/service mark of the Frank Russell Company. Russell[®] is a trademark of the Frank Russell Company. Past performance is not a guarantee or a reliable indicator of future results.

other hand, for fast-growing companies behavioral errors are based almost *entirely* on estimates of future growth prospects.

For investors like ourselves interested in turning these various biases to our advantage, the key is, then, to focus on those aspects of a company that will be most rewarded when the mistakes of other investors are eventually unmasked. Therefore, for low-growth companies, while we do factor in earnings growth and quality, we rely on value heavily, and for faster-growing companies, earnings revisions and quality weigh prominently with value playing a more minor role. This is a distinctive part of our strategy for our core equity funds. Yet, in small caps, where information is even scarcer, mistakes even bigger, and biases even more amplified, it can be especially beneficial and impactful.

BETTING BIG VS. BETTING SMALL

If mispricings account for such a large portion of small-cap alpha, it's fair to ask why a manager wouldn't just focus on finding stocks for which the dislocations are most glaring. Indeed, many managers do just that. They devote considerable resources to segments of the market where they believe they can gain an information edge, and then construct portfolios with a relatively small number of concentrated bets. However, because of the multitude of forces that can move prices, managers are at best *estimating* the magnitude of a mispricing and when (and how fast) it will correct, if at all. The information used to locate a mispricing may appear convincing, but investors may be even slower to react than anticipated. Or the information itself may turn out to be messier or more incomplete than the manager realized. One of the major differences between concentrated small-cap managers and those with more diversified portfolios is how they compensate for the greater margin for error in small caps. Concentrated managers may dig deeper into specific segments of the market for better information, the downside of which is it can further increase their exposure to sector- or country-specific risks. Diversified, more quantitative managers like ourselves tend to spread the bets among larger numbers of holdings. By diversifying a portfolio, we are able to minimize the idiosyncratic (or uncompensated) risk which is higher in small caps.⁹ While this can result in an under-capturing of certain large moves, we prefer to take our chances with being a little right a lot than a lot right less frequently.

CONCLUSION

The evidence for small caps as a standalone premium may be weaker than once assumed. Yet, the evidence for small-cap managers as a strong source of performance (compared to their large-cap peers) and a valuable addition to a well-diversified portfolio has become stronger than ever. Investors looking to consistently extract excess returns from a portfolio should pay requisite attention to those managers who have demonstrated a consistent ability to exploit small caps for alpha.

In selecting these managers, we believe investors improve their chances of success by understanding why alpha is more available in small cap than in other parts of the markets. Our research suggests that the inefficiencies in the small-cap market give rise to a situation where mispricings are consistently available and managers with a disciplined and well-constructed process are able to systematically harvest the resulting alpha. Ultimately, investors evaluating their managers' ability to capture those mispricings must decide for themselves which approach best meets their needs and investment objectives. But it starts with a clear understanding of why large alpha exists in small caps.

⁹ QMA, "The Search for Alpha: Emerging Markets Small Cap," November 2014.

Authors

Gavin Smith, PhD, Vice President, Portfolio Manager and Strategist
QMA's US Core Equity Investment Team

For more information

To learn more about QMA's capabilities, please contact Gavin Smith at Gavin.Smith@qmassociates.com or 973.367.4569.

About QMA

Since 1975, QMA has served investors by combining experienced judgment with detailed investment research in an attempt to capture repeatable long-term outperformance. Today, we manage approximately \$116 billion* in assets globally for institutions, sub-advisory clients and individual investors through a broad mix of asset allocation, core equity, value equity and indexing solutions.

QMA is a business of Prudential Financial, Inc.

*As of 9/30/2016.

REFERENCES

Alex Bryan, "Does the Small Cap Premium Even Exist?," Morningstar, 2014.

James Scott, Margaret Stumpp and Peter Xu, "Behavioral Bias, Valuation and Active Management," Financial Analysts Journal, Vol 55 (July/August 1999).

QMA, "The Search for Alpha: Emerging Markets Small Cap," November 2014.

Richard M. Ennis and Michael D. Sebastian, "The Small-Cap Alpha Myth," Journal of Portfolio Management 28(3):1-6 (2002); "The Small Cap Alpha Myth Revisited," Aon Hewitt Investment Consulting, January 2016.

Rolf Banz, "The Relationship between Market Value and Return of Common Stocks," Journal of Financial Economics, 1981.

These materials represent the views, opinions and recommendations of the author(s) regarding the economic conditions, asset classes, securities, issuers or financial instruments referenced herein. Distribution of this information to any person other than the person to whom it was originally delivered and to such person's advisers is unauthorized, and any reproduction of these materials, in whole or in part, or the divulgence of any of the contents hereof, without prior consent of Quantitative Management Associates LLC ("QMA") is prohibited. Certain information contained herein has been obtained from sources that QMA believes to be reliable as of the date presented; however, QMA cannot guarantee the accuracy of such information, assure its completeness, or warrant such information will not be changed. The information contained herein is current as of the date of issuance (or such earlier date as referenced herein) and is subject to change without notice. QMA has no obligation to update any or all of such information; nor do we make any express or implied warranties or representations as to the completeness or accuracy or accept responsibility for errors. These materials are not intended as an offer or solicitation with respect to the purchase or sale of any security or other financial instrument or any investment management services and should not be used as the basis for any investment decision. Past performance may not be indicative of future results. No liability whatsoever is accepted for any loss (whether direct, indirect, or consequential) that may arise from any use of the information contained in or derived from this report. QMA and its affiliates may make investment decisions that are inconsistent with the recommendations or views expressed herein, including for proprietary accounts of QMA or its affiliates.

The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients or prospects. No determination has been made regarding the suitability of any securities, financial instruments or strategies for particular clients or prospects. For any securities or financial instruments mentioned herein, the recipient(s) of this report must make its own independent decisions.

The financial indices referenced herein are provided for informational purposes only. You cannot invest directly in an index. The statistical data regarding such indices has been obtained from sources believed to be reliable but has not been independently verified.

References to specific securities and their issuers are for illustrative purposes only and are not intended and should not be interpreted as recommendations to purchase or sell such securities. The securities referenced may or may not currently be held in portfolios managed by QMA and, if such securities are held, no representation is being made that such securities will continue to be held.

Russell 1000® Index is an unmanaged index that measures the performance of the 1,000 largest companies in the Russell 3000® Index, which represents approximately 90% of the total market capitalization of the Russell 3000® Index.

Russell 2000® Index is an unmanaged index that measures the performance of the 2,000 smallest companies in the Russell 3000® Index, which represents approximately 8% of the total market capitalization of the Russell 3000® Index.

MSCI EAFE Index (Net) is comprised of companies representative of the market structure of 21 developed market countries in Europe, Australia and the Far East.

MSCI EAFE Small Cap Index (Net) is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding U.S. and Canada, of companies that are in the Investable Market Index (IMI) but that are not in the Standard index.

MSCI Emerging Markets Index is a free float-adjusted market capitalization index designed to measure equity market performance in the global emerging markets.

MSCI Emerging Markets Small Cap Index is a free float-adjusted market capitalization index designed to measure equity market performance in the global emerging markets of companies that are in the Investable Market Index (IMI) but that are not in the Standard index.

Certain information contained herein may constitute "forward-looking statements," (including observations about markets and industry and regulatory trends as of the original date of this document). Due to various risks and uncertainties, actual events or results may differ materially from those reflected or contemplated in such forward-looking statements. As a result, you should not rely on such forward looking statements in making any decisions. No representation or warranty is made as to the future performance or such forward-looking statements.

Certain information contained in this product or report is derived by QMA in part from MSCI's Index Data. However, MSCI has not reviewed this product or report, and MSCI does not endorse or express any opinion regarding this product or report or any analysis. Neither MSCI nor any third party involved in or related to the computing or compiling of the Index Data makes any express or implied warranties, representations or guarantees concerning the Index Data or any information or data derived there from, and in no event shall MSCI or any third party have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) relating to any use of this information. Any use of the Index Data requires a direct license from MSCI. None of the Index Data is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such.