The future of active management

How do we integrate humans and machines?

Equities

Global
Quantitative

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What drives returns across the market?

In an effort to understand what proportion of the market could be indexed, we decompose returns in to their underlying drivers: beta, macro factor, sector, quant factor and idiosyncratic exposures. Overall, we find that 38% of returns are driven by beta and as a result this is approximately the proportion of returns that could be indexed in a world where exposures are completely unbundled.

Returns are likely to be low and volatility high = favour active exposures

In a world of structurally lower growth, index returns are likely to be subpar (estimate 3.1% real) and volatility higher over the next 10 years. In this environment, the dispersion of returns is likely to be high and as such we favour active exposures (both factors and fundamental) over passive exposures.

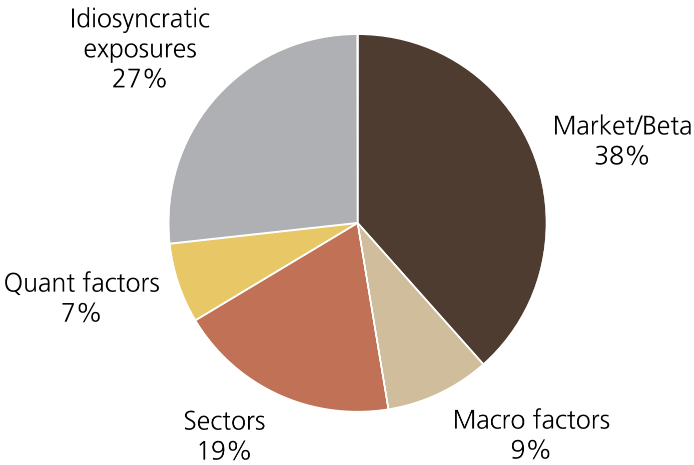
How do we integrate humans and machines?

This depends largely on the investment horizon. Managers should focus on factors that have the greatest efficacy on their stated investment horizon. In other words, managers with a twelve month horizon should focus on quality and value. Momentum is a useful factor to be aware of on a long horizon, but it's not useful to load on given its short horizon.

Where to focus your attention?

Where's the alpha? Relative to its size, Asian emerging markets are a particularly attractive market followed by Latin America and European emerging markets. Across the developed markets, Australia is the most attractive, followed by the US, Europe and Japan.

Figure 1: Return decomposition for MSCI World



Source: FactSet, UBS Quant. Chart shows proportion of matched PCA factor returns described by each factor group.

Contents

Executive summary

In this note, we extend our research from our previous notes on Active vs Passive part 1 and part 2, and seek to answer:

(1) What drives returns across the market? And what proportion of the market could be passive?

(2) What do we expect from passive and active exposures over 10 years?

(3) How can we best generate these active returns? Humans vs machines

(4) How do we integrate humans and machines?

(5) Which markets are the most fertile markets for harvesting excess returns?

Over the past 20 years, we have witnessed the rise of index investing, quant funds, specialist funds (both sector and country), and hedge funds. At the same time, diversified mutual funds have come under significant pressure. Whilst the shift has been branded 'Active to Passive' this has only been true for retail investors (who make up around one third of the assets). From an institutional perspective (the other two thirds), the shift in demand represents an unbundling of exposures, with asset owners preferring to allocate capital to specialist managers offering either beta (index funds), factor (quant funds) or idiosyncratic exposures (hedge funds) in an effort to improve their ability to measure performance as well as reduce overall costs. The other categories that have grown significantly are sector and country specialist managers that tend to run concentrated portfolios offering specific exposures that generate alpha.

The market exposure represents around 38% of stock variance

Overall, we find that beta or market exposure represents around 38% of stock variance. As a consequence, if the market were to unbundle all exposures, it would be feasible for 38% of the market to be passive. However, for this to occur we'd need to see the complete demise of all mutual funds and a significant increase in the number of quant funds and hedge funds.

We expect subpar returns from passive exposures over the next 10 years . We expect active exposures to outperform

We expect subpar returns from passive exposures over the next 10 years, driven largely by weak demographics and an already high equity market multiple. We also expect above average volatility. As a consequence, we expect active exposures to outperform.

Combining machines and humans is the art of combining systematic factors with idiosyncratic exposures

Harvesting these excess returns can be done systematically, fundamentally or through a combination of both: the integration of humans and machines. Ultimately, combining machines and humans is the art of combining systematic factors with idiosyncratic exposures. There are a number of ways to do this. In this note, we present a simple approach of identifying the relevant factor exposures by sector and then overlaying these exposures with our analysts' views of stock specific risk. The next step will be to enhance analysts' views of idiosyncratic exposures through better information analytics.

Emerging markets have been the most attractive markets for active exposures, in particular Asia Pacific. The most attractive developed market has been Australia.

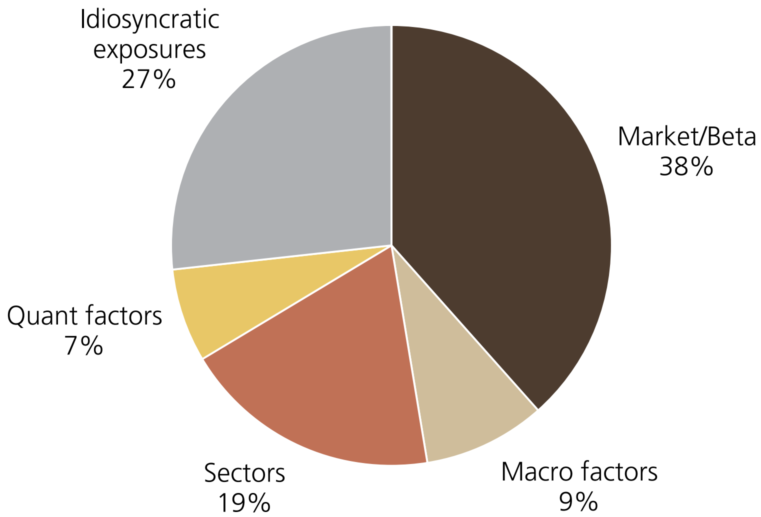
Finally, we present the markets that have historically been the most fruitful for active exposures. Overall, the emerging markets have been the most attractive markets for active exposures, in particular Asia Pacific. The most attractive developed market has been Australia. The United States, Europe and Japan are all reasonable when it comes to active exposures, so allocations to these markets should be done with reference to expectations of returns to beta as they are all likely to offer similar active excess returns.

What drives returns across the market?

Returns across the market can be decomposed into: beta, macro factors, sectors, quantitative factors and idiosyncratic exposures. (See appendix for detail on how we describe returns across the market). Below we show the proportion of stock price variance associated with each factor grouping.

Returns across the market can be decomposed into: beta, macro factors, sectors, quantitative factors and idiosyncratic exposures

Figure 2: Return decomposition for MSCI World



Source: FactSet, UBS Quant. Chart shows proportion of matched PCA factor returns described by each factor group.

On average over time, around 38% of returns are described by the market (beta), and around 27% by idiosyncratic exposures. The middle third is described by macro factors, sectors and quantitative factors. However, it should be noted that there is significant overlap in these three descriptors. If we leave any one of them out, the exposure becomes described by one of the other drivers of returns. For example, if we left macro factors out, the returns driven by the oil price would likely be subsumed by the energy sector. Similarly, if we left sectors out, returns driven by cyclical sectors would likely be subsumed by the beta and value factors.

38% of returns are described by the market (beta), and around 27% by idiosyncratic exposures. The middle third is described by macro factors, sectors and quantitative factors

What is important in this discussion is that overall, around 38% of the market is driven by beta, around one third by factors that can be easily defined, and around 27% remains idiosyncratic. As we get better at defining factors, we find that we can explain a greater proportion of returns as factor exposures, and as a consequence, less is described as idiosyncratic.

So, what proportion of the market can be passive? At the extreme, in a world where all investors unbundle their exposures, it is conceivable that around 38% of the market could be passive. However, this would entail significant growth in hedge funds and quant funds and the complete demise of the diversified mutual fund model.

So, what proportion of the market can be passive?

Does passive investing decrease market efficiency?

Whilst we have observed some pricing inefficiency in the market as a consequence of the rise of index funds ('Passive opportunities for active managers' Holcroft et al); overall we do not consider the overall market efficiency to have declined (although, this is only an observation, and not something we can prove empirically). Rather, we see the unbundling of exposures as an opportunity for active managers to further generate alpha through liquidity provisioning.

There remains significant debate as to whether or not the increase in passive investing decreases market efficiency. This debate is challenging to resolve as it remains difficult to prove one way or another. All we can observe at this point is that the shift in market participants (the rise of high frequency traders, quant funds, hedge funds and index investing) seems to have fragmented the available excess returns into different horizons. So whilst diversified mutual fund managers used to be entirely responsible for the overall efficiency of pricing assets in the market on all horizons, this responsibility is now shared with new market participants, all operating on differing horizons: high frequency traders (intraday), quant funds (short horizon, generally one month), and hedge funds (also short horizon, generally around three months), and of course diversified mutual funds and other fundamental investors (long horizon, on average one year).

As a consequence, it's more instructive to contemplate how the evolution of active and passive managers has impacted the market. Overall, we find that stocks that are heavily held by passive investors:

a. tend to underperform their region/sector benchmarks (stocks that are over-owned by active investors tend to outperform)

b. tend to underperform their region/sector factor exposures (stocks that are over-owned by active investors tend to outperform)

c. display delayed responses to earnings surprises

See 'Passive opportunities for active managers' Holcroft et al, for more information.

Whilst on the surface, this would suggest a decline in market efficiency, we would argue the opposite. The mispricing observed by the unbundling of active and passive exposures allows active managers the opportunity to outperform through liquidity provisioning.

Overall, it is difficult to draw any conclusions, and clearly more research is necessary. However, from what we can observe so far there doesn't appear to be any significant decline in market efficiency and we have introduced greater choice to the market in terms of investable products.

What do we expect from passive vs active exposures?

Long term real returns are around 7.7% whilst returns from 1980 to 2007 averaged 9.3%

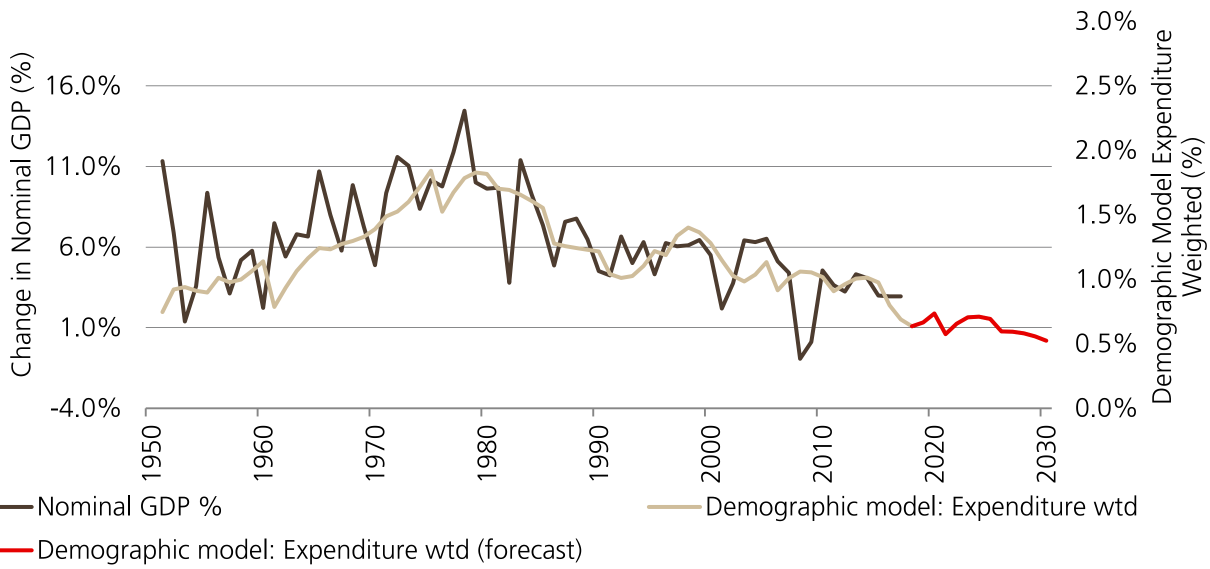
Assessing long term equity market returns in the United States highlights that long term (1871 to 2017) real returns were 7.7%. However, from 1980 through to 2007 returns averaged 9.3%, 169 bps above average. These above average returns likely occurred as a consequence of:

1. positive demographics as baby boomers reached their peak earning potential in the early eighties and pushed underlying earnings growth higher,
2. productivity enhancements from technological innovations,
3. declining interest rates as baby boomers evolved from being net demanders to net suppliers of capital to the system,
4. strong corporate profit growth as a consequence of increased revenue from external markets and the opening up of trade, and
5. declining corporate tax rates

Most of these tail-winds are now behind us

Most of these tail-winds are now behind us. Baby boomers are retiring pushing us into a world of structurally lower growth. Interest rates can fall further, but the benefit from declining rates will not be as significant as it has been in the past. Globalisation has occurred and is unlikely to yield much more. As a consequence, we expect growth over the next 10 years to be below the long term average.

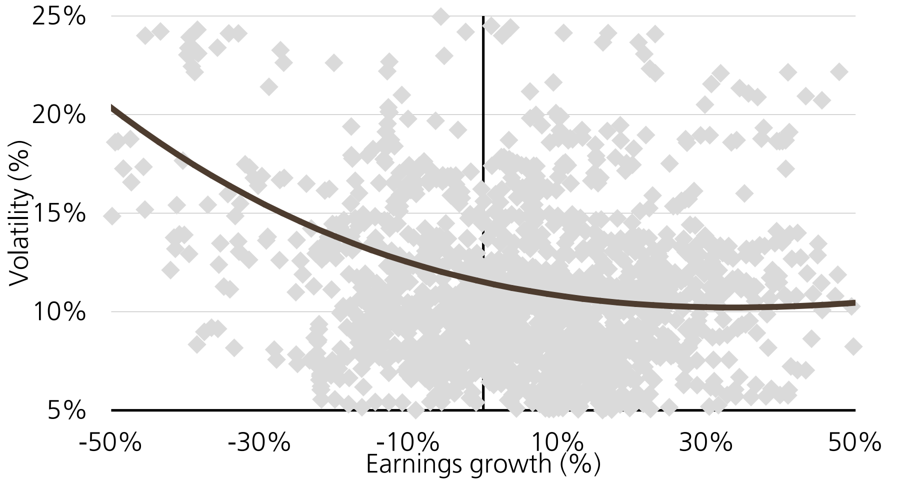
Figure 3: Demographic model (expenditure weighted) and US nominal GDP



Source: Haver, FactSet, UBS Quant, US data

At the same time, a world of structurally lower growth suggests a world of structurally higher volatility. Below we look at the relationship between earnings growth rates and associated volatility. Broadly speaking, when growth rates slow down, uncertainty increases and as a consequence, price discovery, or volatility, increases.

Figure 4: Earnings growth and volatility



Source: FactSet, UBS Quant, US data

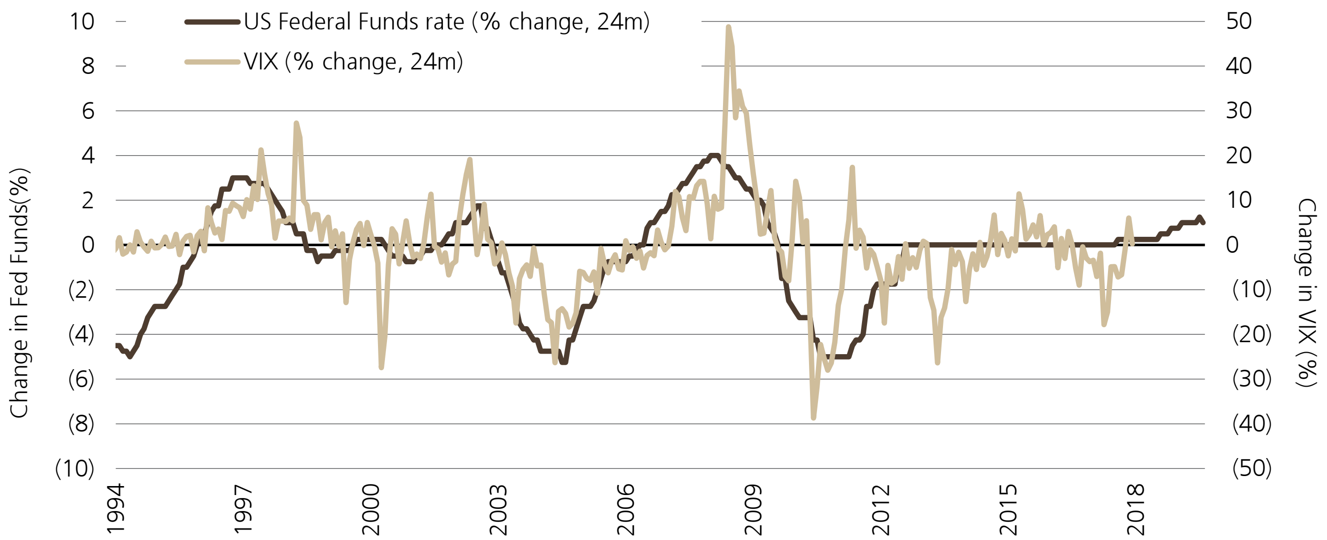
We haven't seen much from volatility so far this cycle as the cycle has been underwritten by unprecedented monetary policy. However, as we noted in our research (['What to expect from volatility' Winter et al]()) there tends to be a two year lag between changes in the Fed Funds rate and volatility.

The cyclical component to volatility is likely to increase in 2018

The cyclical component to volatility is likely to increase in 2018 primarily as a result of the Federal Reserve tightening cycle constraining corporate margins of highly geared firms. Given that the average firm finances on a four year horizon it stands to reason that the cost of funding would affect the index on a two year horizon. So by extension, the Fed both reacts to and causes the cycle.

As a consequence, when we lag the Fed Funds rate with the VIX, we arrive at the conclusion that volatility is likely to increase over the next twelve months as a result of the Fed beginning its tightening cycle in December 2015. Having said that, this particular tightening cycle has been more gradual than previous cycles. As a consequence, it's likely that the tightening affects highly geared firms, and rather than ending the cycle is likely to simply drive dispersion of returns.

Figure 5: Changes in the Fed Funds rate (lagged 24 months) and changes in the VIX

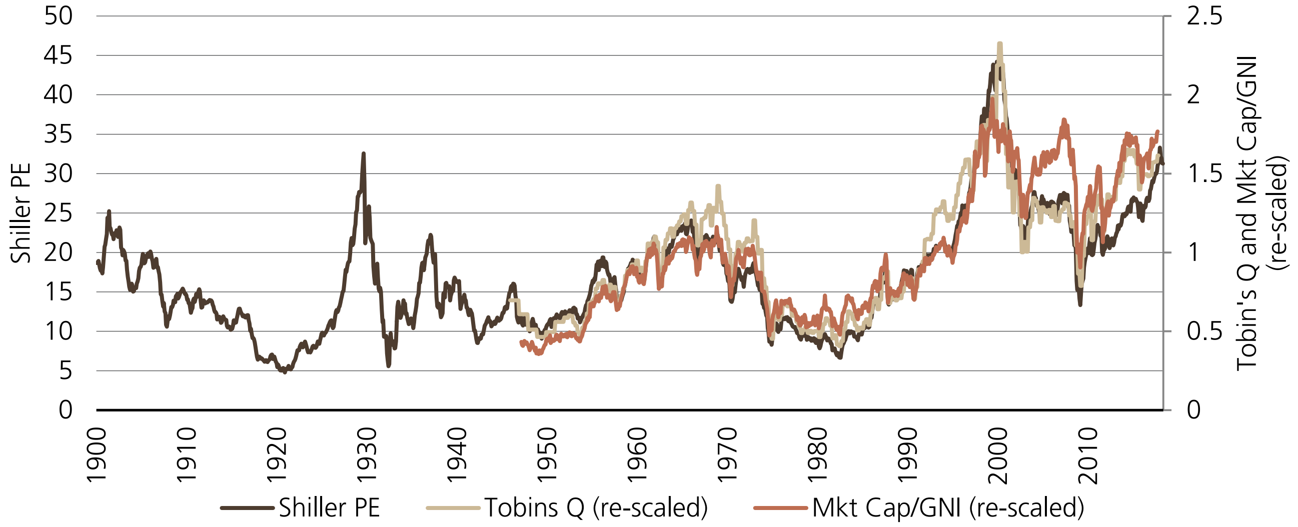


Source: FactSet, UBS Quant

What does this mean for stock market returns?

There are two ways to think about equity market returns: the first is from a bottom-up perspective looking at the underlying economic growth, and the second is from a top-down perspective looking at the multiple that equities currently trade on. Currently economic models are suggesting that growth rates are likely to be subpar, whilst multiple based approaches (which assume long term growth rates are stable) are pointing to the market being expensive and hence suggesting below average returns with increased volatility. Below we review the Shiller CAPE, Tobins' Q and Market Cap to GNI.

Figure 6: Shiller CAPE, Tobins' Q and Market Capitalisation to GNI (United States)



Source: FactSet, Haver, UBS Quant

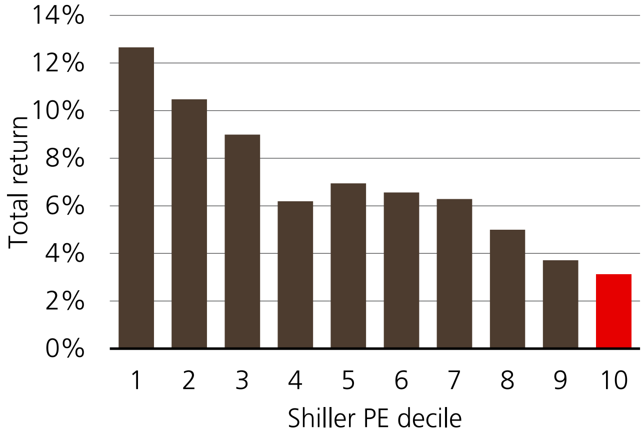
Given that all three models are indicating that the market looks expensive, we use the Shiller CAPE as this model has the longest history. Historically, when the market has traded on a multiple of 31x (current multiple) returns over the subsequent 10 years have averaged 3.1% with 15% realised volatility.

Figure 7: Returns and volatility conditioned on CAPE decile

Decile	CAPE	10y ave TR (nominal)	10y ave TR (real)	Max	Min	Std Dev	Volatility	IR
1 - cheap	7.5	14.1%	12.7%	19.5%	4.0%	3.3%	16.7%	0.76
2	10.2	13.9%	10.5%	17.9%	1.4%	3.5%	14.0%	0.75
3	11.9	12.5%	9.0%	15.3%	-2.2%	4.6%	13.0%	0.69
4	13.7	9.6%	6.2%	14.6%	-3.9%	5.3%	12.4%	0.50
5	15.4	8.6%	6.9%	15.5%	-4.0%	4.3%	12.3%	0.56
6	16.9	9.1%	6.6%	15.0%	-3.1%	4.0%	12.3%	0.54
7	18.4	8.4%	6.3%	14.5%	-2.8%	3.6%	12.6%	0.50
8	20.5	7.9%	5.0%	11.0%	-2.8%	3.4%	13.7%	0.37
9	23.2	6.5%	3.7%	8.9%	-3.2%	3.6%	14.6%	0.25
10 - expensive	31.6	5.1%	3.1%	7.3%	-5.1%	3.4%	15.3%	0.20

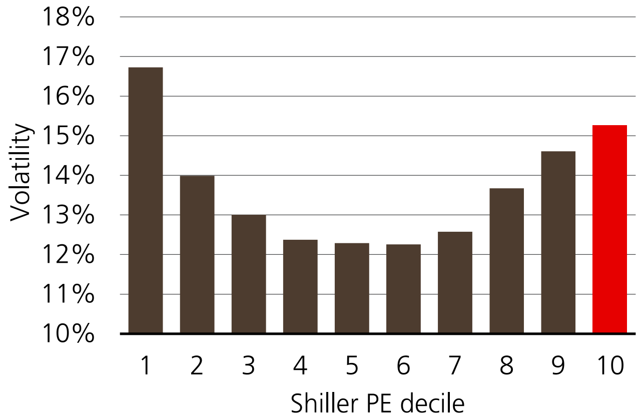
Source: FactSet, UBS Quant

Figure 8: CAPE and subsequent 10 year returns



Source: FactSet, UBS Quant, US data

Figure 9: CAPE and subsequent 10 year volatility



Source: FactSet, UBS Quant, US data

Bear case, bull case and likely case?

Bear case:

The weakness of this approach is that it doesn't consider the underlying growth rate which our previous analysis suggests is likely to be tepid. In this environment, the already high multiples may be exacerbated by structurally lower aggregate earnings growth and the suggested returns of 3.1% per annum may well be significantly lower.

Bull case:

Technological disruption may drive significant productivity enhancements which are currently not being captured by traditional economic variables such as GDP. As a consequence, earnings from technology companies, especially those relating to consumer technology, and companies that are deploying technology in an effort to disrupt their competition, are likely to be significantly higher. As a consequence, we may be underestimating market earnings and may be into a world of unanticipated higher earnings growth. This of course is likely to be associated with significantly higher dispersion of returns as companies deploying technological solutions outperform their traditional competitors.

The likely case:

As long as 10 year earnings growth rates are similar to those experienced over the past 100 years, the best predictor of returns on a 10 year view is likely to be the starting multiple rather than the underlying growth rate. However, in a world experiencing a 'technology revolution' in line with the disruption of the Industrial Revolution, we may experience significantly higher returns to the market.

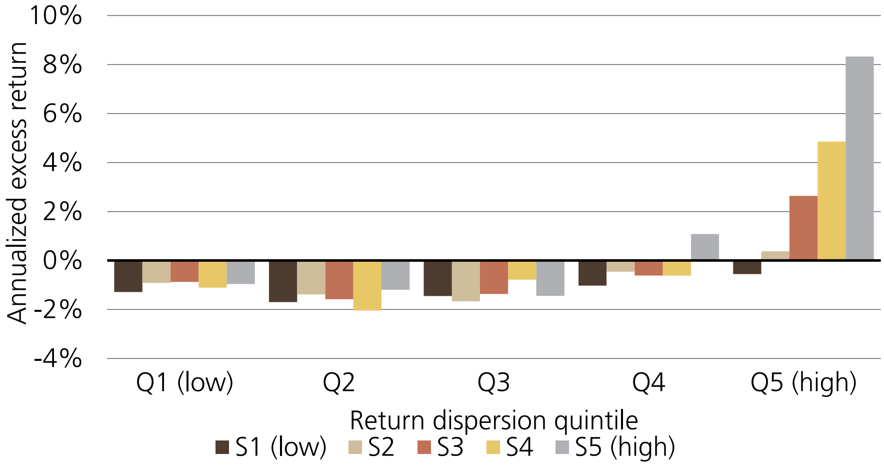
One conclusion we can be fairly certain of: in both the bull case and the bear case, we are likely to experience significantly higher dispersion of returns. In the bear case this is likely to be driven by volatility. In the bull case, this is likely to be driven by technological disruption.

Invest in active exposures

Active managers perform well during periods of high dispersion

In a world of greater dispersion of returns, active exposures are likely to outperform. In a study of active manager returns in the United States from 1972 to 2015, Dr Anna von Reibnitz found that active managers perform well during periods of high dispersion, however, they struggled to outperform when dispersion of returns was low. Below we show the performance of active manager returns split by how 'active' the managers were (using an R2 approach) conditioned on return dispersion.

Figure 10: Performance of active managers (ex-fees) with respect to dispersion



Source: von Reibnitz, Anna Helen, When Opportunity Knocks: Cross-Sectional Return Dispersion and Active Fund Performance (September 14, 2015), US mutual fund data

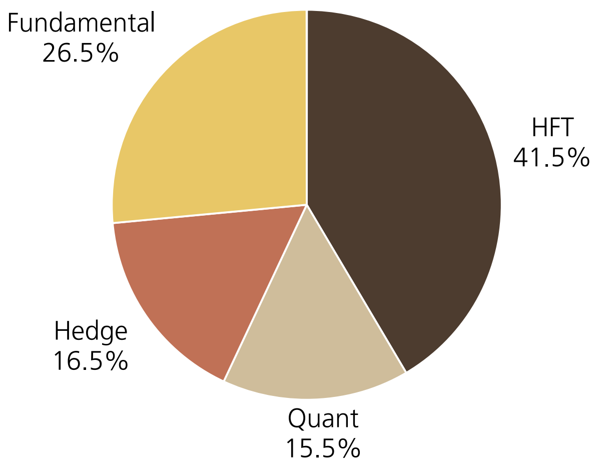
In this environment of increase dispersion of returns the opportunity set for active strategies increases, as a result we suggest loading on active exposures as these will provide exposure to beta as well as technological disruption. Exposure to technological disruption can be achieved through both factor exposures as well as idiosyncratic exposures and as such can be delivered by both quant factors and fundamental managers.

How do we best harvest excess returns?

Who (mis)prices assets? Quant v Fundamental

There is a significant amount of discussion occurring as to how assets are being priced and which market participants are pricing or mispricing them. It's always easy to point to mispricing and make the assumption that mispricing is occurring due to market participants whose processes for pricing assets are less well understood. Below we show the share of volume by market participant in the United States. This data is similar across developed markets.

Figure 11: Share of volume by market participant, United States



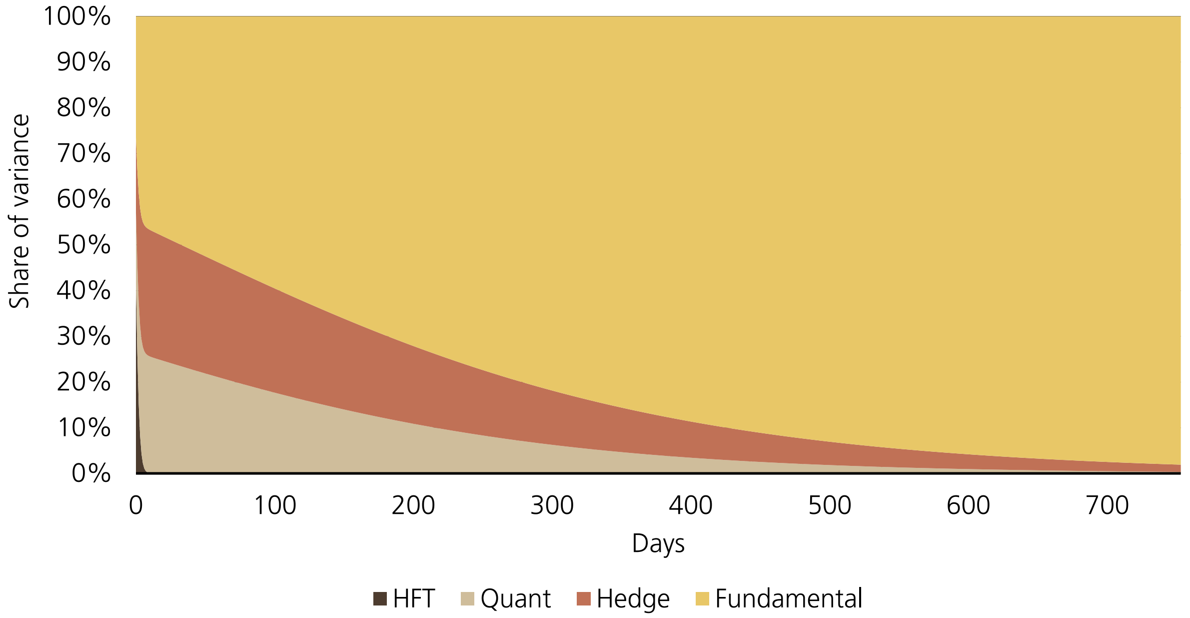
Source: TABB Group estimate

So, who prices assets? Philosophically, we can think about assets as being priced by the participant trading them and the model being used to price them, as well as the level of horizon of the participant, or more specifically, the percentage of volume that the participant trades and the half-life of the participant's positions. So whilst high frequency traders make up around 41.5% of flow, their positions are only live intraday. As a consequence, they have no pricing power beyond one day. Quant funds typically have shorter horizons (holding periods of anywhere from days to months), whilst fundamental investors typically have longer horizons (fundamental hedge funds typically hold positions for months, whilst long-only fundamental investors typically hold positions for around one year.

Below, we use the estimates of trading volume by TABB Group, and adjust them by the estimated half-life of each market participant.

Note: Special thanks to Professor Pete Kyle from the University of Maryland for the advice on market impact of each participant.

Figure 12: Market participants impact on price given horizon (days), United States



Source: TABB Group estimate, Professor Pete Kyle, UBS Quant

High frequency traders are a significant proportion of daily volume (41.5%) but their impact on the market is limited as their horizon is intraday

Whilst high frequency traders are a significant proportion of daily volume (41.5%) their impact on the market is limited as their horizon is intraday. Quant funds on the other hand represent 15% of volume, however, given their relatively short horizon (a few months), their impact on price is relatively short lived. It should be noted that quant funds are only trying to arbitrage behavioural mispricing effects exhibited through factors. They are not trying to price the idiosyncratic exposures of a company. Worded another way, quant funds are trying to be broadly right across many small bets. They're not trying to be exactly right on any specific stock.

On a three year horizon, 98% of a company's price is being driven by fundamental investors

Realistically, on a three year horizon, 98% of a company's price is being driven by fundamental investors (both retail and institutional) who are pricing a company not simply on its underlying factors, but taking into account the company's idiosyncratic exposures as well.

On a three year horizon, hedge funds account for around 1.58% of the estimated price impact, quant funds around 0.38% and HFTs 0%.

What works on different horizons?

Generally, funds that trade 'big data' and newsflow have fairly short horizons, mostly intraday and out to one month. Once we move beyond the one month horizon we enter the domain of traditional quant funds that load on factors. Factors fall broadly into four main groups: quality, value, momentum and size. Within each of these groups, there are numerous sub-groups with the academic literature being littered with claims of hundreds of factors.

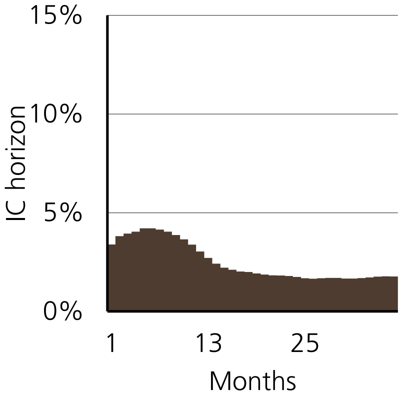
Momentum is most effective over a period of up to five months

Value, on the other hand, has a much longer horizon

Quality has a lower information coefficient than Value, it is highly persistent

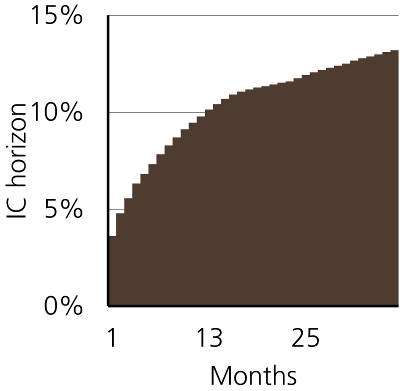
Importantly, each factor has its own horizon. So, for example, momentum is most effective over a period of up to five months. Once we go beyond this, it loses its efficacy quite quickly. As a result, momentum strategies tend to be associated with high levels of turnover, and are only really utilised by quant funds. However, it is still a useful factor for fundamental investors to gauge short term market sentiment on a stock. Value, on the other hand, has a much longer horizon with the information coefficient rising persistently out to around twelve months and whilst slowing down, it tends to increase out to the three-year mark. Whilst Quality has a lower information coefficient than Value, it is highly persistent and demonstrates a rising information coefficient out to three years. Note: we don't consider small caps as a factor in this study. Whilst the efficacy of factors increases as size declines, we don't believe that there is a generic small cap factor that we can load on - please see our research "Understanding size investing" Winter et al

Figure 13: Momentum IC horizon



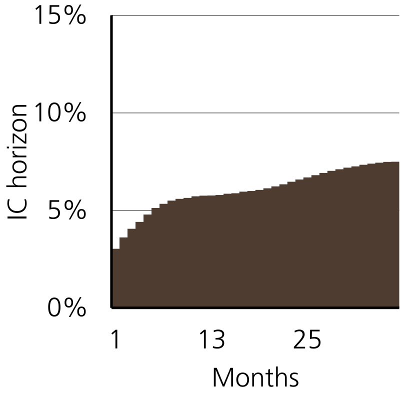
Source: FactSet, UBS Quant

Figure 14: Value IC horizon



Source: FactSet, UBS Quant

Figure 15: Quality IC horizon



Source: FactSet, UBS Quant

Factors used: Momentum is 12m minus 1m, value is forward earnings yield, and quality is our definition of absolute quality.

Understanding these factor horizons is important as it helps us understand what different market participants are using to price assets. In the short term, it's mostly momentum. However, in the longer term, today's momentum is largely irrelevant as assets are priced predominantly by quality and value. And of course, the longer the horizon, the more idiosyncratic exposures matter.

How do we integrate humans and machines?

Machines have an advantage in processing power and speed

Humans have an advantage is in accuracy and in understanding idiosyncratic exposures.

Given that machines have an advantage in processing power and speed, there's little point in humans attempting to trade on a short horizon. However, where humans have an advantage is in accuracy and in understanding idiosyncratic exposures.

As a consequence, when we start to think about how we blend humans and machines, or more specifically, fundamental and quant processes, what we are really doing is trying to merge factor and idiosyncratic exposures. To do this, we need to be aware of which factors we want to utilise, and this will be determined by our investment horizon. Given that most fundamental investors exhibit around 50% turnover per annum, we will focus on a one year horizon.

How do we plan to build our quantamental process?

We are launching a series of Quantitative Industry Primers that will highlight:

1) Industry primer: fundamental overview of the sector
2) Macro factors: which macro factors matter
3) Systematic factors:
   a) which systematic factors are used by quants on a short horizon
   b) which systematic factors have efficacy on a long horizon (typically quality and value factors)
4) Quantamental: sector specific quality and value framework
5) Analyst view: applying the analysts' view of idiosyncratic exposures.

Over the coming months we will aim to represent each sector with a Quantitative Industry Primer.

The final frontier

Once we get to the point where we are better at defining factor exposures and using our analysts to identify the idiosyncratic exposures relating to the company or sector, the final frontier is to use advanced information analytics to enhance analyst decision making in an effort to turn stock specific exposures into alpha in portfolios. This is the realm of our UBS Evidence Lab team who focus on developing data driven solutions to augment analyst decision making.

Which markets are the most fertile for harvesting excess returns?

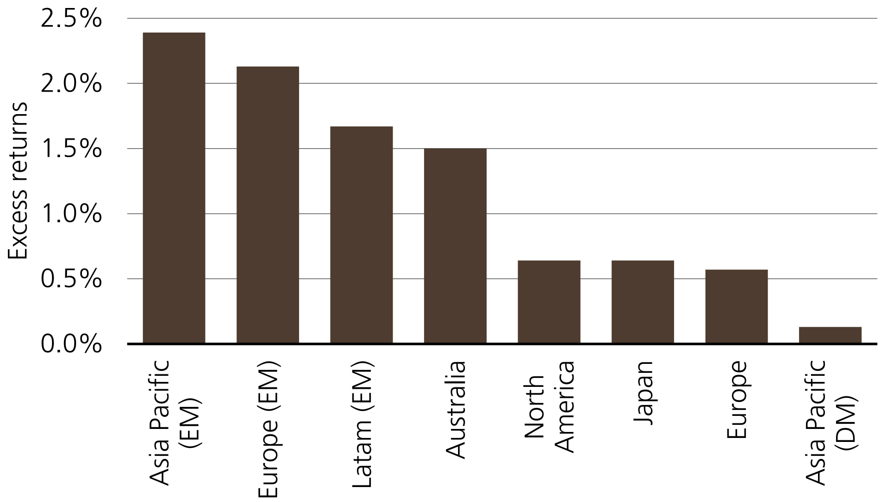
So, whilst the portfolio manager of the future will depend on the successful integration of quant and fundamental analytics, one more question remains: where to focus your attention?

Asia Pacific emerging markets are the most lucrative market for active managers

Of the developed markets, Australia is the most attractive

Here we present the excess returns to active strategies globally. Overall, we find the Asia Pacific emerging markets are the most lucrative market for active managers followed by European and Latin American emerging markets. Of the developed markets, we find Australia is the most attractive whilst North America, Japan and Europe are all reasonably similar.

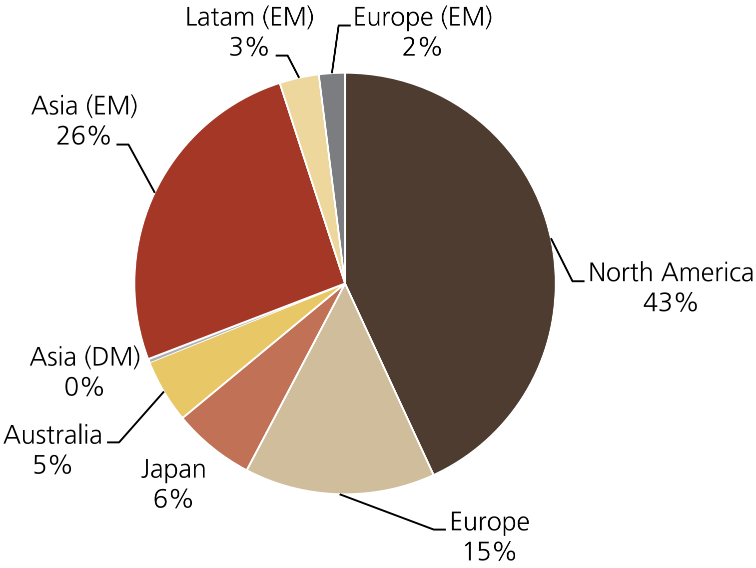
Figure 16: Excess returns to active strategies by region



Source: Gallagher et al "Global Equity Fund Performance: An Attribution Approach"

One question that we field from time to time is 'Which markets are the most fertile for harvesting excess returns?' We approach this by assessing the ability of active managers to generate excess returns relative to the size of the market using market capitalisation (we could also use liquidity). Using this approach, we arrive at the below. Overall, we think Asia is a particularly interesting market and with the increasing importance of China and its inclusion in the MSCI indices, the opportunity to generate excess returns in Asia Pacific is large and growing. Within the developed markets, Australia looks the most interesting.

Figure 17: Active opportunities by region (share of $ value)



Source: Gallagher et al "Global Equity Fund Performance: An Attribution Approach", UBS Quant

Appendix

Calculating the proportion of returns driven by beta, macro factors, sectors, quant factors and idiosyncratic exposures:

Each month (for each of the regions we have looked at) we built a region risk model. We took a long-term view, using 5 years of monthly data and included a static set of macro factors which have explained some amount of variance over time (we didn't change the macro factors or attempt to fit them) as well as generic top-level sector and quant factors. From this risk-model we created an orthogonalised time series of returns (macro factors adjusted for market returns, sectors adjusted for macro factors etc.).

Separately, over the same 5 year windows, we fitted a PCA (Principal Component Analysis) model to the monthly returns of stocks in the index over that window and collected the time series of the statistical factors. We then iterated through the statistical factors and for each we selected (without resampling) the risk model time series that had the highest rank correlation of returns with the statistical factor. We used a rank correlation cut-off of 0.2 to prevent spurious correlations. This generally left us with 10-15 factors that we had "identified". We then grouped these factors into either "Market" (the first statistical factor), and those related to macro, sector and quant factors, with the remaining unused statistical factors being noise / idiosyncratic factors, and summed the proportion of variance explained by each group. Clearly the statistical factors are only some proxy for the risk model factors (e.g. a statistical factor could be Long IT and Short Energy) and as the correlation decreases we are less confident about the relationship, however the results are intuitive (in terms of the proportion of variance explained by 'the market', known factors and unknown factors) and raising the correlation cut-off did not change the results at a high level.

It is based (loosely) on an idea from Marco Avellanda at NYU (https://www.math.nyu.edu/faculty/avellane/Lecture2Risk2011.pdf).

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Source: UBS. Rating allocations are as of 31 March 2018.
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