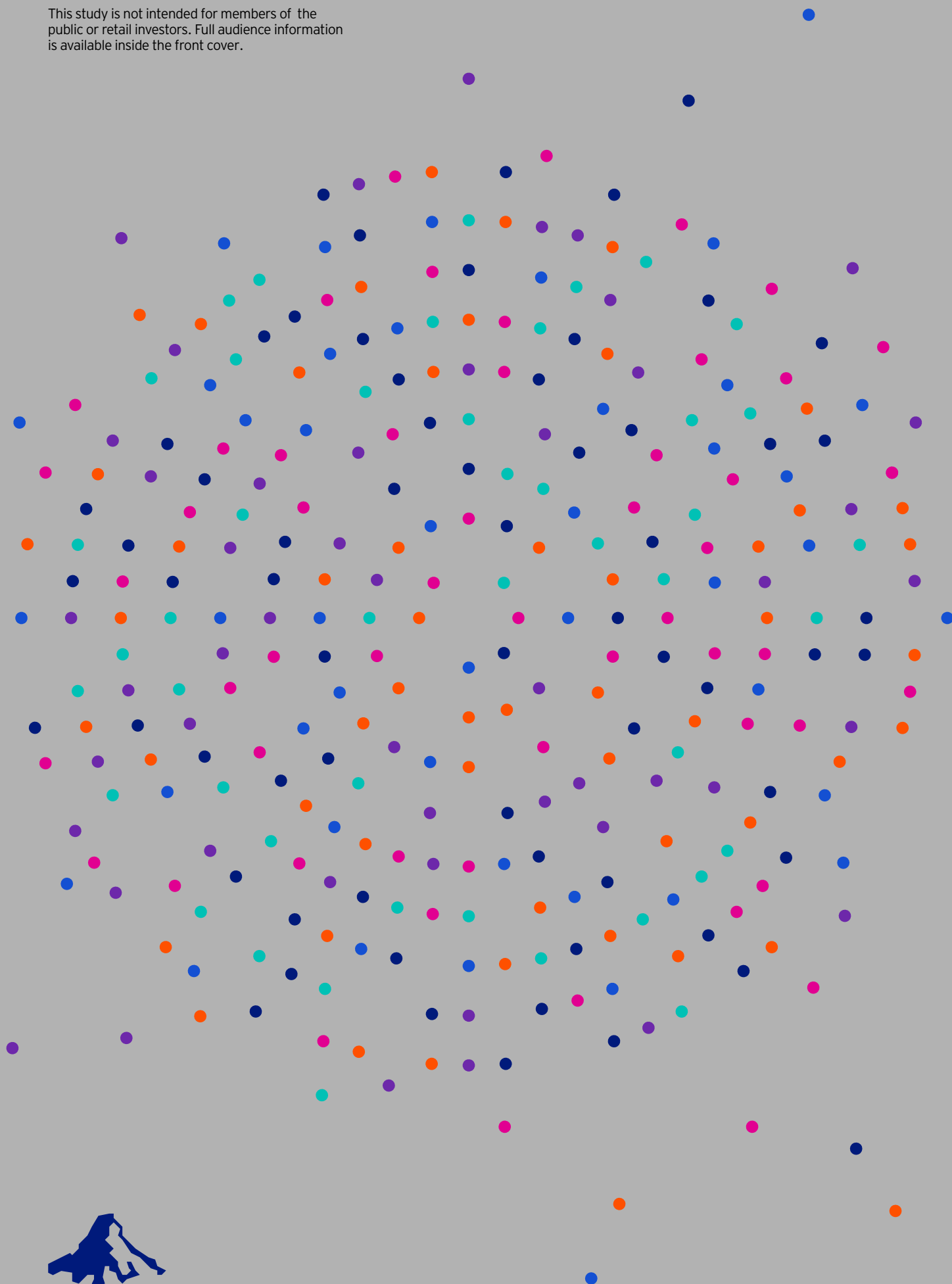


Invesco Global Factor Investing Study 2017

This study is not intended for members of the public or retail investors. Full audience information is available inside the front cover.



Important information
This document is intended only for Professional Clients and Financial Advisers in Continental Europe (as defined in the important information); for Qualified Investors in Switzerland; for Professional Clients in, Dubai, Jersey, Guernsey, Isle of Man, Ireland and the UK, for Institutional Investors in the United States and Australia, for Institutional Investors and/or Accredited Investors in Singapore, for Professional Investors only in Hong Kong, for Qualified Institutional Investors, pension funds and distributing companies in Japan; for Wholesale Investors (as defined in the Financial Markets Conduct Act) in New Zealand, for accredited investors as defined under National Instrument 45-106 in Canada, for certain specific Qualified Institutions/Sophisticated Investors only in Taiwan and for one-on-one use with Institutional Investors in Bermuda, Chile, Panama and Peru.

02	Executive summary
04	Key findings
06	Theme 1 A positive 5-year growth outlook across institutional and retail investors
14	Case study 1 Australian DC pension fund
16	Theme 2 Growth in fixed income factor products with demand for multi asset, multi factor strategies
22	Case study 2 European multi-manager
24	Theme 3 Factor research and development will encourage further allocations and reduce risk of commoditisation
32	Case study 3 European pension fund
34	Theme 4 Institutions are actively exploring options to internalise factor capability but recognise the challenges and limitations implied
40	Theme 5 Market evolution will challenge traditional manager, consultant and academic roles, favouring those with capacity to adapt
46	Case study 4 European bank treasury
48	Appendix
52	Important information

In May 2017, we completed our second annual cycle of global interviews on factor investing. This year, we conducted interviews with 108 different investors and intermediaries (an increase from 66 in 2016) across 19 countries who in total account for well in excess of US\$7 trillion in AUM. We also completed four in-depth case study interviews, to explore the practical experience of investors in implementing factor investing within their portfolio.

Taking an industry lifecycle view, recent investor experience with factor investing has often met or exceeded expectations, barriers are lowering, but it is still relatively early in the adoption process. The investor landscape is already clearly segmented by size and region, and our respondents make it clear that it will become larger and richer over time.

- Large institutional factor investors, often having experienced good outcomes with equity factor strategies, are looking to allocate more to those strategies, broaden their application to other asset classes, and in some cases lift to a whole-of-portfolio view. In doing so, they typically seek to internalise more factor activity and integrate it more tightly with the overall investment strategy.
- Smaller institutional and retail investors are usually at an earlier stage of the factor journey with many yet to adopt. They see the benefits but are more reliant on external partners for implementation, both asset consultants and specialist factor specialist managers. These investors often utilise pooled products, both single factor and multi factor bundles, but will seek to exert more control over which factor exposures are present in portfolios.
- North America leads adoption in both institutional and (especially) retail investor segments. While all regions seek portfolio risk and performance improvements via the inclusion of factor investing, cost reduction had a stronger influence in North America
- European investors have a similar profile to North America, but with less emphasis on securing lower costs through factor investing. This is partly a function of factor’s uptake by less price sensitive segments, but also because factor strategies offer insurers new options for dealing with the implications of regulatory issues
- Allocations to factor strategies increased most rapidly across both institutional and retail segments (albeit from a low base) in Asia Pacific. Investors in Asia Pacific have a distinctively different profile to those in other regions, seeking return improvements well ahead of risk and cost reductions.

The factor/asset management industry is in a relatively attractive place. It has been offering products based on deep, academically robust research, pitched at a relatively appealing price point, and delivering on many occasions a good investor experience. Unsurprisingly, investors have responded positively and growth prospects remain strong – if anything stronger than seen in 2016.

Success has brought associated challenges. Providers face pressure on their commitment to costly research and development, specialisation, and scale, at a time when there is growing concern about proliferation of new non-specialist participants and the dilution of philosophy.

Providers that are proactive will flourish in the form of new relationships, wider product offering and retained business. Those aiming to defend existing participation or economic models will face challenges from both competitors and investors directly. As the factor industry gives rise to new interactions and capabilities, the importance of strategy and governance will grow. However, ultimately, the growth and improvement of factor investing strategies is dependent on the industry’s commitment to its research origins, and the sharing and application of its findings.

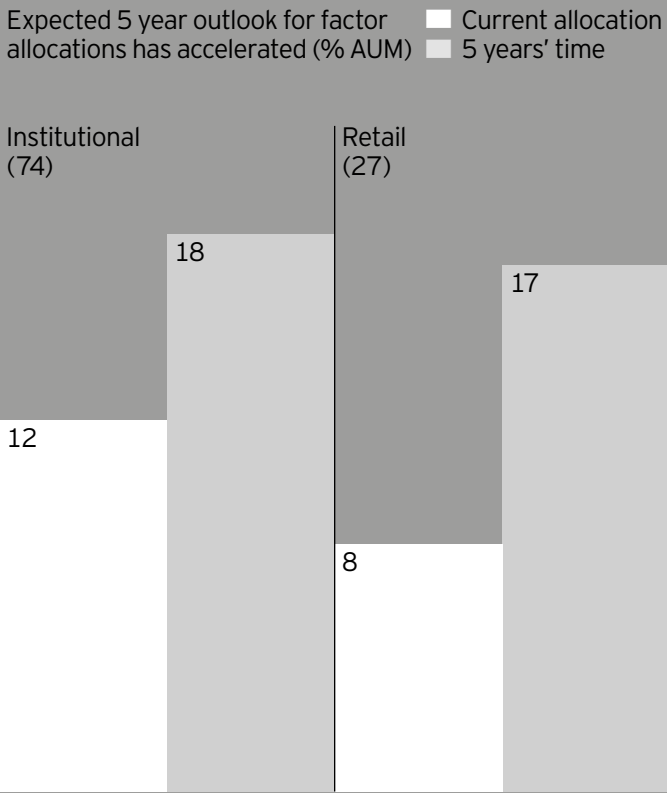
We hope the unique, evidence-based findings in this year’s report provide a valuable insight into a fascinating and evolving area of asset management.



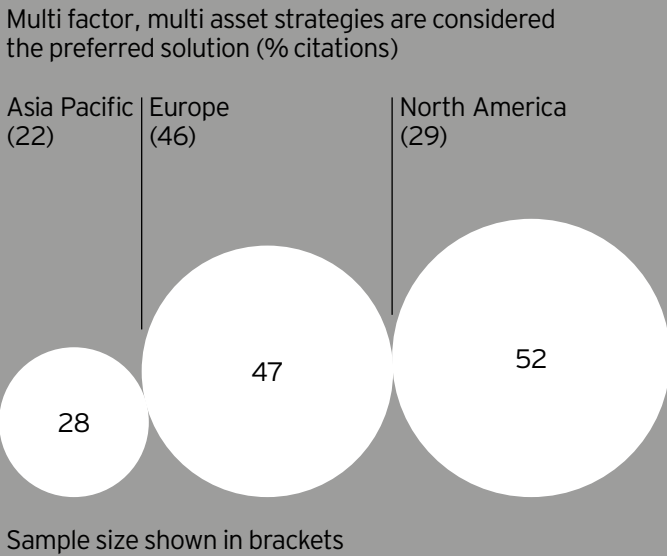
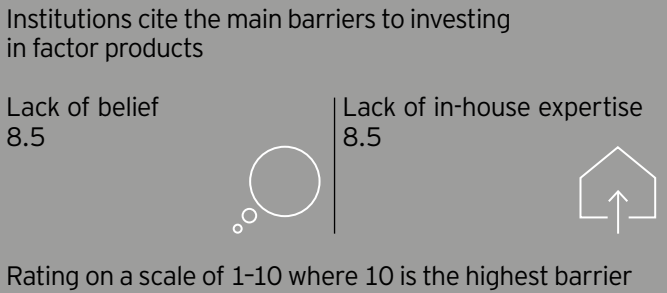
Georg Elsaesser
Senior Portfolio Manager
Invesco Quantitative Strategies



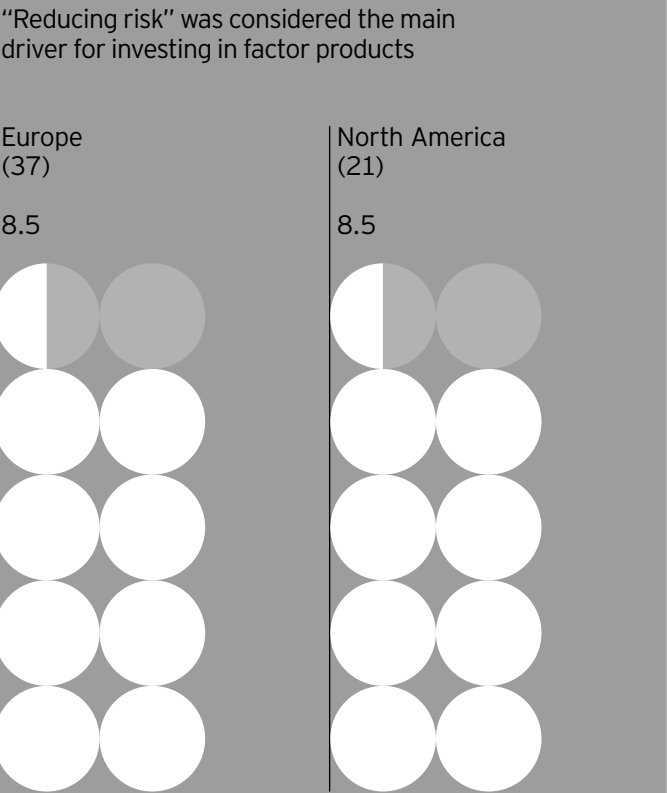
Sergio Trezzi
Head of retail distribution
EMEA



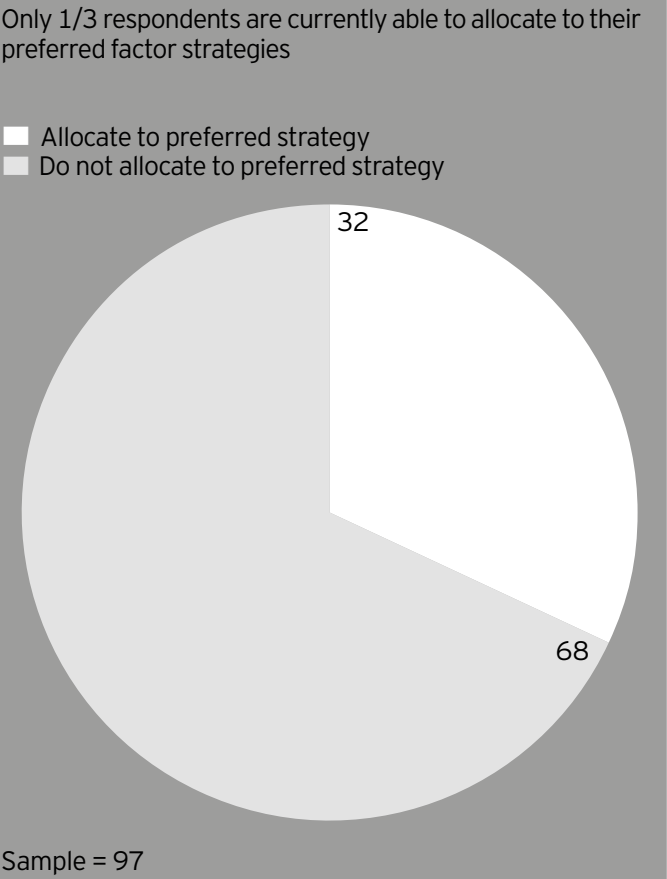
Sample size shown in brackets



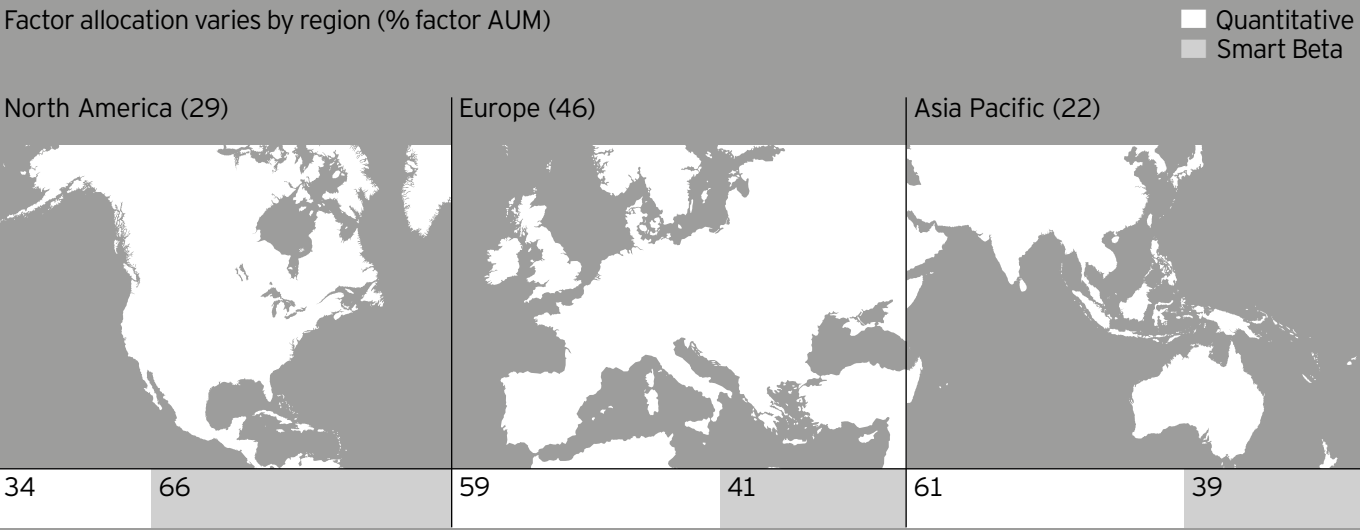
Sample size shown in brackets



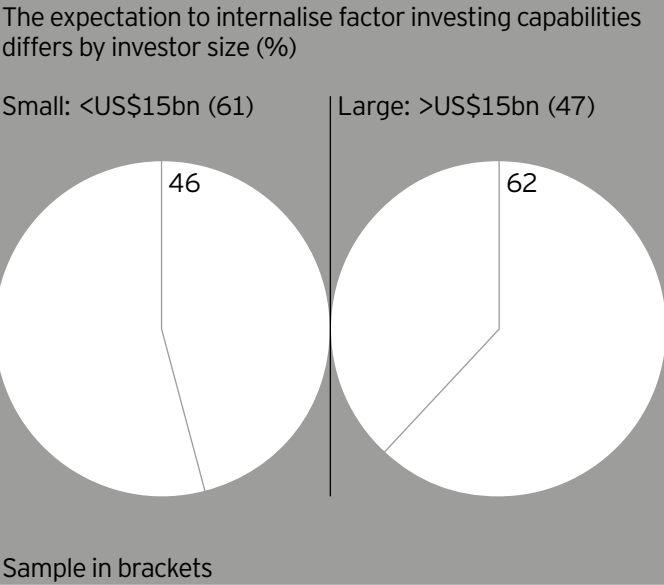
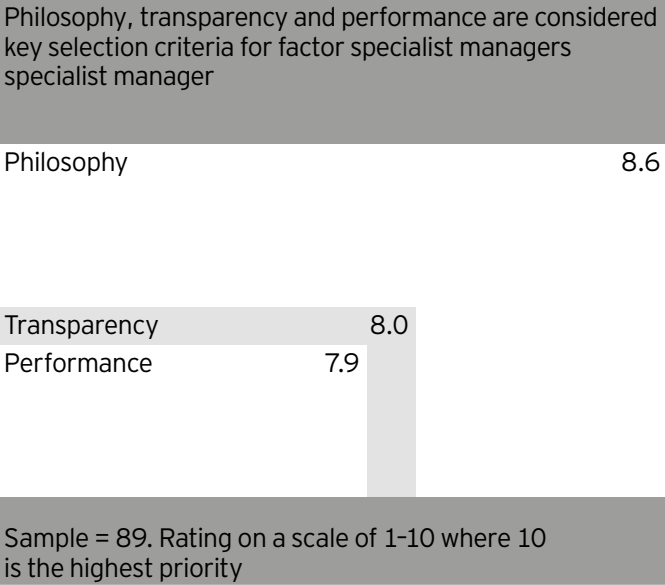
Score is based on a rating on a scale of 1-10 where 10 is complete agreement with the reason in question



Sample = 97



Sample sizes show in brackets



Sample in brackets

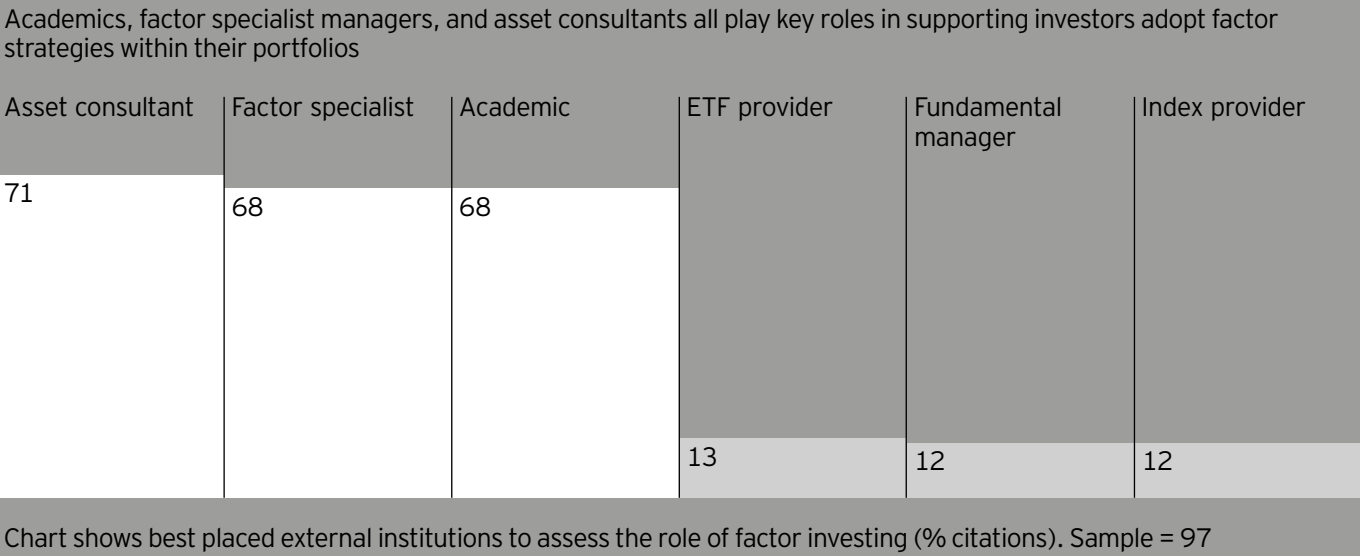


Chart shows best placed external institutions to assess the role of factor investing (% citations). Sample = 97

Theme 1

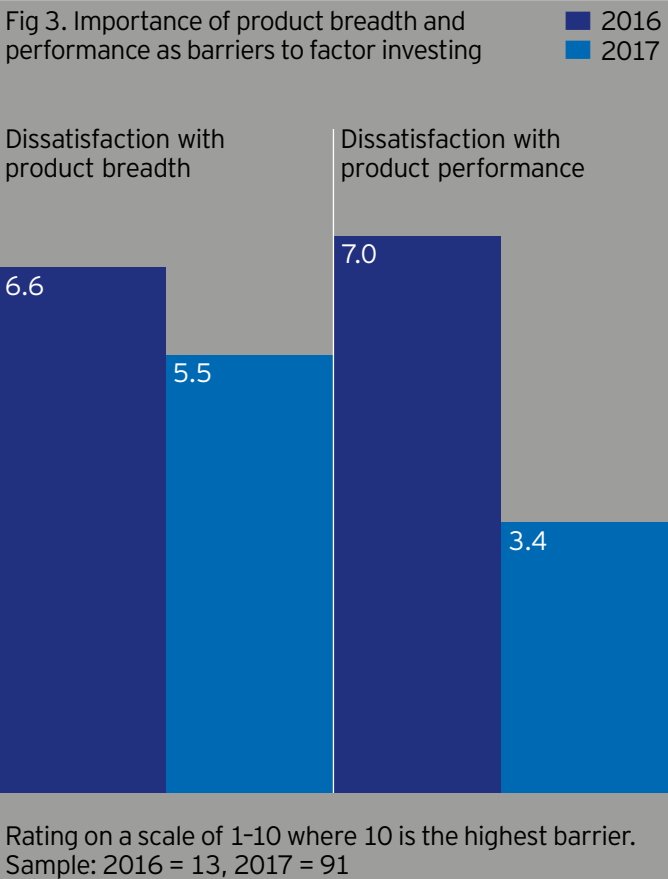
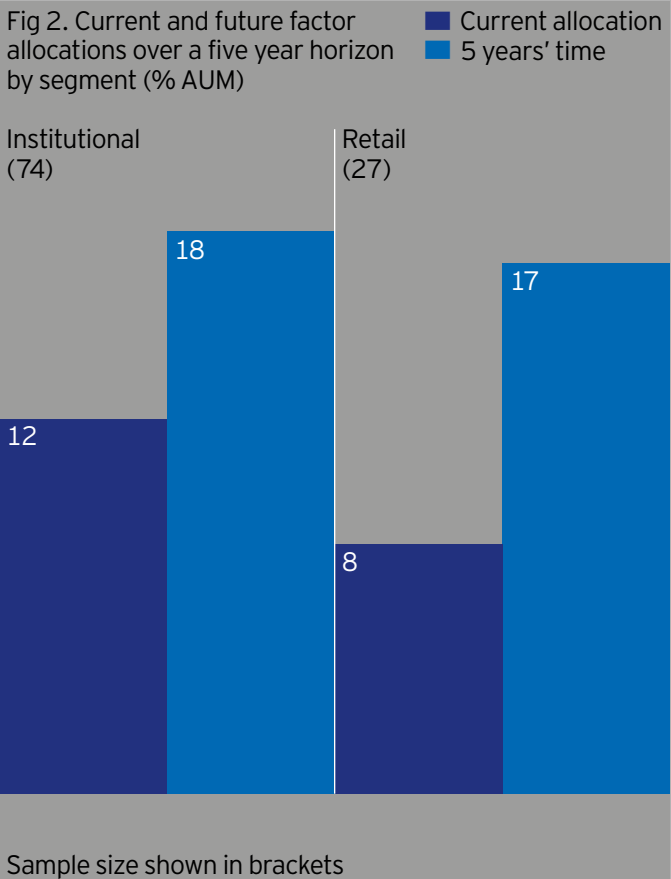
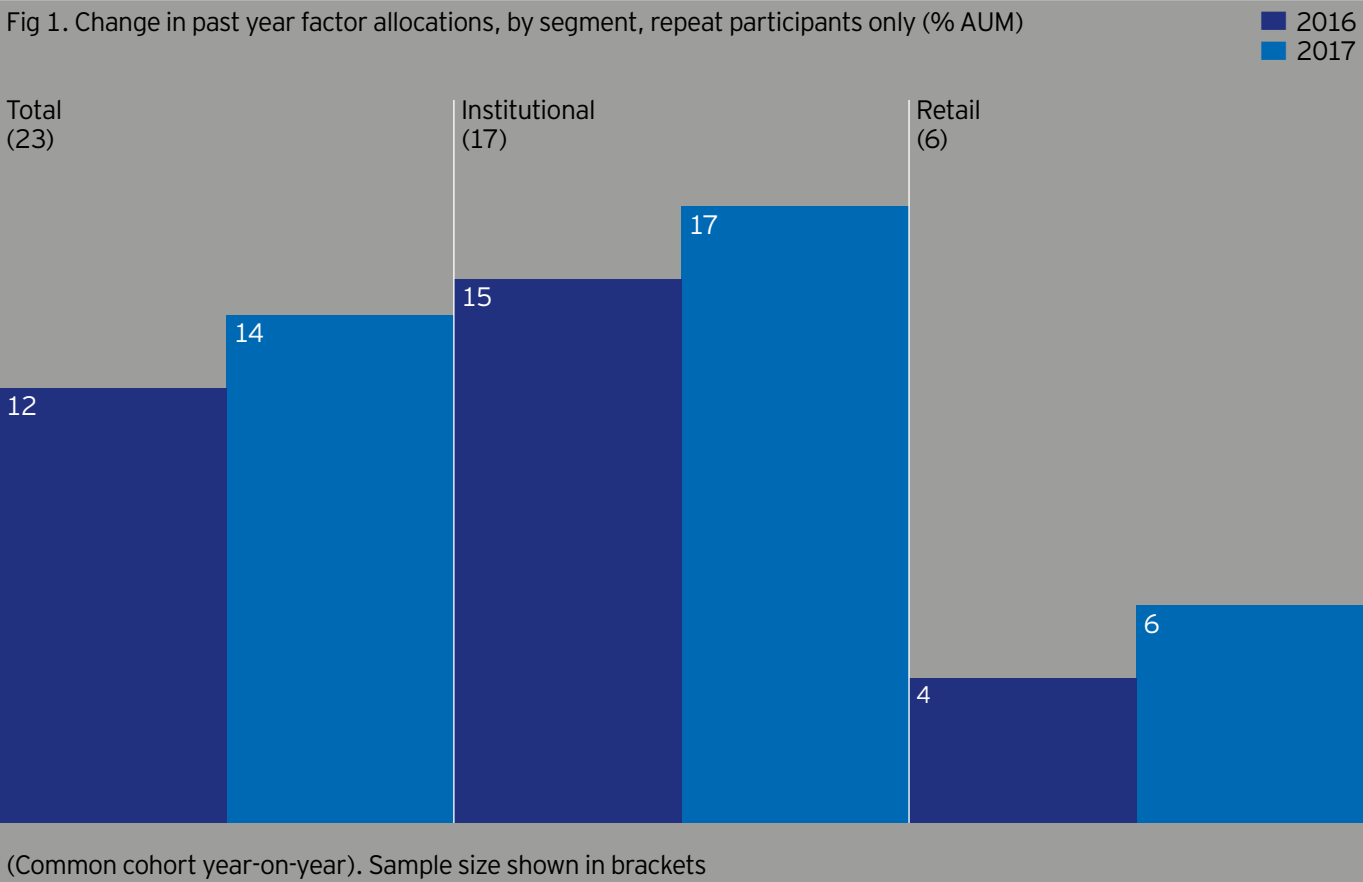
A positive 5-year growth outlook across institutional and retail investors

- All investor segments report increases to factor strategy allocations over 2016 levels.
- Expected growth in 5-year outlook for factor allocations has accelerated.
- Factor investing is carving out a distinct role complementing traditional active and passive strategies.
- Broad-based support but notable differences in benefits sought in North America, Europe, and Asia Pacific.
- Barriers to adoption remain but are eroding.



Bridge at Hoover Dam,
North America

Adoption of factor investing is being driven by its growing role as a third pillar of portfolios, alongside fundamental active and passive strategies



In our first Global Factor Investing Study published in 2016, respondents signalled a strong growth outlook for factor allocations over the five years to 2021.

In this year's study, we have seen evidence to support this intention. Respondents reported a broad-based increase in both adoption of and allocations to factor products (including smart beta and active quantitative strategies), with overall factor allocations increasing (amongst repeat participants) from 12% in 2016 to 14% in 2017 (figure 1). All key institutional and retail segments and geographies noted increases (figure 4 on page 11). Given the size of the market implied by the respondents, the allocation increase illustrated in figure 1 is a material move in the space of a year.

In our 2017 interviews, investors emphasised the importance of prevailing environmental conditions, including:

- In public asset markets, the combination of pricing and exposure to current and expected macro and geopolitical risks, is challenging fundamental active and passive strategies.
- In private asset markets, the combination of pricing, accessibility and liquidity in alternative and real asset categories.

These factors prevail at a time when both institutional and retail investors noted that they were seeking to balance persistently high return expectations and/or liability commitments, and in many cases increasingly onerous regulatory, prudential or governance requirements.

Traditionally, active and passive management have been the two fundamental approaches to portfolio management. However, factor investing is increasingly perceived as a third pillar, offering a means to meet performance or liability thresholds while managing macro or cyclical risks in public markets. Figure 2 highlights further anticipated momentum in factor allocations, with institutional and retail investors now expecting to increase factor allocations to 18% and 17% of AUM respectively over a five-year horizon.

Respondents cite three major reasons for growth in consideration of factor strategies:

- 1 Evolving attitudes to fundamental active and passive strategies:
 - While there is an ongoing role for fundamental active managers delivering a high alpha share, investors were becoming less confident of the ability of some active strategies to consistently outperform factor benchmarks.
 - Further, while passive investing is effective in implementing low cost headline allocations, investors noted that the performance of their portfolio was becoming increasingly market cyclical with the adoption of passive strategies.
- 2 Broadening applications of factor investing:
 - Risk reduction has often been the instigator for factor allocations, and remains the primary driver. However, the drivers are broadening. From a risk perspective, concerns around increasing volatility of equities and fixed income are seeing more investors look beyond geographic and sector diversification to factors as a systematic means of diversifying and managing macro or cyclical risks.
 - For some investors, early experience with factor strategies has also outperformed return expectations (particularly relative to costs), encouraging further applications from a returns perspective.
- 3 Increasing acceptance of application of academic factor theory to products:
 - The 2016 study showed that the majority of investors acknowledge the history and depth of academic theory relating to factor investing, with somewhat less confidence in translating this into practice. In the intervening year, confidence has improved, with citations of product breadth as a barrier to factor adoption having fallen (figure 3).
 - Robustness of testing and performance forecasting, lengthening track records, and a wider range of products have made factor investing more appealing and accessible.

North America leads amidst large differences in adoption and allocation patterns

Perceptions of risks and the resulting challenges to active and passive strategies are relatively consistent across geography and investor segments but progress in making allocations varies considerably (figure 4). Current and 5-year forecast allocations are largest across European and North American institutional investors, driven by insurers and state pension funds. This segment cited risk benefits, ahead of potential alpha improvements, as the primary reason for larger allocations (figure 5).

While cost reduction is the third ranked objective across all regions, it has a relatively stronger influence in North America. Our interviews highlighted a favourable combination (from the investors’ perspective) of strong levels of supply and downward pressure on fees due to investor scale.

North American interviewees also cited a network effect, whereby growth in factor allocations had increased the number of reference cases and the body of empirical evidence on factor implementation, further increasing demand. As figure 6 highlights, North American investors also exhibit different product preferences. Within established factor strategies (defined as single and multi-factor equity products), the preferred product remains smart beta, with anecdotal evidence indicating that factor inflows were typically sourced from fundamental active strategies (seeking the triple benefits of risk reduction, performance improvement and cost reduction).

In Europe, factor allocations are largest among insurers and sovereign wealth funds. European respondents see a similar combination of risk-return benefits to North Americans, but with less emphasis on cost reductions.

Insurers highlighted the tension they face between the need to generate sufficient returns to meet guaranteed rates in an ongoing low yield environment vs current and pending regulation, impacting flexibility and cost of investing in volatile equities or illiquid asset classes.

In response, European factor investors are increasing allocations to both smart beta and active quantitative strategies, reweighting from fundamental and passive equity strategies, and fixed income allocations. Equity factor strategies focusing on low volatility, quality and momentum – coincidentally cited as the most difficult to implement in figure 15 (on page 26) – are currently perceived as offering an attractive means to deliver returns while complying with relevant regulation.

Asian respondents were quite different in their profile. They have the lowest allocations to factor investing but the highest rate of annual increase. When making factor allocations, the potential to improve returns is the most important driver for Asian investors (as shown in figure 7), over risk reduction, with cost reductions less important again. The jump in adoption of factor strategies in Asian retail channels reflects a trend to outsourcing of investment strategy via model portfolios. Asian financial advisory firms and private banks noted that they are looking to construct diversified portfolios of pooled client assets, with two thirds of Asian retail respondents reporting that the shift towards centralised investment propositions has led to an increase in the use of factor products.

Projected growth is associated with recent adopters (including insurers, pension funds and retail adviser model portfolios) reallocating from fundamental active equity to active quantitative strategies with the objective of delivering superior alpha with reduced volatility.

“We are revising our economic forecasts and this is leading us to consider factor-based products.”
Pension fund, North America

Fig 4. Change in past year factor allocations, by segment and region (% AUM)

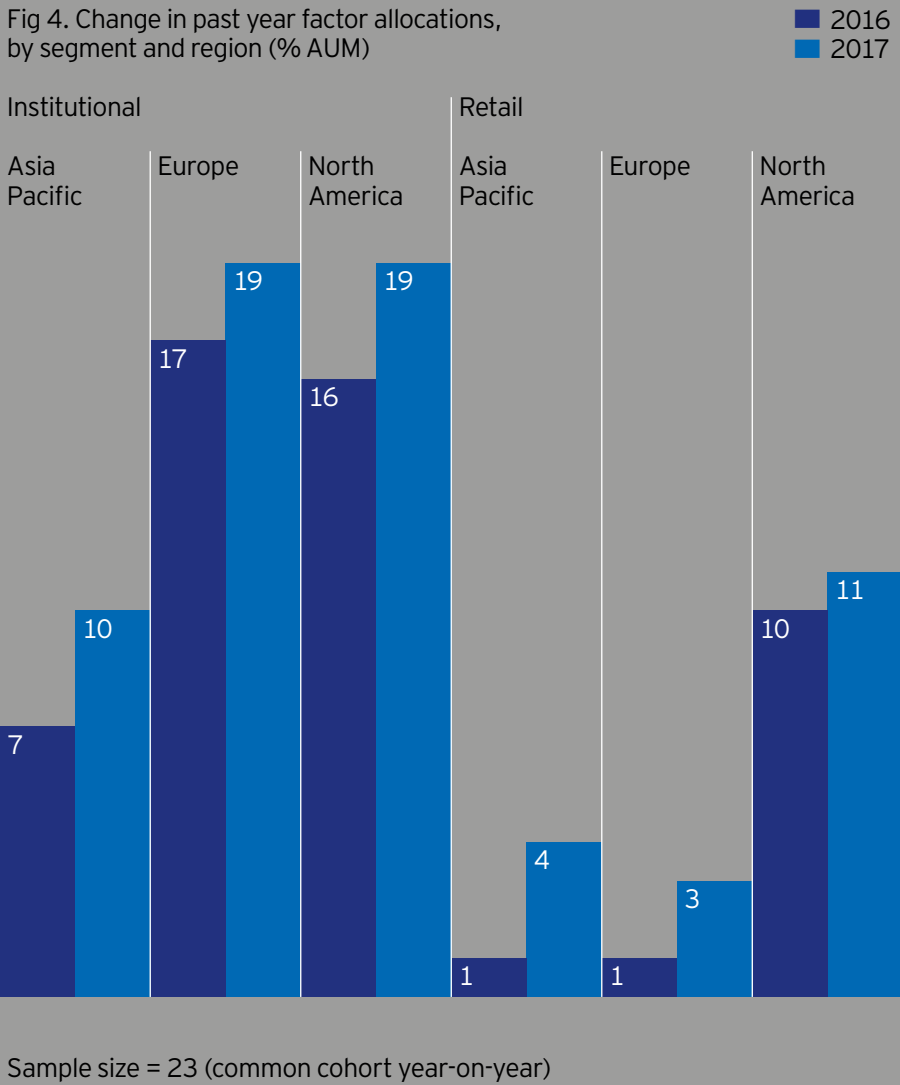


Fig 5. Reasons for investing in factor products – European and North American institutional investors

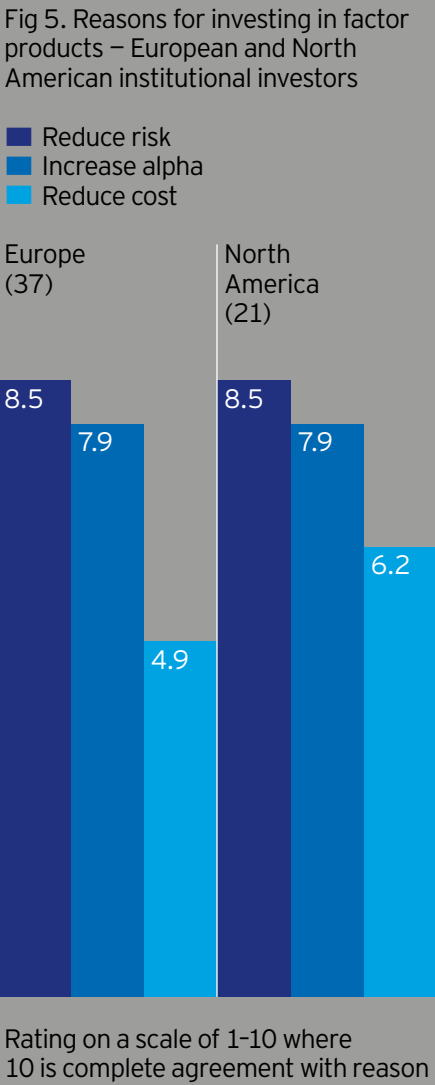


Fig 6. Factor product allocations, by region (% factor AUM)

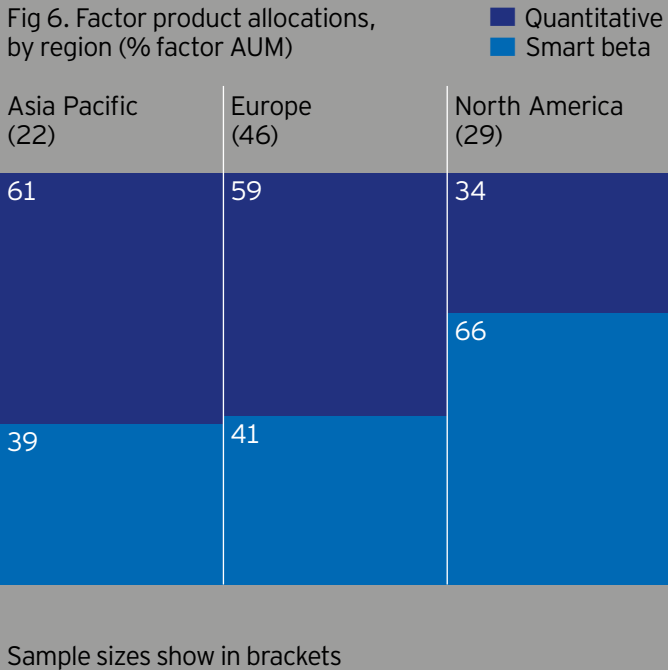


Fig 7. Reasons for investing in factor products, Asian retail investors

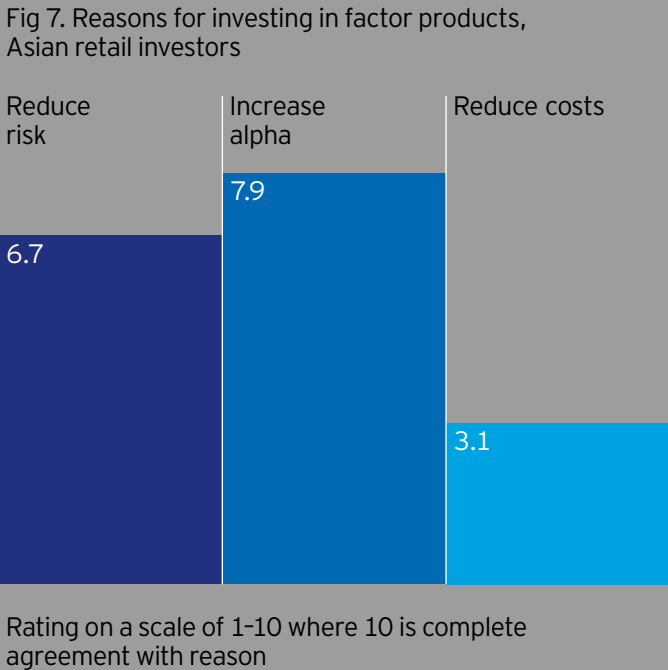
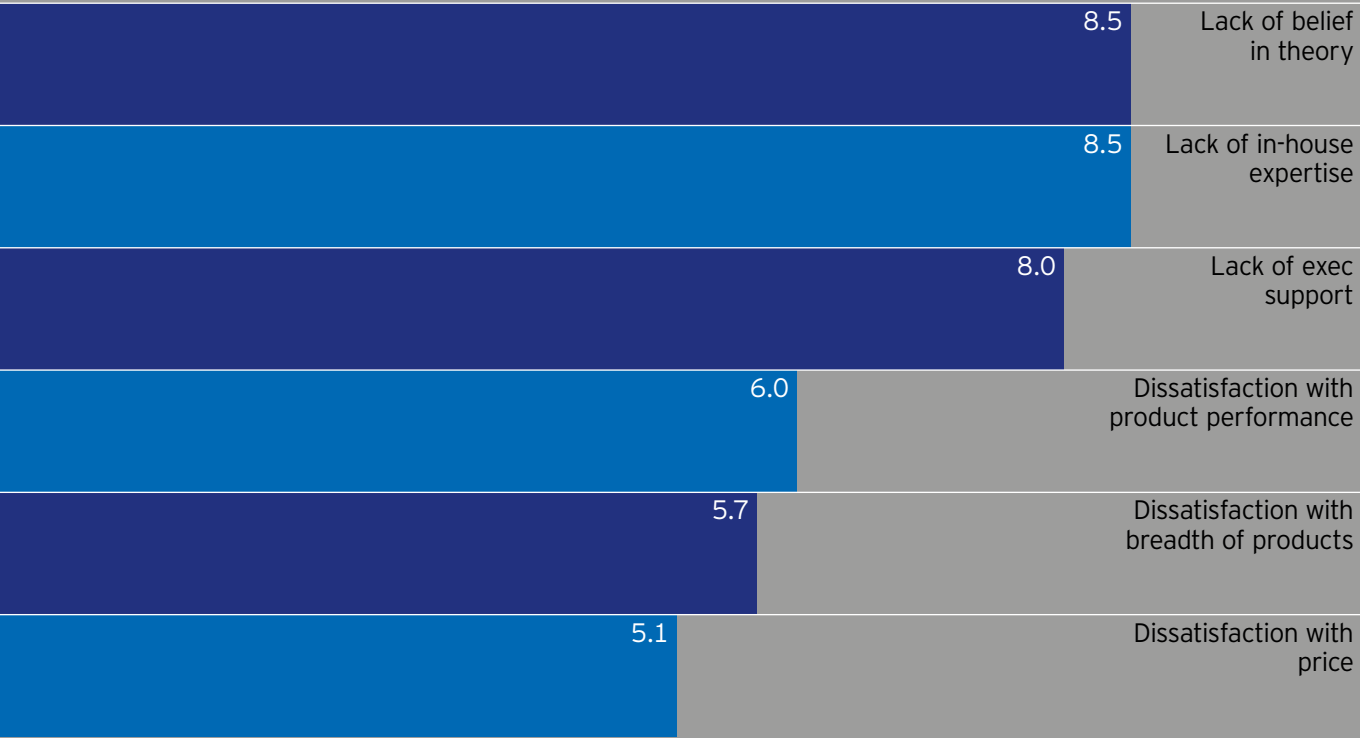
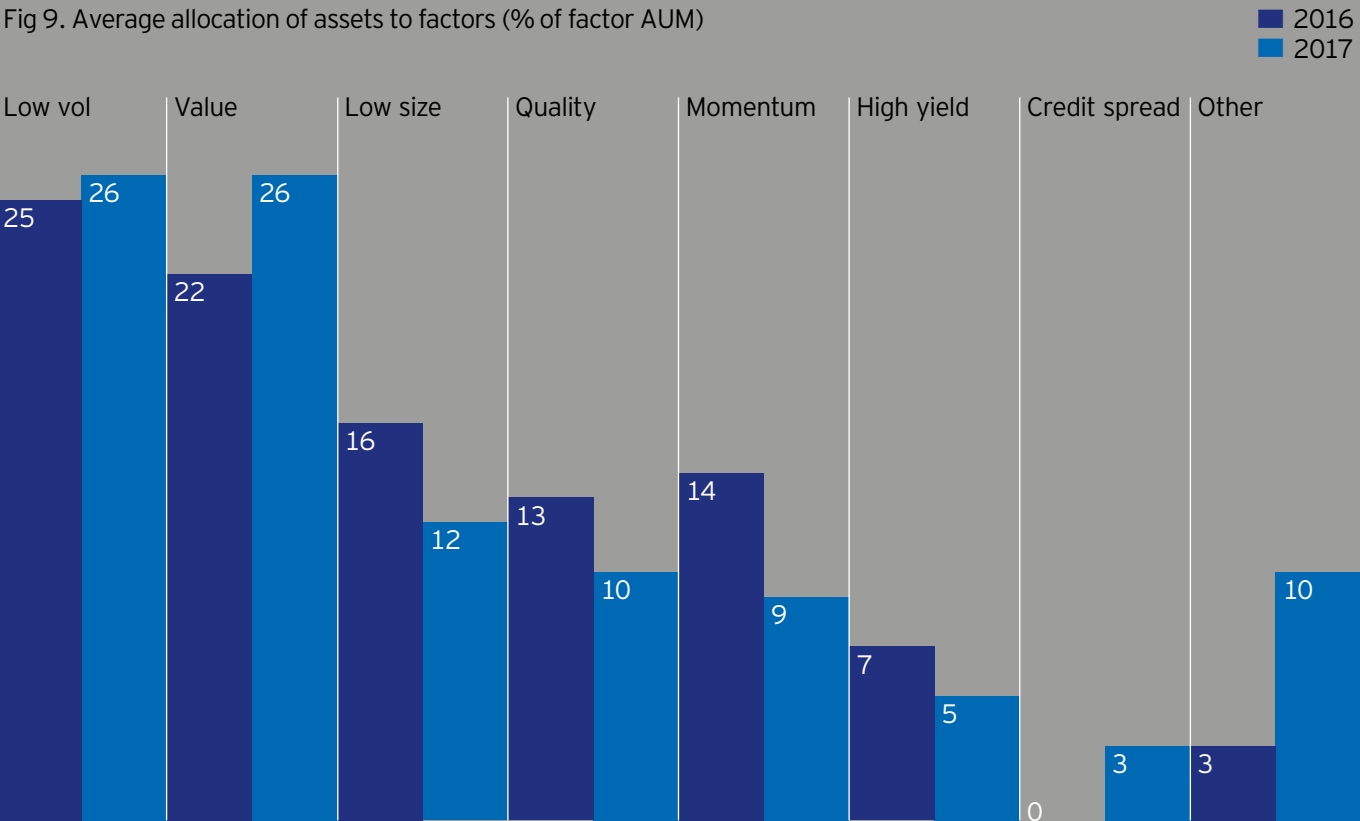


Fig 8. Barriers to investing in factor products, factor non-users



Sample = 11. Rating on a scale of 1-10 where 10 is the highest barrier

Fig 9. Average allocation of assets to factors (% of factor AUM)



Sample = 96

Multiple sources of growth fuel further increases in factor allocations; barriers can be overcome

The positive 5-year demand picture shown in figure 2 on page 8 appears to be on solid foundations given that it is drawing in multiple sources of growth rather than a single ephemeral driver such as favourable short-term returns. Expectations of increases in factor allocation are relatively broad-based across a wide range of investors and varying levels of experience:

- New allocations from existing factor investors to emerging factor strategies: including multi factor, multi asset and fixed income strategies, and growing adoption of factor techniques in portfolio construction and management (66% of the forecast uplift).
- New allocations from existing factor investors to established strategies: including smart beta and equity single factor (29% of the forecast uplift).
- New allocations from new factor investors (5% of the forecast uplift).

It's also important to note that the aggregate uplift potential for allocations from these new factor investors is likely to be understated – potentially significantly so – given that factor non-users are underrepresented in the sample.

What is stopping investors from adopting factor investing? Institutional respondents cited internal constraints (lack of expertise and decision-maker acceptance/support) and a lack of belief in the theory of factor investing as key reasons (figure 8). That said, these barriers are not regarded as insurmountable, even in the case of 'lack of belief'. Objections might be resolved through the continuing build-up of academic and empirical evidence and case studies of successful adoption and implementation of factor strategies.

Among private bank advisers and financial intermediaries, understanding and acceptance of factor theory was nominated as a continuing barrier to adoption. Most retail advisers feel comfortable with the concepts, but are challenged by the education and lead time required for clients to come around to supporting a recommended change in investment strategy.

Adoption by non-users to factor strategies demands ongoing efforts from providers to improve education and investor servicing, including:

- Insurers need to improve understanding of risks and transparency of risk reporting to meet Solvency II requirements, particularly with respect to derivative positions within active quantitative products and daily disclosure of equity holdings.
- Retail gatekeepers need further development of client reporting and product documentation to engage individual advisers and retail clients.
- For all investor segments, academic factor research and product development have important roles to play in supporting growth and overcoming adoption barriers. With just five factors accounting for 83% of factor investment (figure 9), there is an expectation that investment managers and academics will invest to develop new factors, supporting uptake among non-users who do not believe in the theory of existing factors. Such ongoing research also supports the sustainability of allocations but also spin-off benefits in addressing perceived barriers to adoption, such as reduced trading costs and other implementation factors.

How do you define factor investing?	Factor investing emerges from the search for strategies that are more skilled based than traditional passive, and with lower fees than fundamental active. Currently factor fits within the portfolio's alternative beta strategies. We are using quality and low volatility factors to balance our global equities risk profile.
Do you perceive factor investing strategies as active or passive?	Alternative beta strategies are between these concepts. For us factor investing has produced outperformance, reduced volatility, and improved capacity. Lower fees compared to active have helped manage down the overall cost of the portfolio.
Describe the journey of your factor-based investments?	It has been a 5+ year journey with a ramp-up in the past two years. It takes a lot of time, people and research. Initially factor was expected to be a small exposure and be seen as diversification. Our research also indicated that some of what is claimed as active alpha actually arises from factor exposures, which could be harvested in a more systematic, cheaper way. We now believe it works, have learnt more, and there are lots of manager developments, increasing the number and quality of strategies. Factor investing is becoming bigger and broader than anticipated and we expect to extend its usage. We perform our own research with a team of six, including a PhD in factor strategies, reflecting the research heavy nature of the work. That said we still partner with external managers to develop IP. We both develop and use academic definitions of factors, but manage our own blend. Implementation is external and we are not looking to change that in the near future – although we are big we have no scale advantages and internalisation would mean an expensive operating model build.

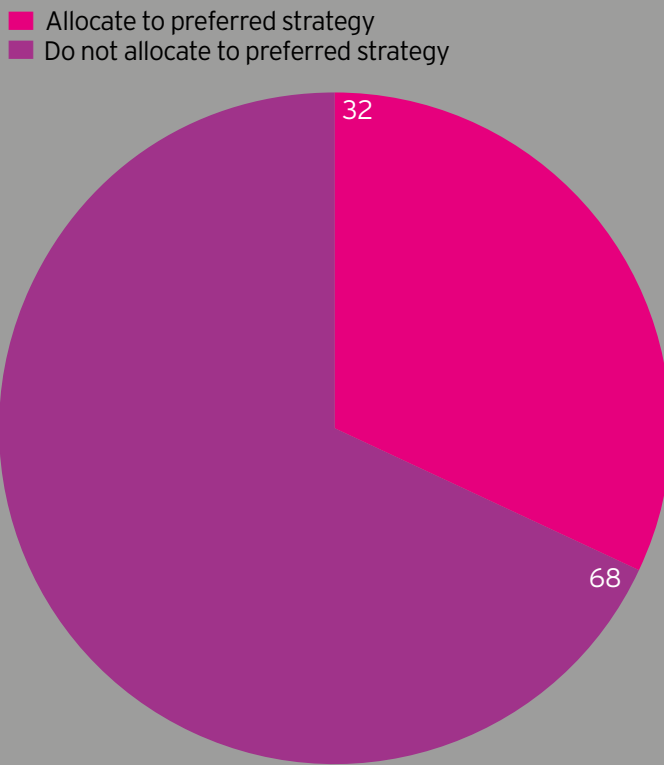
What's your current allocation to factor Investing strategies and how will it change?	It's currently ~6.5% of the portfolio (mostly global equities). We are likely to introduce factors to fixed income, multi asset, Australian equities and emerging markets within global equities.
How do you integrate factors in your investment decisions?	Factor investing is considered within asset classes (ie mix of fundamental active vs factor-based vs passive). It is not currently integrated across asset classes, but this may change over time as we are looking at how factors interact with the wider portfolio.
What would you like to achieve through the implementation of factor investing strategies?	Our portfolio has an alpha target and an overarching principle on downside protection; factor is assisting with both.

Theme 2

Growth in fixed income factor products with demand for multi asset, multi factor strategies

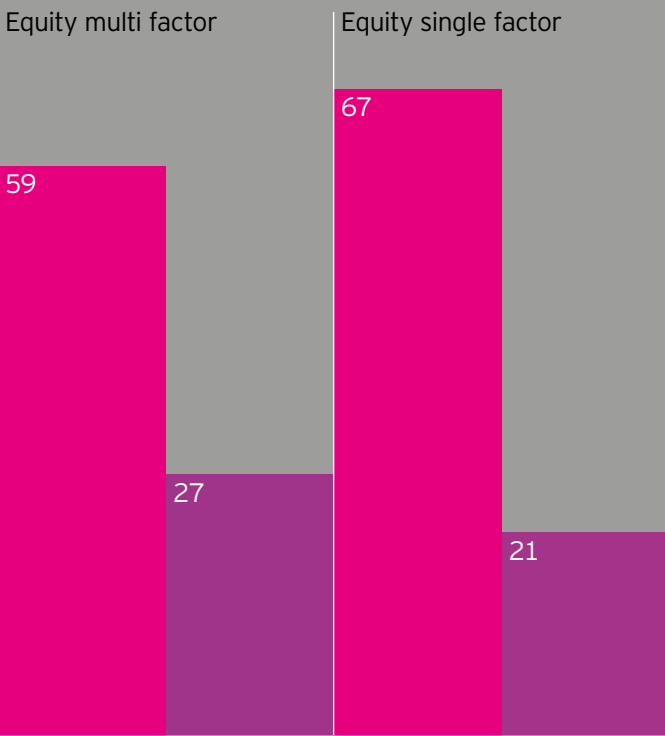
- Factor investors have an unmet need for new strategies.
- Fixed income followed by multi factor, multi asset products are the next evolutions post-equities.
- Larger investors in particular are interested in the potential to move from both single and multi factor, multi asset products to factor-based portfolio construction.
- Each new strategy comes with adoption barriers but enough investors believe they will be overcome.

Fig 10. Allocating to preferred factor strategies (% citations)



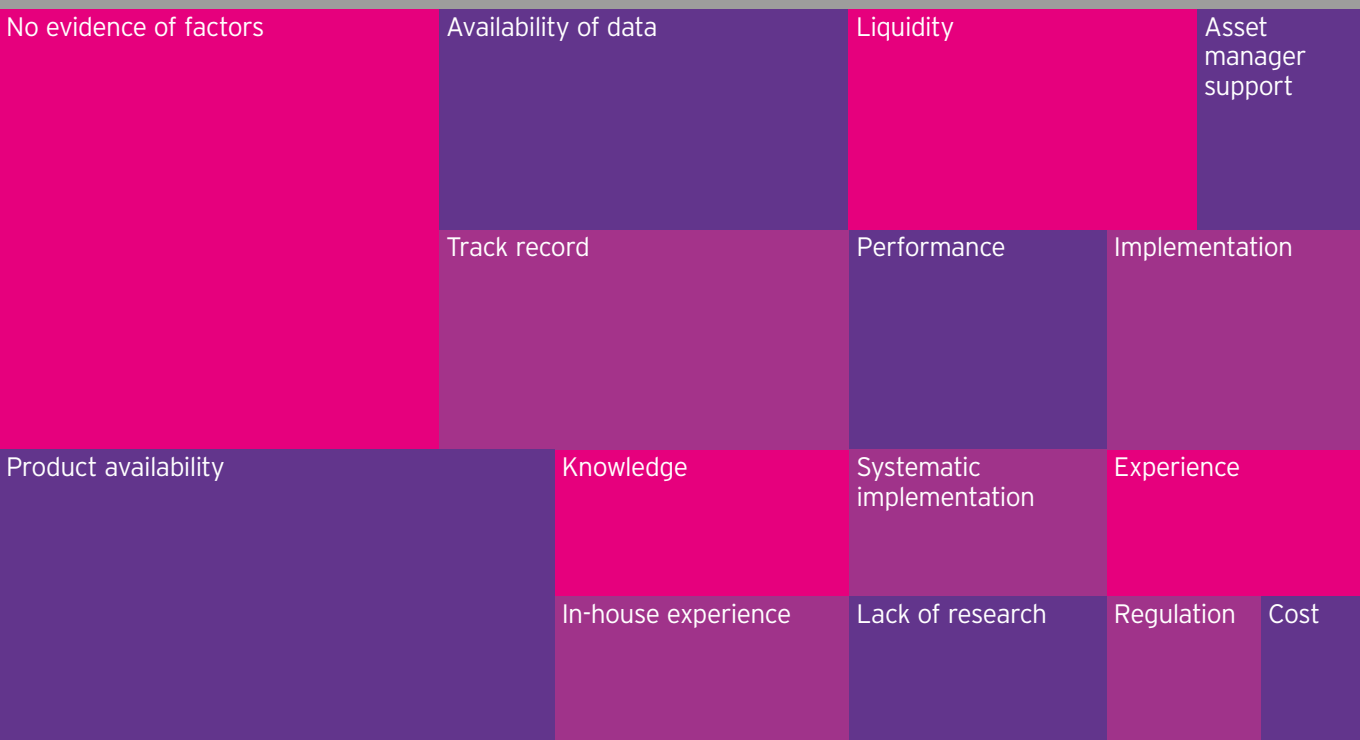
Sample = 97

Fig 11. Actual vs. preferred equity factor strategies (% citations)



Sample = 97

Fig 12. Barriers to investing in fixed income factor products



Sample = 92

Demand for factor application to fixed income and multi asset

Fixed income factor products beginning to address concerns surrounding academic evidence and implementation

In 2016 respondents indicated interest in extending their factor portfolios, however, there was little certainty of the direction of this change. The 2017 study demonstrates the increasing importance of finding these new directions.

The concentration of investor flows to established factor strategies has led to a clear disconnect between current and desired or target allocations. As overall investor interest in and research of factor strategies has grown, so too has demand for new factor products, however only one third of respondents are currently able to allocate to their preferred factor strategies (figure 10). Two thirds remain on the journey to implementing their preferred strategy.

While respondents remain anchored in practice to equity strategies, and overweight these strategies relative to their preferred structure (figure 11), this reflects a demand among investors to additionally invest in fixed income and multi factor, multi asset solutions. This disconnect could reflect the much greater depth of academic and empirical evidence relating to the most common factors and their application to equities.

Respondents noted that governance committees and investment boards are now familiar with factor approaches utilised in equity allocations, but were still on a learning curve in relation to unfamiliar factor approaches and new asset classes. Furthermore, internalisation of fundamental equity mandates driven by risk-return concerns and the parallel adoption of passive strategies has, in some cases, delayed the consideration of factor strategies.

Our respondents identified unmet demand for fixed income factor strategies, both on a standalone basis and as building blocks to portfolio construction. Around two thirds believe that the theory of factor investing can be applied to fixed income, but just one third are currently using factor approaches within fixed income portfolios.

As central banks move from quantitative easing to tapering, investors anticipate elevated volatility in their fixed income portfolios even as allocations revert to pre-global financial crisis (GFC) norms. This may drive demand for fixed income factor strategies to reduce risk and improve diversification and performance.

The cyclical sector outlook reinforces structural perspectives:

- Institutions with experience in equity factors are seeking a more consistent approach across asset classes, encouraging the spread of factor investing to fixed income.
- Investors recognise a relatively widespread use of factor-based techniques as inputs to what are typically considered fundamental active fixed income strategies; for example the application of carry to address inefficiencies in credit indices. Respondents see factor products as a means to achieve targeted exposure to such factors, typically at lower cost than when housed in an active strategy.
- Respondents see tangible benefits in the targeted use of duration to match assets to liabilities, and credit quality to reduce exposure to risky debt instruments.

However, there are barriers to adoption within fixed income factor strategies. Investors cited a lack of academic research, a scarcity of strategies and products with the requisite philosophy and track record, and concerns over a lack of implementation references and experience (figure 12).

Nonetheless, as with factor with factor barriers generally, feedback was positive with expectations that concerns around theory, product, and experience are all likely to diminish with maturity.

Many of the governance hurdles to the adoption of factor investing within fixed income have already been overcome in the adoption of equity factor products. Several of the specific concerns around fixed income factors (eg. no evidence of factors, product availability, track record) were the same issues which were present at the time of considering equity factor strategies. Those issues were overcome by the industry via ongoing investment in research and product development, and the same is expected for fixed income factors.

Beyond fixed income, we found clear anecdotal evidence of a longer term desire for factor-driven portfolio construction in the form of multi factor, multi asset strategies.

Large sovereign investors and pension funds have been among the pioneers of factor investing, pooling internal teams to conduct their own research into factors and potential applications in portfolio construction. Such investors often favour a risk-parity allocation using macro factors (inflation, rates, equity) to identify and target risk and return sources in the portfolio across multiple asset classes.

As evidence accumulates of successful implementation of asset class-based strategies, an increasing number of institutional investors are considering the transition from a traditional asset allocation approach to factor-based portfolio construction. This is driven by a view that diversification can be improved by spreading risk more evenly across the portfolio, and freeing up risk budget to allocate to alpha seeking managers within a market neutral, uncorrelated portfolio. While only a handful of respondents have adopted a factor-driven portfolio construction approach, one third expressed an intent to move in this direction with certain respondents noting the relevance of their experience of multi factor equity strategies.

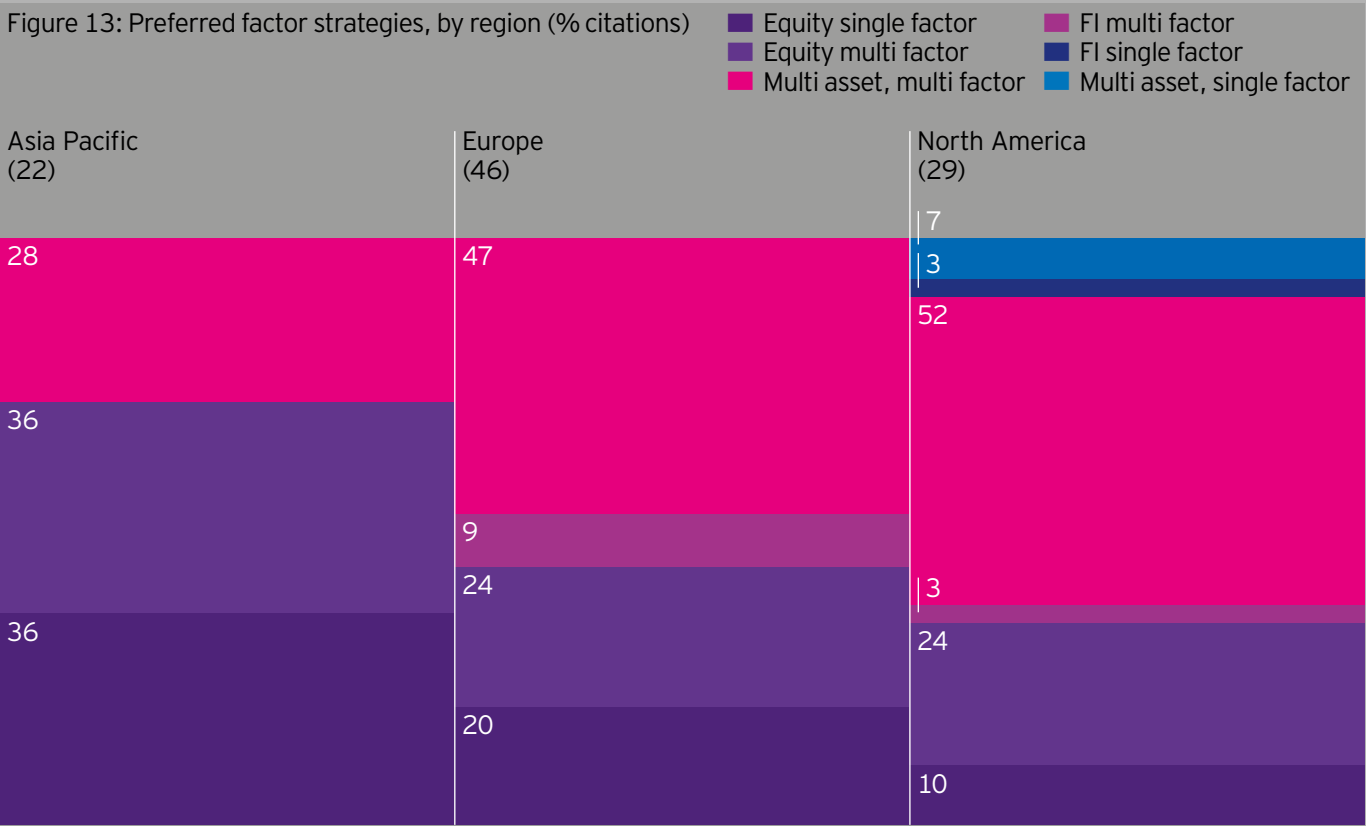
This trend is not just limited to the largest investors. As interest in a portfolio-level factor approach has expanded into mid-sized and smaller institutions, strong demand has emerged for multi factor, multi asset products, particularly in European and North American institutional markets (multi factor, multi asset were cited as the preferred factor strategy for 47% and 52% of institutional respondents respectively).

These segments seek a wide range of asset class and factor exposures within single products (figure 13), in order to maintain a diversified pool of assets to match long-dated liabilities. Respondents believe that a consistent application of factor investing will ultimately lead to better long-term returns through exposure to more diverse sources of risk premia.

Adoption barriers for multi factor, multi asset strategies reflect the earlier stage of its evolution; objections are fewer but more general (figure 14):

- Larger institutions with objections are typically yet to be convinced of the underlying theory.
- Small to mid-sized institutions and retail segments are more commonly concerned with the current product offering, with ‘complexity’ and ‘governance’ of multi factor, multi asset, and the unclear exposure to ‘derivatives’ and ‘leverage’. As can be seen from figure 14, these dominate the objection set.

Figure 13: Preferred factor strategies, by region (% citations)



Sample size shown in brackets. FI = fixed income

Fig 14. Barriers to investing in multi asset factor products



Sample = 97

Case study
European multi-manager

What is the role of factor investing in your portfolios?	We believe in the existence of factors across equities and fixed income, and factor investing as a systematic source of outperformance. We allocate to three factors: value, momentum and quality. We are not as sophisticated in fixed income implementation – equity manager performance is more volatile, so there was a greater need to seek to identify the drivers of performance.
How do you implement factor investing?	We use segregated mandates with specialist factor managers, which act as a pool for our multi-manager funds. In assessing managers in terms of contribution to tracking error, we see quantitative managers as a stable core exposure, we don't believe timing is possible with these exposures.
Describe the journey of your factor-based investments?	We were early believers in factor and have had allocations for some time, evolving to utilising a range of factor managers. We have also developed an internal capability including a factor specialist research team with customised risk models and factor reporting. Our clients are typically unable to invest time in understanding factor theory, so a challenge we face is to articulate the factor strategy that we employ and its merits.

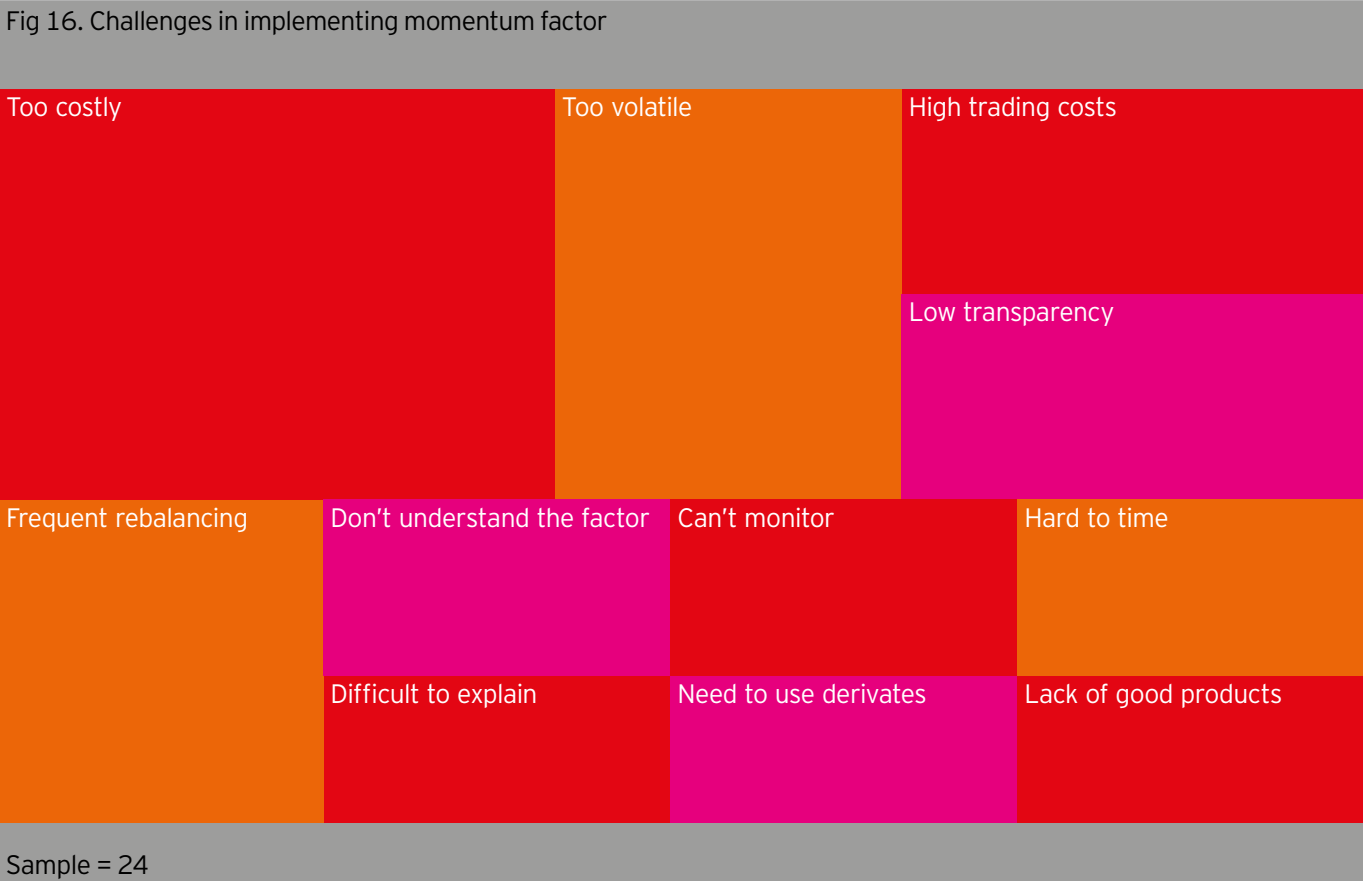
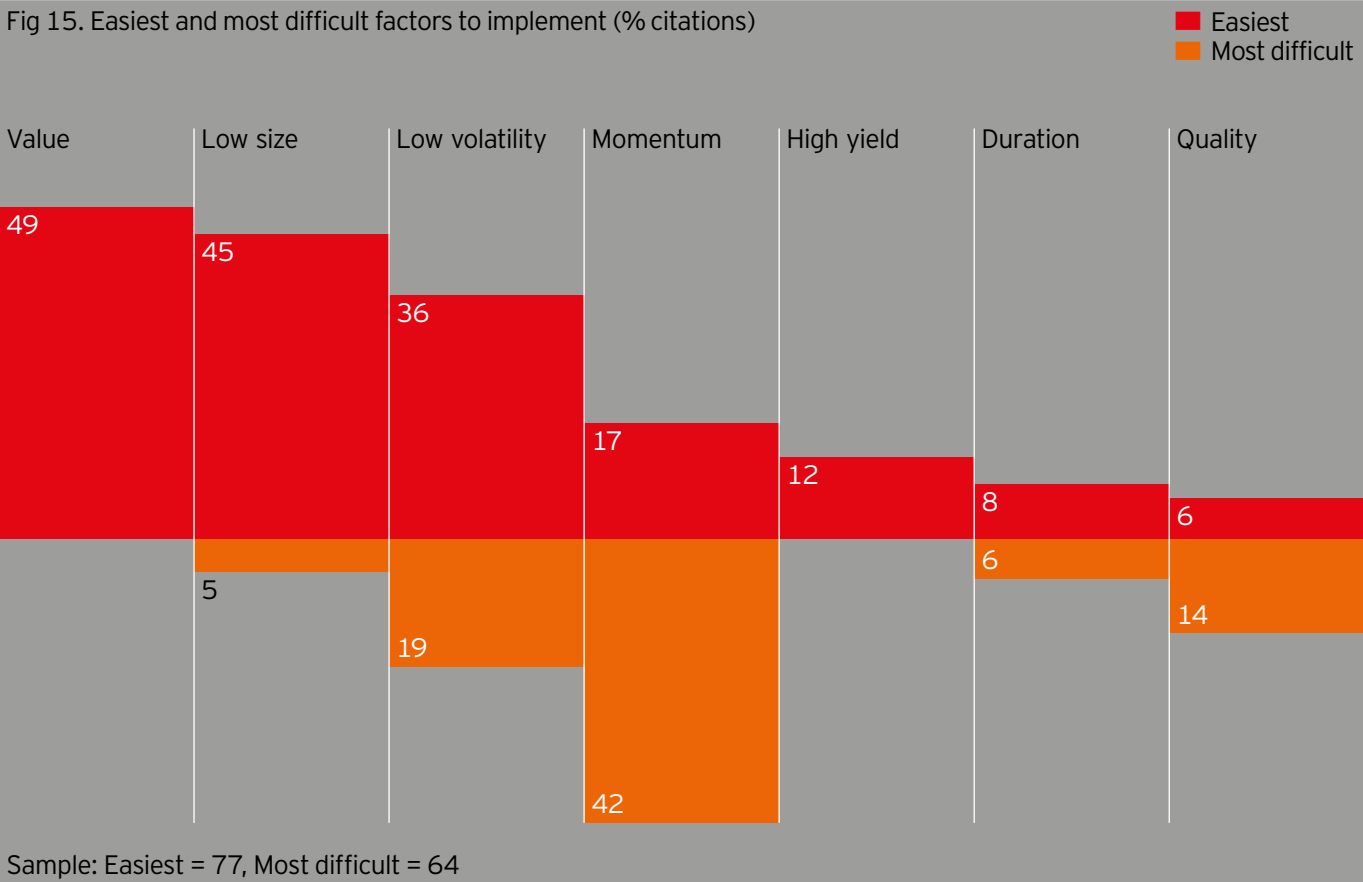
“We expect allocations to increase: active managers face increasing comparisons to factor strategies, as well as pricing pressure from clients.”
European multi-manager

What are the barriers to expanding the use of factor investing?	We hear a lot of commentary around crowding – particularly for low volatility and momentum factors within large cap stocks – so we prefer factor managers with a broad investment universe. The industry seems to overstate challenges related to trading costs – we require our managers to consider trading costs, but we don't want it to limit their investment strategy. Large institutions (including us) face difficulty in being unable to fully commit to factor investing – because of our size, when we want to add exposure to a certain strategy, we have to debate whether fundamental active management or factor is the best way to achieve this exposure.
What would you like to achieve through the implementation of factor investing strategies?	Deliver measurable consistency of performance to our clients.

Theme 3

Factor research and development will encourage further allocations and reduce risk of commoditisation

- Factor investing is distinctive in requiring a heavy research and development programme to support both existing factors and development of new factors.
- This creates the basis of collaborative relationships with more scope for direct value-add engagement.
- With factor strategies typically priced attractively relative to fundamental active, factor purchasing is primarily based on value-add and engagement rather than price.



Realising the potential growth of factor investing requires ongoing investment in research, product development, and implementation

While the potential for growth in factor investing is strong, these expectations are dependent on:

- Maintaining the confidence of early adopters in their initial applications of factor investing (usually equities).
- Building the confidence of adopters to extend their initial applications of, and allocations to, factor strategies (for example fixed income or portfolio-level construction).
- A flow of new adopters.

A critical pre-requisite for growth in factor investing is maintaining the efficacy of existing factors and the development of an expanded range of factor investing solutions. These are not trivial tasks and there is a recognition among respondents that they will require significant investment, including:

- Research into enhancement of existing factors to address investor concerns of sustainability (59% of respondents believe factors may become crowded out if large amounts of assets are allocated).
- Research into the theory, implementation, and sustainability of new factors, leading into the development and propagation of a broader range of factor solutions.
- Development of trading techniques to reduce implementation challenges and improve net returns, reduce costs, increase liquidity, and minimise volatility.

Both institutional and retail respondents are looking to asset managers to invest in the optimisation of existing factor products. Momentum, low volatility and quality are nominated as the hardest factors to implement (figure 15), but for quite different reasons.

- Momentum is considered by far the most difficult of the current mainstream factor set. Respondents highlighted trading costs, volatility and frequency of rebalancing (figure 16) as particular problems.
- Low volatility factor difficulties are more a function of success, with high demand making stock selection a challenge in implementation.
- Quality factor suffers from a lack of standardisation. Respondents noted that definitions of quality varied greatly between providers, with relatively few managers able to explain the benefits of their rationale relative to competitors.

As implementation issues are resolved, assets and crowding concerns tend to follow. This encourages new factor development and expansion of factors to new asset classes, which respondents believe are likely to ease crowding concerns within established factor strategies. However, the widening range and complexity of factor strategies also challenges investors' ability to select managers and implement within their portfolio, highlighting the need for factor specialist managers to take a collaborative approach with investors.

Factor specialist managers are well placed to build differentiated, value-added engagement with investors

Pricing is important, but other criteria dominate factor allocations and manager selection

Investors expect significant manager R&D programmes (supporting both existing and new factors) to create a basis for a deep relationship between providers and investors. These programmes are most effective when performed with an appreciation of the direction of investor objectives and overall portfolio strategies.

Investor feedback highlights the importance of manager philosophy underpinning proposed outcomes. With growing concerns for data mining, investors are looking managers who can articulate a rationale for factor definitions as well as performance, both actual and back tested. A commitment to a factor philosophy, in combination with related R&D, creates a basis for differentiation between managers and aids institutions in their consideration process. Transparency and exchange of insights are also valued as investors seek to build greater understanding of factor strategies. With growing adoption of factor inputs in portfolio construction and of multi asset factor management, there is a considerable, unique opportunity for factor specialist managers to build consultative, solutions-based engagement with investors.

This need for a deeper partnership is highlighted by the emphasis on philosophy and theory research. This opportunity exists even with investors building internal capability – managers willing to support the development of internal capability gain unique insights to the application and benefits of their existing and new factor capabilities across an investor’s portfolio, and can link these to the specific needs of investors.

Such partnership-style engagements provide a strong defence against commoditisation and allow providers to travel with clients on an internalisation journey. They create a hurdle to switching, but more importantly create a broader basis for shared value, efficiency and cost outcomes over time.

Price and cost structures are key recurrent themes for institutional investors and intermediaries. Typically priced between passive and fundamental active, factor strategies can make a useful contribution to institutional investors’ efforts to reduce their overall manager costs. Within their factor allocations, larger respondents in particular are looking to further reduce the cost to implement active quantitative strategies via exploitation of scale and automation by proficient managers.

Interviewees noted that relative to active fundamental managers, factor products are typically lower cost – although some factor providers have initially had unrealistically high expectations of pricing – and therefore the category tends to see limited pricing scrutiny.

Large institutions have also tended to perform price comparisons with their at-scale internal fundamental active capabilities, but such comparisons are becoming less relevant as the motivation for factor strategies becomes a blend of outperformance and risk diversification.

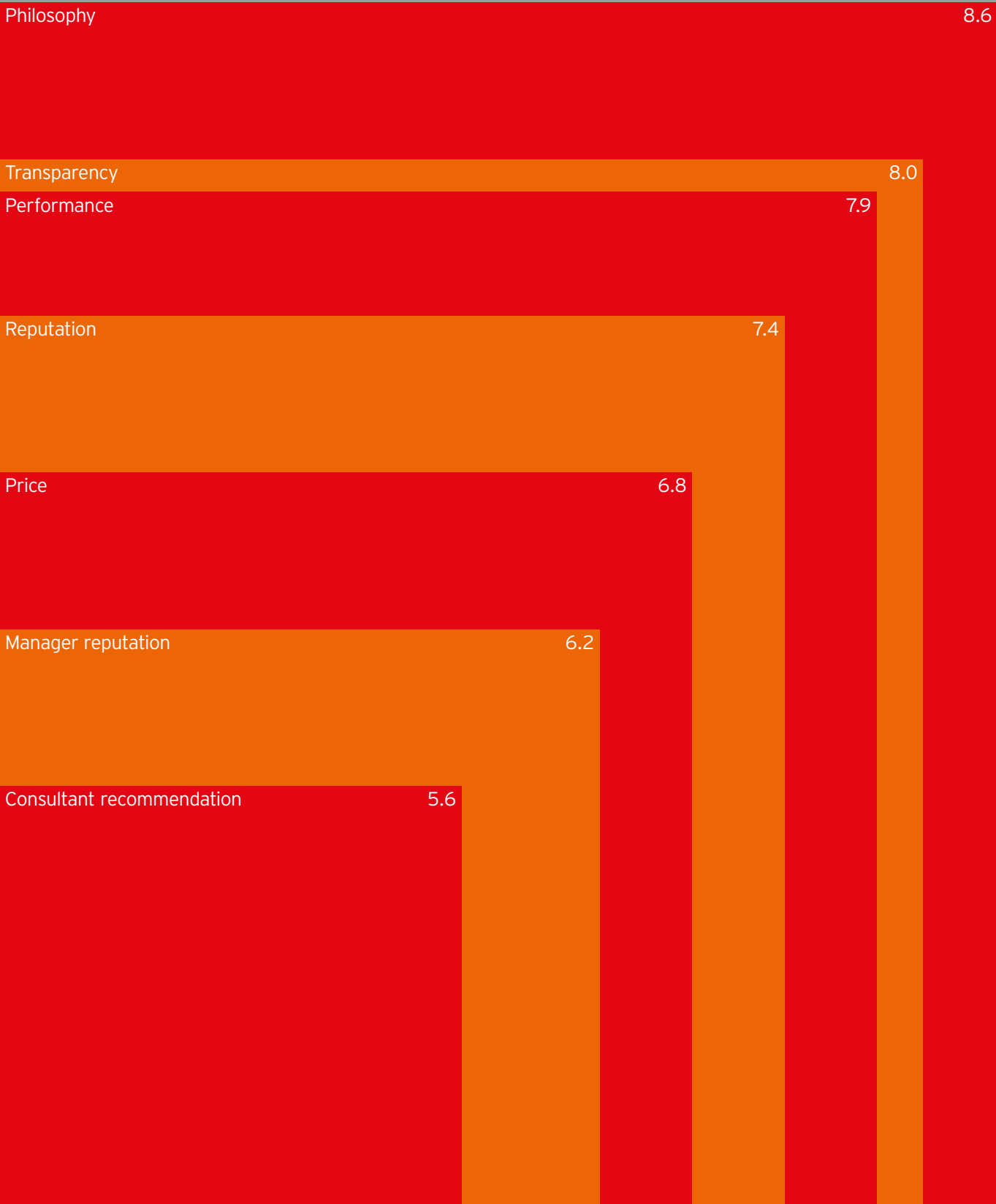
With price de-emphasised as the key purchasing driver, the criteria discussed above – including risk, performance philosophy, R&D, and engagement – come to the fore. The selection of managers for factor strategies is accordingly tilted to these considerations, as demonstrated in figure 17. Price is a relatively lower ranking factor, and has declined slightly in importance since the 2016 study.

Also notable in figure 17 is the more limited influence of asset consultant recommendations in manager selection. Instead, consultants have focused attention on development of multi-manager factor products, especially for small to mid-size institutional investors looking to introduce factor strategies to a portfolio.

“We need more customised solutions from asset managers, however, we have the scale to make this economically viable.”
Insurer, Asia Pacific

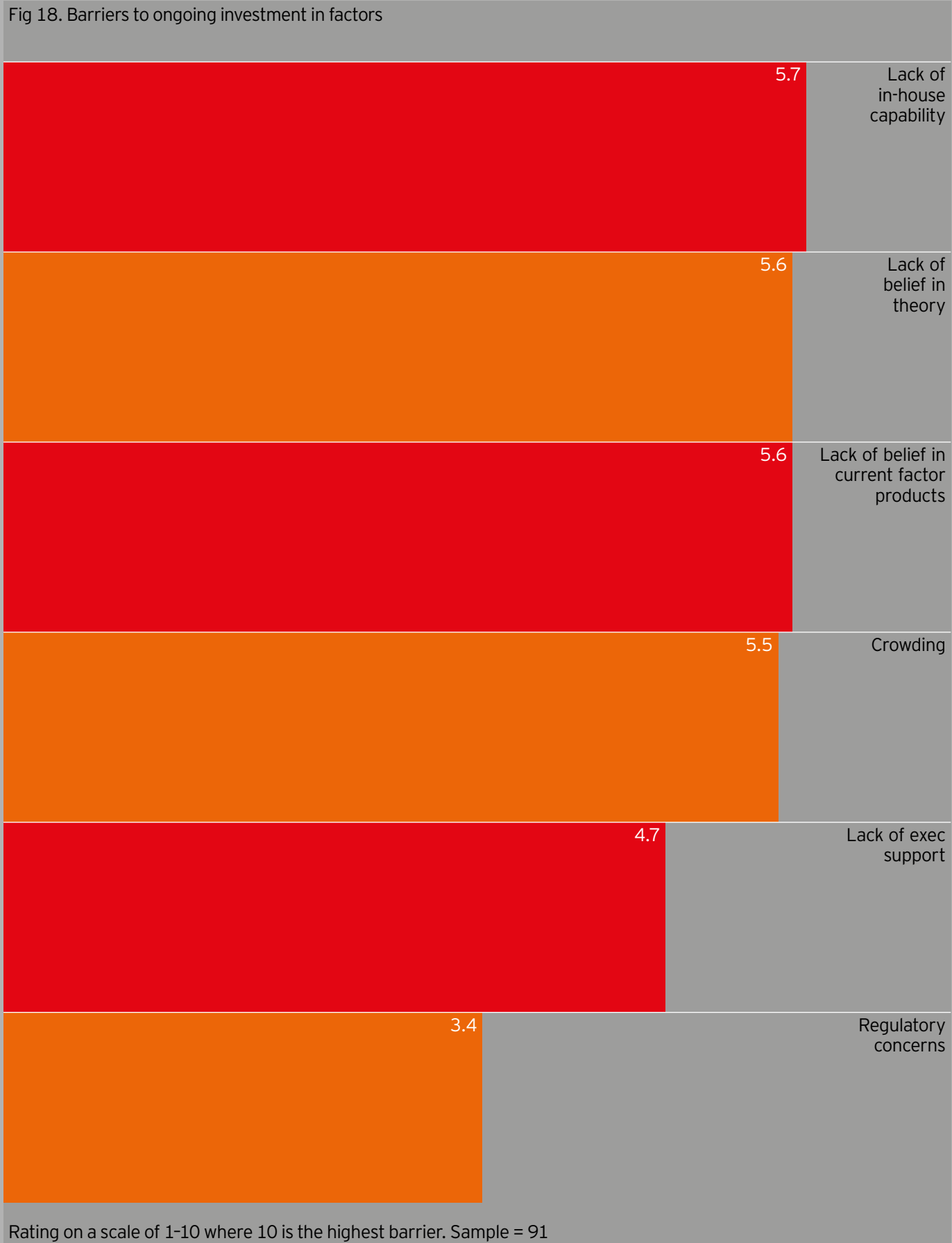
“Manager selection is primarily about the definitions and theory that the asset manager is applying.”
Asset consultant, Europe

Fig 17. The selection criteria for a factor specialist manager



Sample = 89. Rating on a scale of 1-10 where 10 is the highest priority

“We need our consultants’ expertise to differentiate between the vast array of factor products.”
DC pension, Asia Pacific



Larger institutional investors tend to see factor investing as a field in which they and specialist factor specialist managers have stronger research programmes than their asset consultants. Correspondingly there are more frequent direct factor relationships between institutions and managers compared to the norm.

There are reasons for optimism that this basis for manager differentiation will prove sustainable:

- Investors see a continuing basis for differentiation even within single factor equity strategies, improving the range and execution efficiency for existing factors.
- With such a heavy emphasis on research and development, investors expect ample scope for future differentiation between managers and products.
- There is seen to be more scope for differentiation in factor products vs fundamental active generally.
- Perceived barriers to successful factor investing in figure 18 provide a further basis for factor specialist asset managers or asset consultants to add value.

While the barriers identified in figure 18 are enduring, the scores are not high (on a 0-10 scale) in an absolute sense, and in all cases are materially lower than seen in last year's study. Even with pricing pressure likely to continue in the near future, investors' preferences indicate that capable, committed and proactive factor specialist managers will continue to have a strong basis to differentiate, pass on economies of scale, and support satisfactory profit margins.

How do you define factor investing?	It's challenging to find the right way through the jungle of fact products when every equity income strategy is labelled as a factor strategy. Our experience so far is that factor definitions and strategies differ quite strongly, and that the industry is lacking transparency to some extent.
Do you perceive factor investing strategies as active or passive?	We see factor strategies sitting between active and passive. Recently, many active asset managers have struggled to generate sustainable outperformance and investors have moved to passive products – so did we. We're now very exposed to passive market risk so we're looking for options to reduce market risk without giving up return. Excess returns are a 'nice-to-have', but our first priority is capital preservation and factor is a convenient risk management tool.
Describe the journey of your factor-based investments?	We started 18 months ago, driven by growing research and product offerings from asset managers. We've had small cap and dividend strategies in our portfolio for a long time, and our first explicit factor investment was a low volatility equity ETF, then an actively managed global multi factor equity fund. We started with equity strategies as the factor product landscape seems much more developed and diverse compared to other asset classes. We don't yet see that factor investing models are applicable to fixed income.

What's your current allocation to factor investing strategies and how will it change?	Our exposure in factor strategies is small at ~0.5%. We believe that our allocation will grow in the next five years and expect factor strategies to become more tailored to our needs.
How do you integrate factors in your investment decisions?	Investment decisions are based on a strategic asset allocation analysis within the framework of a regular asset-liability study. This analysis includes only regional market factors at present but we are developing methods and internal tools to run a regular automated factor analysis of our portfolio. We don't want to significantly change existing investments so we are looking for tailored solutions to add desired factor exposures without changing the current allocation.
What would you like to achieve through the implementation of factor investing strategies?	Achieve better diversification; Increase the robustness of our portfolio; Decrease exposure to (passive) market risk; Implement more cost-effective, transparent and systematic strategies.

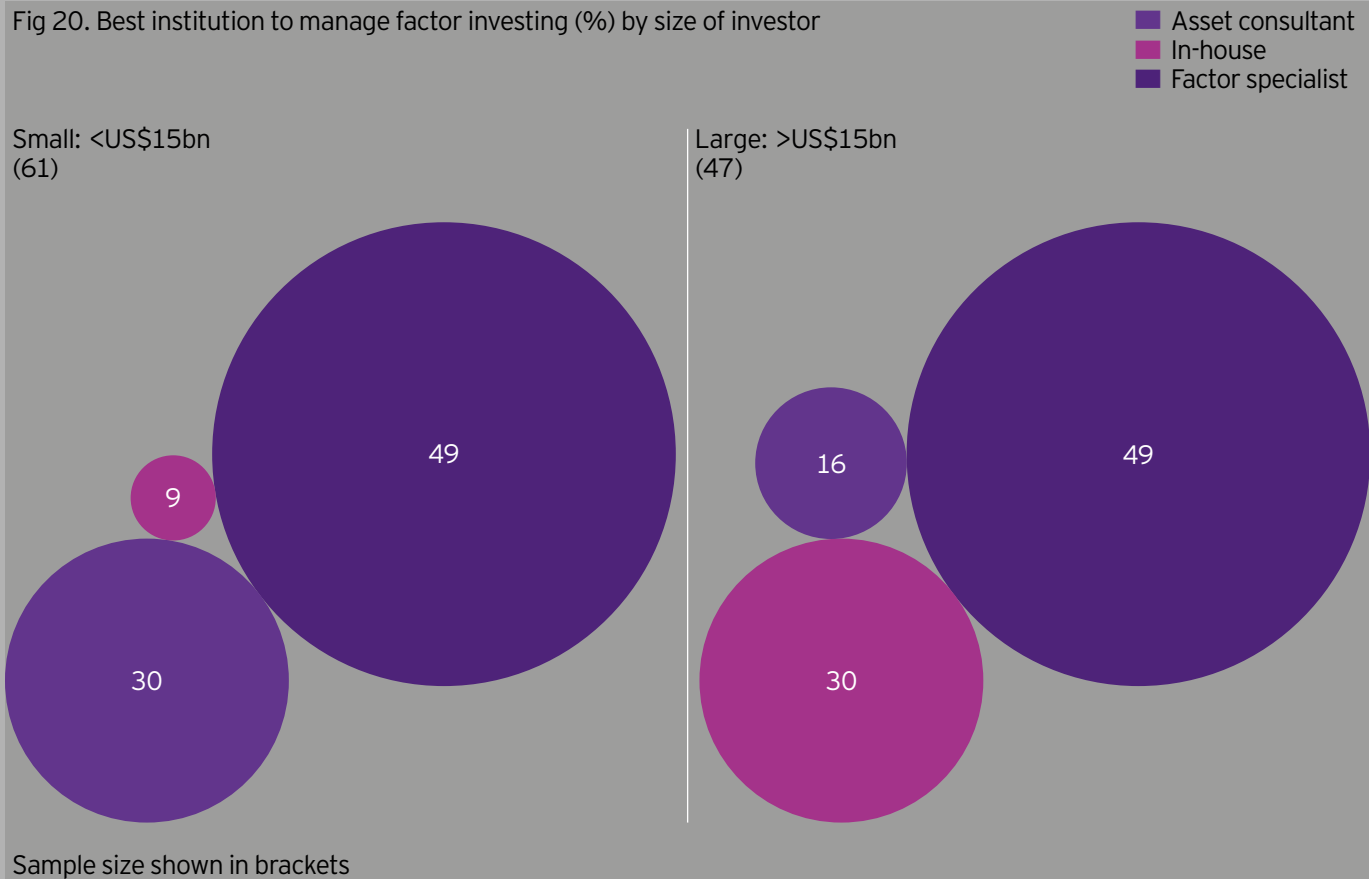
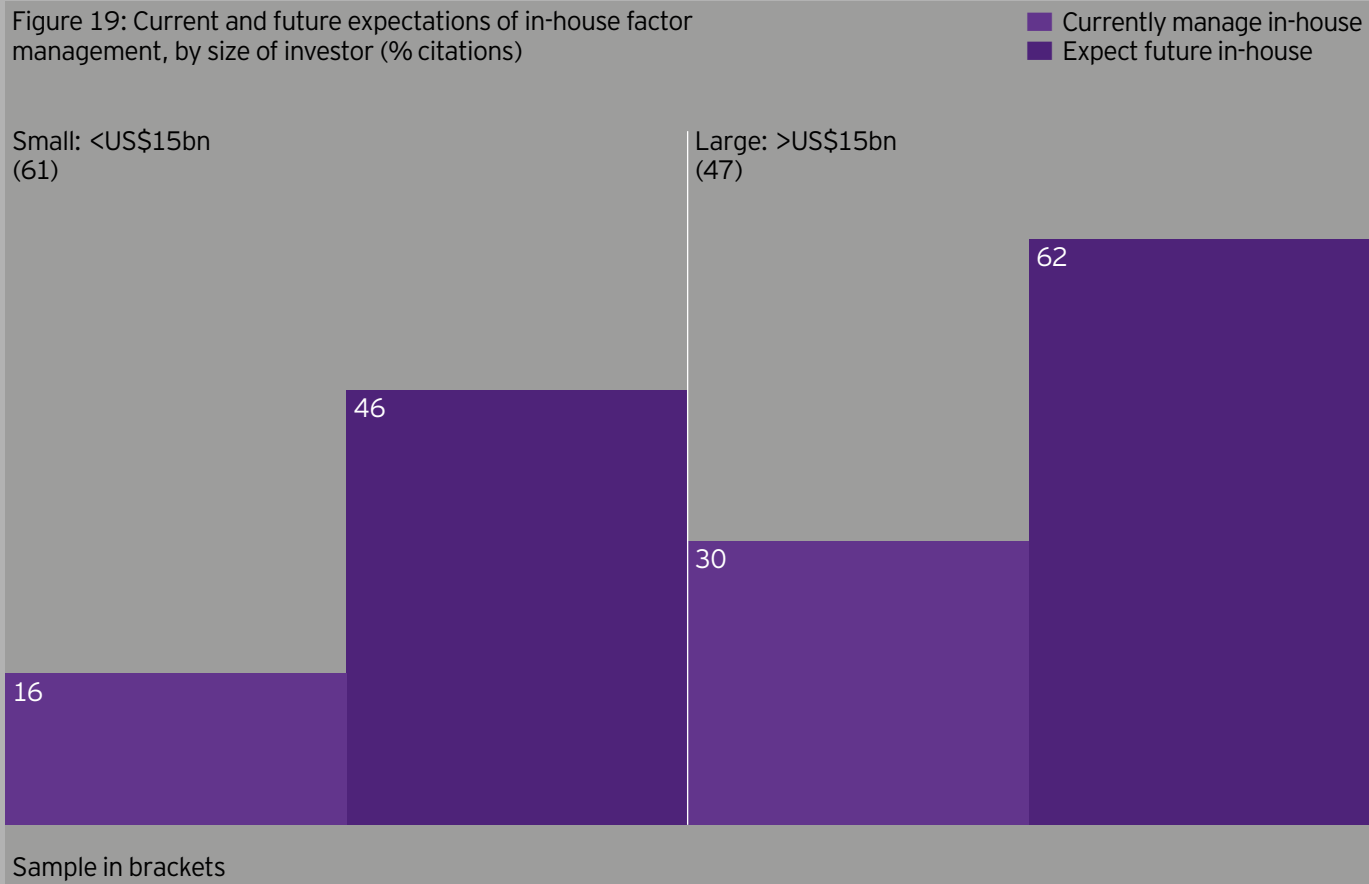
Theme 4

Institutions are actively exploring options to internalise factor capability but recognise the challenges and limitations implied

- Larger institutions, and smaller institutions with strong commitments to factor investing, typically have some internal factor capability and are looking to build more.
- Smaller institutions with limited commitments tend to rely more on asset consultants.
- Retail investors are looking to gain some factor oversight, often within the context of model portfolio design.
- Awareness of the challenges of internalisation suggest an ongoing role for valued external managers.
- The pace of factor internalisation is likely to be cautious, reflecting the size, novelty, and risks of the required commitment.

Waterpark inside ex-airship hangar
Berlin, Germany

“Originally we built tools to understand manager products and performance – this has evolved to internal management.”
DB pension, North America



Cost and control issues lead institutions to examine internalisation of factor capability

This year's interviews highlighted the appetite among institutions and intermediaries to internalise factor investing, with 23% of respondents already managing some factor assets in-house. With a further 31% stating an intention to develop internal factor capabilities, slightly more than half of respondents plan to be performing some degree of internal management.

Where overall factor allocations are driven primarily by blended risk management and return generation opportunities over cost, the decision to build internal factor capability is based on a desire to achieve similar risk-return outcomes to those offered by external managers, at a lower cost.

Also at work is a desire to exert greater control over the factor investing proposition. This increases when investors move from single asset class strategies to a whole of portfolio approach; i.e. the closer factor investing moves to the heart of an investor's strategy, the more likely it is to be internalised, at least in part.

Figure 19 highlights the material difference in internalisation of factor investing by investor size. Large investors (predominantly sovereign wealth funds and defined benefit pension schemes with assets >US\$15bn) have been active in internalising factor management, and the majority expect to do so in the future. This trend is also apparent within smaller institutional investors, although to a lesser extent. With increasing numbers of managers and strategies to consider, many respondents are investing in capability to research, allocate and monitor factors, and are optimistic about their ability to extend to internal factor asset management. Given their scale and internal resources, large institutions are confident in their ability to efficiently manage the upfront and ongoing costs of their factor strategies.

Respondents expect to be able to leverage infrastructure, compliance, and governance processes already in place for internal fundamental active and passive strategies. While large institutions have scale which permits the large upfront investments in internal capability development, this is not the case for smaller investors. Rather, these investors have sought benefits of scale through the use of pooled multi-manager funds, often offered by an asset consultant. This bifurcation is evident in figure 20.

Retail investors are looking to internalise factor investing strategy, but not underlying asset management

Internalisation of factor investing is likely to be measured

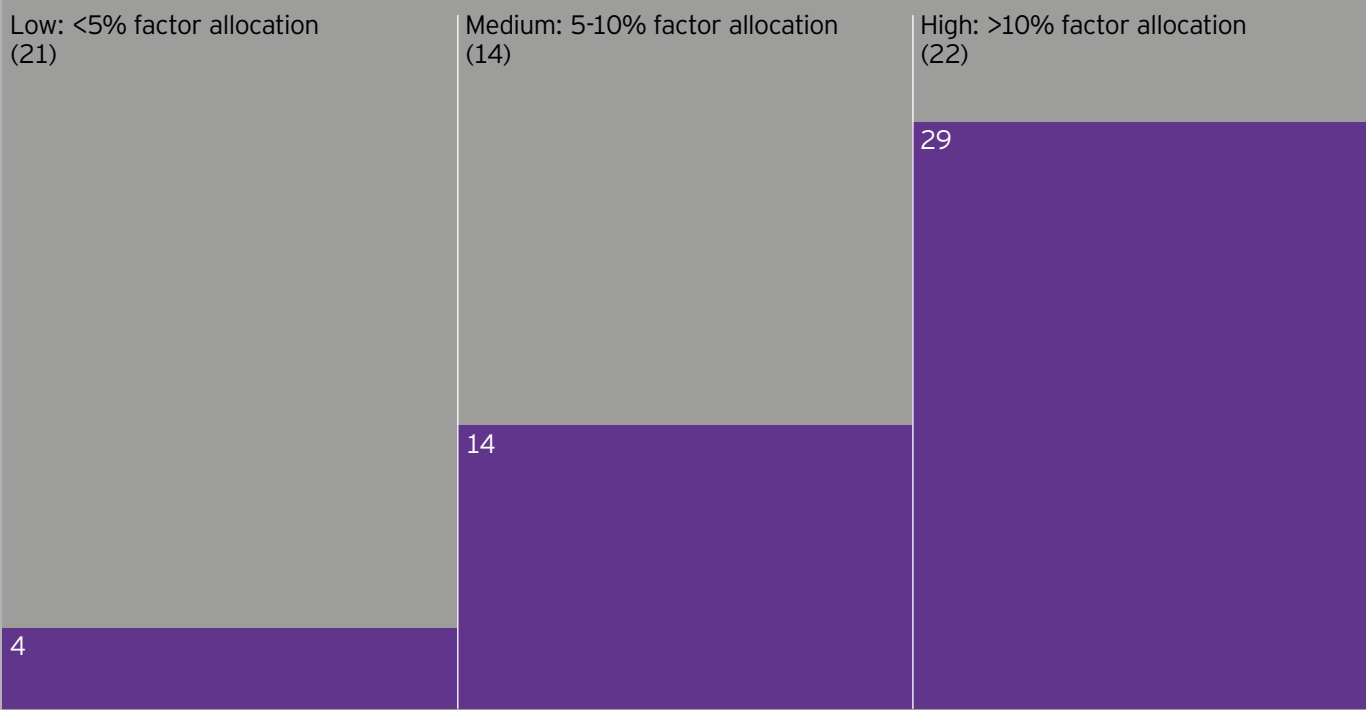
Internalisation intentions are also related to the degree of commitment to factor investing. Figure 21 shows that smaller investors with a strong commitment (>10% of AUM invested in factor strategies) to factor investing are far more likely to have developed some internalised factor capability. Some of these smaller respondents noted that allocations to multi-manager products were unlikely to be sustained in the longer term due to misalignment between internal target factor allocations and the wide range of underlying exposures within multi-manager products. They concluded that research, design and management of factor strategies was better conducted internally, as external asset managers focus their attention on larger customers. Unlike institutional investors, the majority of retail supporters lack the appetite, resources or timeframes to build internal factor management teams. To date retail investors have outsourced the understanding and balancing of factor exposures to external managers. However, a growing number of large retail advisory firms and private banks cite interest in internal management of factor investing strategies, with 46% of retail respondents expecting to manage some allocations to factors internally in the future. That said, the context remains limited. Development of model portfolios, customer acquisition and regulatory compliance are the current strategic challenges for retail. Determining the role of factor investing in model portfolios is part of the challenge set, but just one part. Given that most retail investors are limited in their use of direct securities (due to scale, custodial capability or retail business/investment model design), the internalisation of factor investing typically relates to oversight of factor allocations and manager selections, especially in model portfolios. In large private banks and other high value retail investment advisers which offer investment in direct securities, internal factor strategies (where offered at all) remain concentrated on single factor smart beta products. Respondents acknowledge the ongoing need for external managers in most factor strategies.

The fact that nearly one third of investors are looking to internalise factor management capability poses a challenge to external factor specialist managers. However, progress is likely to proceed at a measured pace and in a manner which preserves valued external relationships given the following four qualifications:

- There is a high degree of awareness of the challenges and risks implicit in internalisation (figure 22), including governance, compliance and ongoing research and development costs. Even where an institution has internalised fundamental active equities, a movement to internalise factor strategies is likely to require additional investments in people and technology. Investment, board, and compliance committees also have limited experience in factor investing. Internalisation would require the hiring of specialist members and third party consultants to support the development of enhanced governance processes.
- Size matters. The commitment to internalisation is most prevalent among large investors which can afford the investments and expect to gain the highest net benefits. As indicated by figure 20, some small to mid-sized institutions along with new adopters are also interested in internal factor management, but acknowledge the cost and implementation challenges. Most continue to value external managers.
- Research commitment. While large institutions can seek to leverage existing internal investment infrastructure to build factor capability, the internalisation of factor brings larger and unique requirements in terms of extensive academic and in-house research requirements that they are unlikely to have been encountered previously.
- Limited ambitions. The desire to internalise is primarily focused on smart beta and single-factor equity strategies. Even the largest internal teams plan to continue to work closely with external asset managers to develop new factors and to extend factor investing to new asset classes.

Internalisation intentions also assume success. There is a real possibility that internal success does not emerge, or makes sense for only the largest investors with specific characteristics in relation to scale, governance and objectives. Over time the evolution of new factors, implementation techniques and pricing models may of course lower internalisation hurdles, but internalisation of the entire factor investing proposition, especially by smaller investors, is unlikely to occur until more and stronger evidence of success emerges.

Fig 21. Internalisation of factor investing, by factor allocation (small investors only, % citations)



Sample in brackets

Fig 22. Challenges to internal management of factor investing

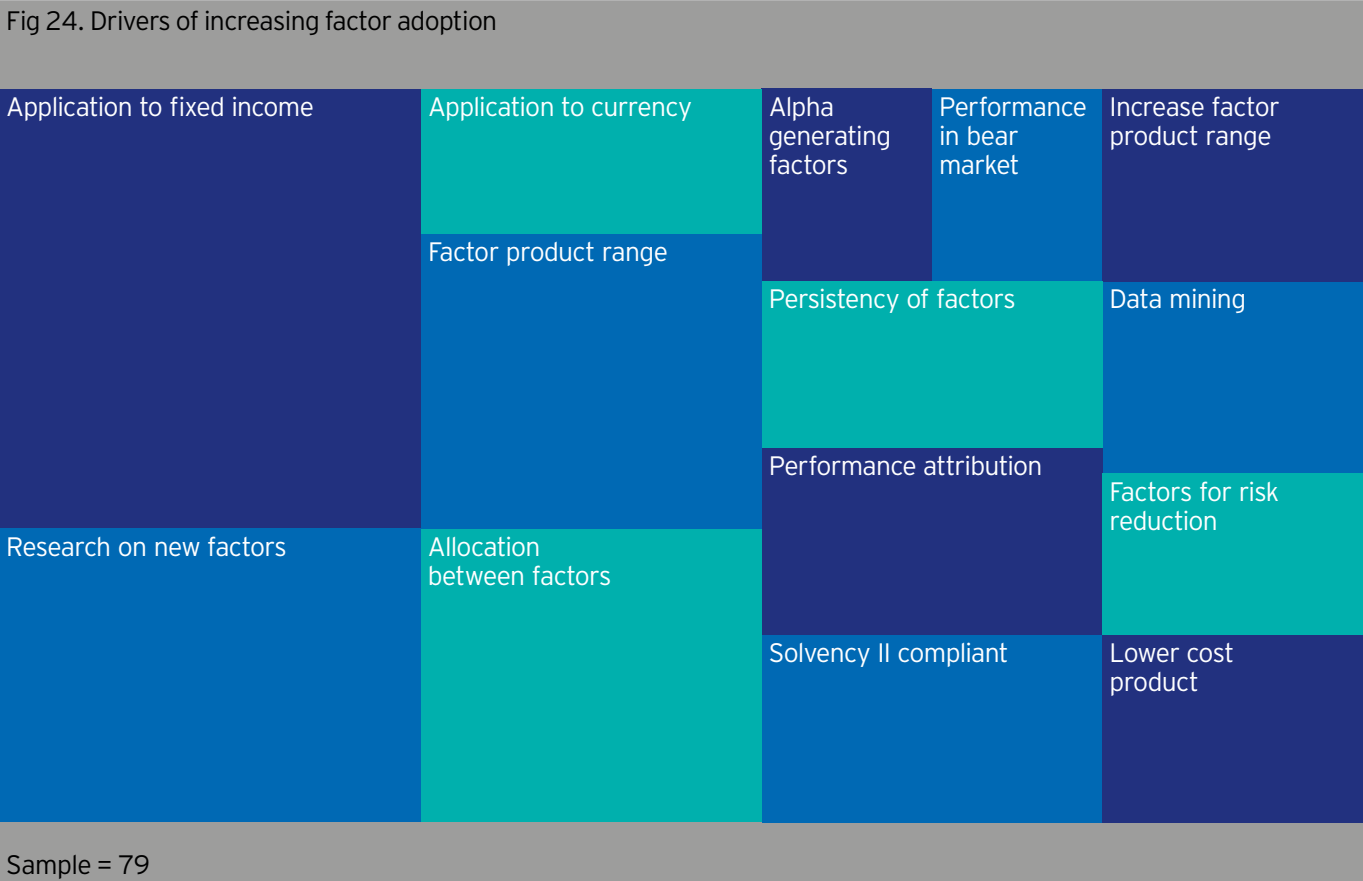
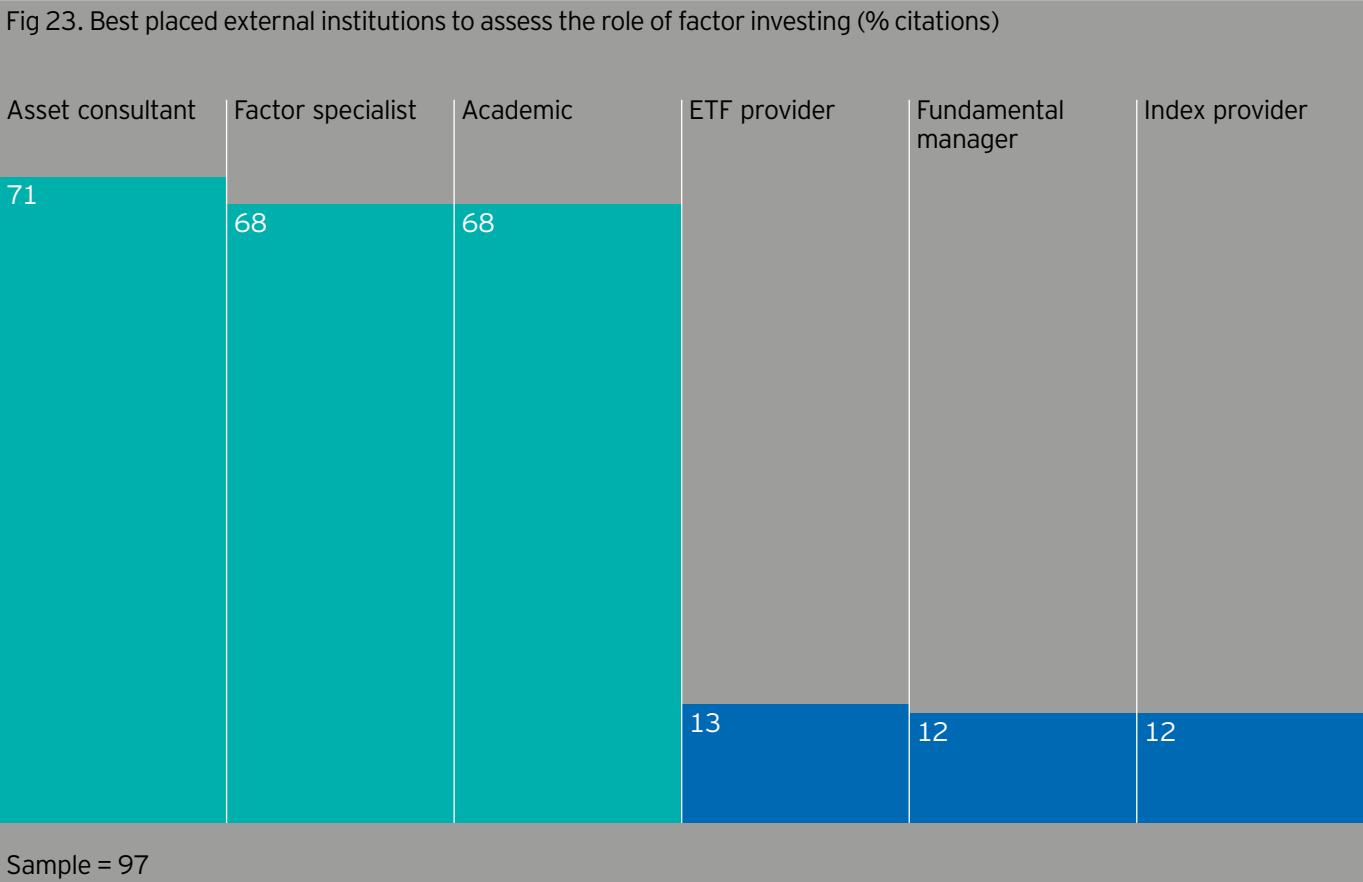


Sample = 42

Theme 5

Market evolution will challenge the traditional roles of investor, factor specialist manager, consultant and academic, favouring those with capacity to adapt

- Factor investors continue to value their external relationships, but the needs of those relationships are changing with time.
- Academia remains an important source of quality and independent research but increasingly needs to be harnessed to the scale resources of other participants to bring strategies to market.
- Asset consultants have seen their role diminish with large institutional investors, but it remains strong with small to mid-size segments where vertical integration into factor products is occurring.
- Specialist factor managers need to find the path between guiding their largest factor investors and the potential risks of internalisation; their role with smaller and retail investors appears relatively secure.



In 2016 we identified the external parties which investors value in their consideration and implementation of factor strategies: academia, asset consultants and factor specialist managers.

The key trends highlighted in 2017 – growth in adoption and allocation, development of new factors and products, broader application of factor investing, and growing internal capabilities – together imply material changes to the roles of and interactions between these different participants. Figure 23 highlights that academics, factor specialist managers, and asset consultants all play key roles in supporting investors adopt factor strategies in their portfolios.

As demand for new factor products increases, there has been a corresponding supply response, but of varying quality. Interviewees cited cases of managers rapidly developing new products, which in their view were dependent on back-testing and data mining ahead of building a solid theoretical basis.

This perceived decline in research quality in the rush to bring new products to market is at odds with the value that investors place on the importance of research to further factor adoption (figure 24), and if anything adds fuel to the intent to internalise.

Consequently, there is strong interest for academic research in the development and proof of factors, particularly within multi asset strategies and portfolio construction. Investors see that the extension of factor investing beyond traditional asset classes has been widely documented among academics, and that there is an opportunity for academics to work more closely with factor specialist managers.

The flaw in this opportunity is the perception that academics can lack practicality and that effective collaboration between academia and industry is difficult to achieve. In an effort to resolve such gaps, a growing number of academics are being recruited by factor specialist managers, helping to address the importance of academic research in providing impartial research on factor efficacy.

Asset consultants have performed a key role in the adoption of factor investing via research, education, and advocacy. As investors formalise factor strategies, there remains demand for ongoing advice from asset consultants (figure 25), but figure 26 shows that the role of the asset consultants becomes less about manager selection and more in relation to embedding factor investing within strategy, portfolio construction, risk management and monitoring.

Consistent with broader industry trends, large institutional respondents which are established factor investors especially those with internal investment capability, are reducing their reliance on asset consultants and are seeking to internalise knowledge and practical experience of factor investing. There remains scope for knowledge-sharing and knowledge-transfer relationships with asset consultants and we expect those to become more defined in coming years.

For the majority of institutional investors located in the smaller to mid-sized segments, internal capability limitations, product proliferation by providers and the emergence of more complex strategies, all favours the continued use of asset consultants for factor advice. This is also true of all sizes of institutional investors in non-standard situations.

As with other specialist product categories, some asset consultants have responded by carving out a new role in supporting mid-sized and smaller investors by developing pooled vehicles offering factor exposures.

Other (and so far, less explored) factor opportunities are seen to exist for asset consultants. With a growing number of pension funds and insurers adopting a factor approach, there is an emerging role for asset consultants in researching and implementing liability matching through factors. Smaller institutions and retail investors will require more support and education from consultants as they look to work more closely with their factor managers and incorporate them into model portfolios.

Factor investing in large part originated in academia (for example the pioneering work of Robert Haugen), and academics continue to be perceived as well placed to support new products due to their objectivity.

However, the scale of resources required to commercialise and efficiently implement factors has frequently moved beyond the resources of academia. The complexity of implementing more active quantitative strategies, often reliant on derivatives and leverage, along with the importance of execution efficiency, mean that the role of asset managers has grown.

As a result, investors expect asset managers to combine scale resources with the theoretical efforts of academics to inform product development, and in some cases to also work with asset consultants to communicate these strategies to investors. It is a case where managers can point to benefits of scale.

With an increasing wealth of skill and experience, factor specialist managers have an opportunity to support the growing number of investors taking their first steps into factor investing. With a growing range of factor solutions available, inexperienced investors will need guidance.

This potential to educate prospective clients on factor products and their applications within portfolios is greatest within retail segments, and many respondents noted there is an opportunity for factor specialist managers to work with retail advisory firms to position themselves within the model portfolio. Retail advisory firms rarely have the scale to partner with academia or asset consultants, and frequently rely, largely or solely, on factor specialist managers for support.

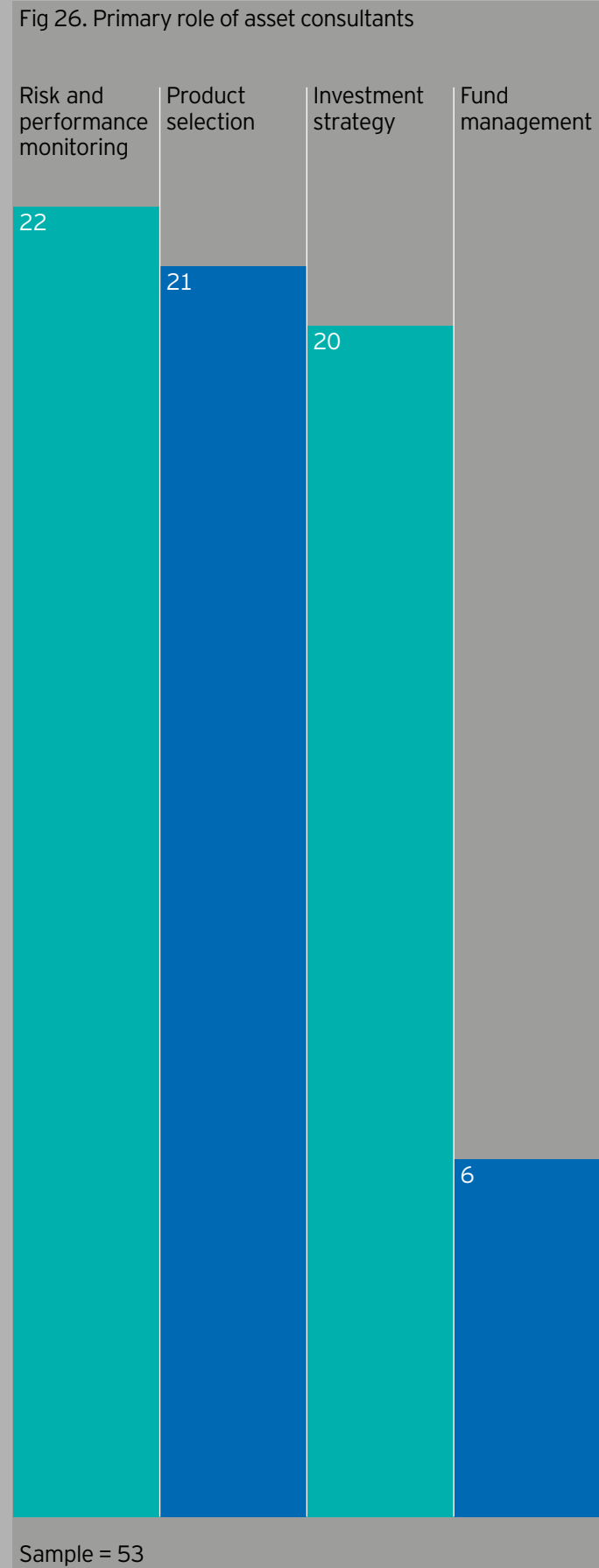
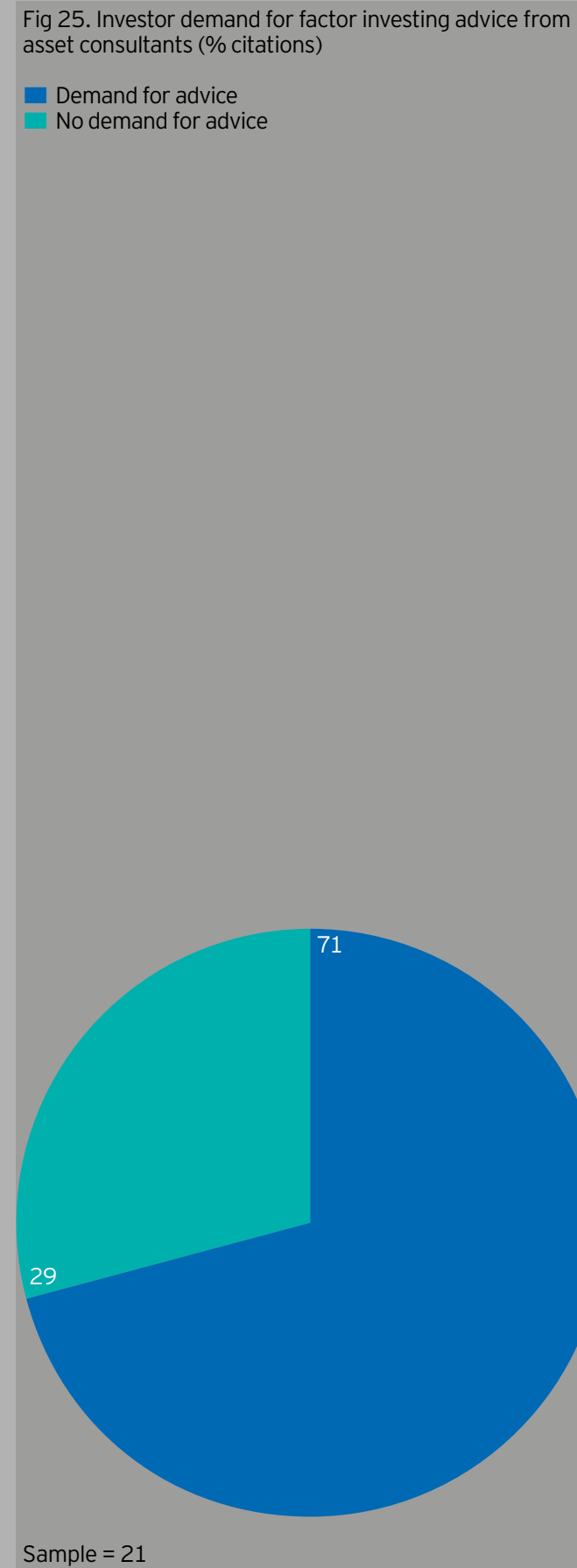
Established factor investors are looking to expand and tailor factor product solutions, offering new opportunities for specialist factor specialist managers, but potentially against a backdrop of internalisation intentions. This can create tensions between managers and their clients.

Similarly, opportunities exist for factor specialist managers even within institutions looking to internalise factor capability. As outlined in theme 4, building internal capability is lengthy and complex. Factor specialist managers are well placed to offer support in the development of governance processes surrounding factor investing and ongoing academic research. Such support is not without reward for asset managers. As noted earlier, the majority of internal factor capability centres on smart beta strategies, with institutions looking to retain external managers for active quantitative products. Factor specialist managers that have built strategic relationships with large institutional investors are best placed to win new business relating to more complex strategies.

While the opportunities are of considerable scale, they are suggestive that managers need to keep moving along the value curve – not just in terms of R&D in relation to existing and new factor strategies, but also the interactions between factors and broader investment issues including solvency regulation, liability matching, and portfolio construction. Factor specialist managers can build long-lasting relationships with their large institutional investors, but they need to move in tandem with their clients.

“We continue to rely on consultants for help in monitoring risk and performance.”
DB Pension, North America

“We use an asset consultant to help us to select managers for more complex mandates.”
DB Pension, Europe



Describe the journey of factor-based investments within your portfolio?	Some board members were sceptical that we could stick to the disciplined investment process embodied in the proposed factor investing strategy. Two years later the portfolio is still following a systematic multi factor approach. It has been successful, outperforming internal and external peers in performance and importantly risk adjusted performance terms.
How do you implement factors within your investment process?	We have a risk factor-based strategic asset allocation; risk factors include duration, credit spread, currency, macro, political etc. The portfolio is divided into segments, each provided with a specific risk budget for every risk factor. Every segment is individually managed and may follow different philosophy/investment styles, within the predefined risk limits. One of those segments follows an explicit factor strategy. Its goal is to exploit factor premiums across different asset classes within a diversified factor portfolio, generating alpha. We would like to tactically allocate factors as they behave differently in different market phases of a market cycle, but more research needs to be done in this space. Macroeconomic indicators don't seem to work very well or are hard to find. Hence, we're focusing on indicators based on historical performance data and valuation levels.
What sources of research do you use?	We largely rely on external research due to very limited internal capabilities. Academic research serves as a base but we also use research provided by asset managers and index providers.

What instruments do you use to implement factors in your portfolio?	For equity factor exposure we use ETFs and an actively managed small cap fund. We are considering smart beta ETFs, and potentially actively managed factor strategies. For fixed income, beside duration and credit, we try to exploit premiums such as illiquidity through the use of bonded loans instead of traditional bonds.
What barriers do you perceive?	Despite a growing world of factor-based products, we see a lack of instruments to efficiently allocate to different factors in a portfolio. The trust and the acceptance of factor investing strategies amongst decision makers is growing only slowly, so there's still lobbying work to do.
How do you expect your factor allocations to change over the next five years?	Our current factor portfolio can be seen as a test of practicability and profitability. It is a very small part of the portfolio; ~1% of our assets. However, depending on the success/performance of the strategy, we expect the allocation to grow after the agreed testing period of three years.

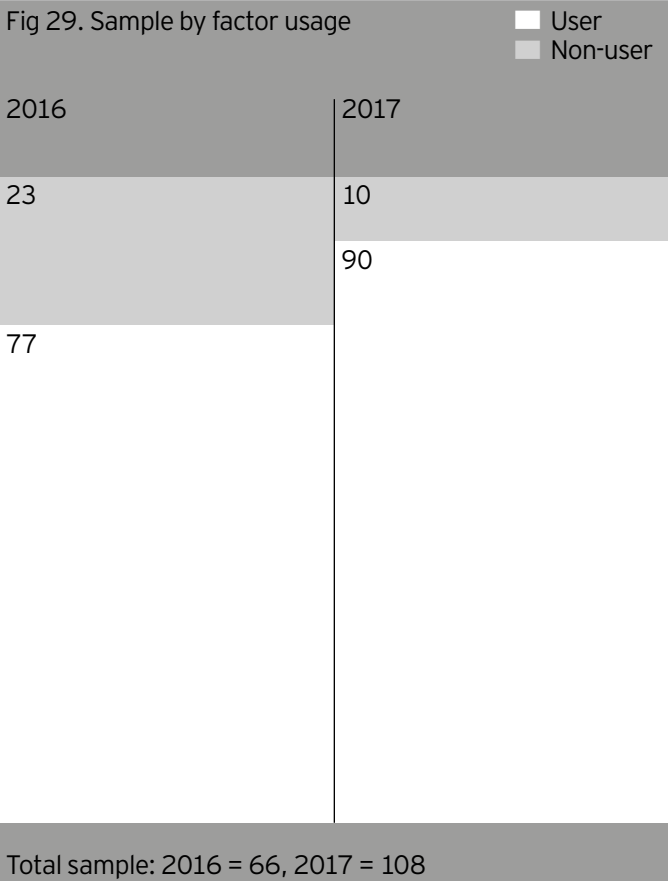
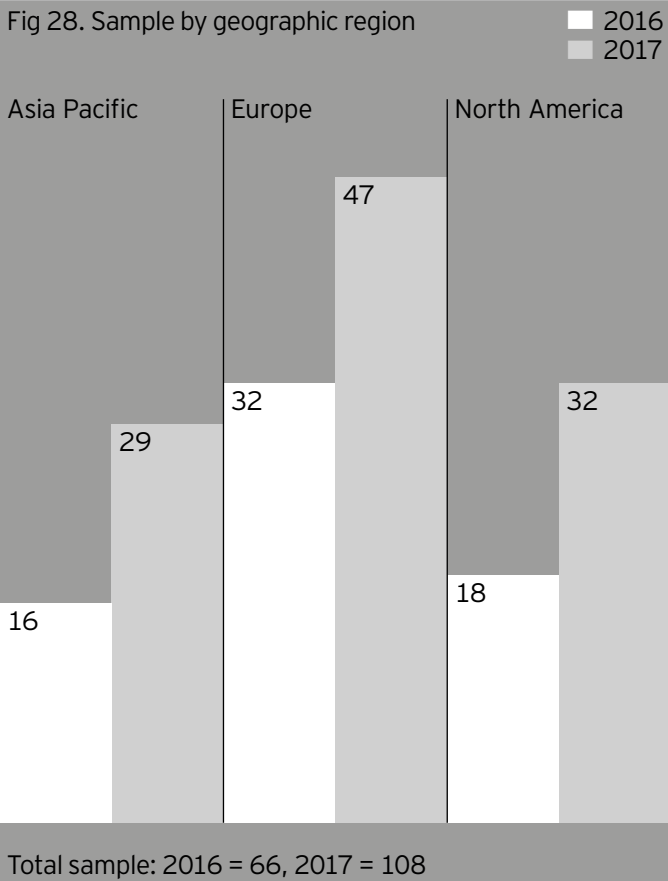
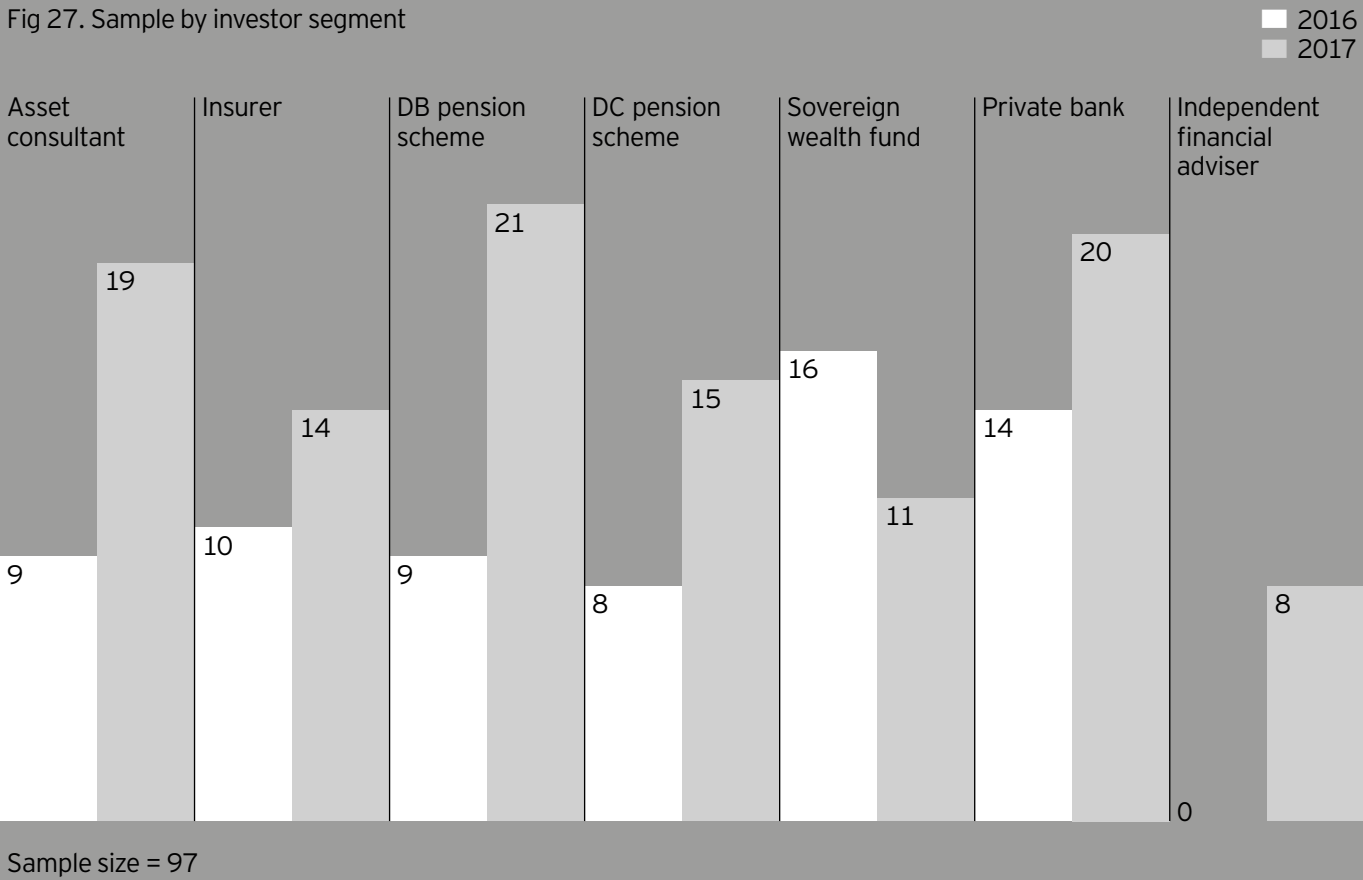


'Multiverse', Leo Villareal
National Gallery, Washington DC, US

The fieldwork for this study was conducted by NMG’s strategy consulting practice. Invesco chose to engage a specialist independent firm to ensure high quality objective results. Key components of the methodology include:

- A focus on the key decision makers within institutional investors, asset consultants, financial advisory firms and private banks, conducting interviews using experienced consultants and offering market insights rather than financial incentives.
- In-depth (typically 1-hour) face-to-face interviews using a structured questionnaire to ensure quantitative as well as qualitative analytics were collected.
- Analysis capturing investment preferences as well as actual investment allocations with a bias toward actual allocations over stated preferences.
- Results interpreted by NMG’s strategy team with relevant consulting experience in the global asset management sector.

In 2017, the second year of the study, we conducted interviews with 108 different asset consultants, insurers, pension funds, sovereign investors and private banks globally (up from 66 in 2016). Across the sample, 90% of respondents were ‘factor users’, defined as any respondent investing in a factor product across their entire portfolio. We deliberately targeted a mix of investor profiles across multiple markets. The breakdown of the 2017 interview sample by investor segment and geographic region is displayed in figures 27 to 29.



This document is intended only for Professional Clients and Financial Advisers in Continental Europe (as defined in the important information); for Qualified Investors in Switzerland; for Professional Clients in, Dubai, Jersey, Guernsey, Isle of Man, Ireland and the UK, for Institutional Investors in the United States and Australia, for Institutional Investors and/or Accredited Investors in Singapore, for Professional Investors only in Hong Kong, for Qualified Institutional Investors, pension funds and distributing companies in Japan; for Wholesale Investors (as defined in the Financial Markets Conduct Act) in New Zealand, for accredited investors as defined under National Instrument 45-106 in Canada, for certain specific Qualified Institutions/Sophisticated Investors only in Taiwan and for one-on-one use with Institutional Investors in Bermuda, Chile, Panama and Peru.

For the distribution of this document, Continental Europe is defined as Austria, Belgium, France, Finland, Greece, Luxembourg, Norway, Portugal, Denmark, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland.

This document is for information purposes only and is not an offering. It is not intended for and should not be distributed to, or relied upon by members of the public. Circulation, disclosure, or dissemination of all or any part of this material to any unauthorised persons is prohibited. All data provided by Invesco as at 30 June 2017, unless otherwise stated. The opinions expressed are current as of the date of this publication, are subject to change without notice and may differ from other Invesco investment professionals.

The document contains general information only and does not take into account individual objectives, taxation position or financial needs. Nor does this constitute a recommendation of the suitability of any investment strategy for a particular investor. This is not an invitation to subscribe for shares in a fund nor is it to be construed as an offer to buy or sell any financial instruments. While great care has been taken to ensure that the information contained herein is accurate, no responsibility can be accepted for any errors, mistakes or omissions or for any action taken in reliance thereon. You may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco.

Additional information for recipients in:

Australia

This document has been prepared only for those persons to whom Invesco has provided it.

It should not be relied upon by anyone else. Information contained in this document may not have been prepared or tailored for an Australian audience and does not constitute an offer of a financial product in Australia. You should note that this information:

- may contain references to amounts which are not in local currencies
- may contain financial information which is not prepared in accordance with Australian law or practices;
- may not address risks associated with invest-ment in foreign currency denominated invest-ments; & does not address Australian tax issues.

Hong Kong

This document is provided to Professional Investors in Hong Kong only (as defined in the Hong Kong Securities and Futures Ordinance and the Securities and Futures (Professional Investor) Rules).

New Zealand

This document is issued only to wholesale investors in New Zealand to whom disclosure is not required under Part 3 of the Financial Markets Conduct Act. This document has been prepared only for those persons to whom it has been provided by Invesco. It should not be relied upon by anyone else and must not be distributed to members of the public in New Zealand. Information contained in this document may not have been prepared or tailored for a New Zealand audience. You may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco. This document does not constitute and should not be construed as an offer of, invitation or proposal to make an offer for, recommendation to apply for, an opinion or guidance on Interests to members of the public in New Zealand. Applications or any requests for information from persons who are members of the public in New Zealand will not be accepted.

Singapore

This document may not be circulated or distri-buted, whether directly or indirectly, to persons in Singapore other than to an institutional investor pursuant to Section 304 of the Securities and Futures Act, Chapter 289 of Singapore (the ‘SFA’) or otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA. This document is for the sole use of the recipient on an institutional offer basis and/ or accredited investors and cannot be distributed within Singapore by way of a public offer, public advertisement or in any other means of public marketing.

This document is issued in:

Australia by Invesco Australia Limited (ABN 48 001 693 232), Level 26, 333 Collins Street, Melbourne, Victoria, 3000, Australia, which holds an Australian Financial Services License number 239916.

Austria by Invesco Asset Management Österreich - Zweigniederlassung der Invesco Asset Management Deutschland GmbH, Rotenturmstrasse 16-18, A-1010 Vienna, Austria.

Belgium by Invesco Asset Management SA Belgian Branch (France), Avenue Louise 235, B-1050 Brussels, Belgium.

Canada by Invesco Canada Ltd., 5140 Yonge Street, Suite 800, Toronto, Ontario, M2N 6X7, Canada.

Dubai by Invesco Asset Management Limited, Po Box 506599, DIFC Precinct Building No 4, Level 3, Office 305, Dubai, United Arab Emirates. Regulated by the Dubai Financial Services Authority.

France, Finland, Greece, Luxembourg, Norway, Portugal and Denmark, by Invesco Asset Management SA, 16-18 rue de Londres, 75009 Paris, France.

Germany by Invesco Asset Management Deutschland GmbH, An der Welle 5, 60322 Frankfurt am Main, Germany.

Hong Kong by Invesco Hong Kong Limited 景順投資管理有限公司. 41/F, Champion Tower, Three Garden Road, Central, Hong Kong.

the Isle of Man and Ireland by Invesco Global Asset Management DAC, Central Quay, Riverside IV, Sir John Rogerson’s Quay, Dublin 2, Ireland. Regulated in Ireland by the Central Bank of Ireland.

Italy by Invesco Asset Management S.A. - Italian Branch, Via Bocchetto 6, 20123, Italy.

Japan by Invesco Asset Management (Japan) Limited, Roppongi Hills Mori Tower 14F, 6-10-1 Roppongi, Minato-ku, Tokyo 106-6114; Registration Number: The Director-General of Kanto Local Finance Bureau (Kin-sho) 306; Member of the Investment Trusts Association, Japan and the Japan Investment Advisers Association.

Jersey and Guernsey by Invesco International Limited, 2nd Floor, Orviss House, 17a Queen Street, St Helier, Jersey, JE2 4WD. Regulated by the Jersey Financial Services Commission.

The Netherlands by Invesco Asset Management S.A. Dutch Branch,Vinoly Building, Claude, Debussylaan 26, 1082 MD, Amsterdam, The Netherlands.

New Zealand by Invesco Australia Limited (ABN 48 001 693 232), Level 26, 333 Collins Street, Melbourne, Victoria, 3000, Australia, which holds an Australian Financial Services License number 239916.

Singapore by Invesco Asset Management Singapore Ltd, 9 Raffles Place, #18-01 Republic Plaza, Singapore 048619.

Spain by Invesco Asset Management SA, Sucursal en España, C/GOYA 6, 3rd floor, 28001 Madrid, Spain.

Sweden by Invesco Asset Management SA, Swedish Filial, Stureplan 4c, 4th floor, 114 35 Stockholm, Sweden.

Switzerland by Invesco Asset Management (Schweiz) AG, Talacker 34, CH-8001 Zurich, Switzerland.

Taiwan by Invesco Taiwan Limited, 22F, No.1, Songzhi Road, Taipei 11047, Taiwan (0800-045-066). Invesco Taiwan Limited is operated and managed independently.

The UK by Invesco Asset Management Limited, Perpetual Park, Perpetual Park Drive, Henley-on-Thames, Oxfordshire RG9 1HH. Authorised and regulated by the Financial Conduct Authority.

The United States of America by Invesco Advisers, Inc., Two Peachtree Pointe, 1555 Peachtree Street, N.W., Suite 1800, Atlanta, Georgia 30309, US.