Q-Series

Why is increasing volatility likely to benefit active managers in 2018?

Equities

Global
Quantitative

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Low volatility will not remain low for much longer

Index level volatility is low for two reasons: firstly, the weight of low volatility stocks in the index has increased, and secondly, correlations have fallen. Stock level volatility, however, has different components: a structural one that is driving volatility lower (this trend remains intact), and a cyclical one (driven by the Fed tightening) that is likely to drive volatility and hence dispersion of returns higher in 2018.

Higher volatility and dispersion is good news for active managers

Active managers outperform when return dispersion is high. We believe the outlook for active management is positive as return dispersion is likely to increase, and correlations are at all-time lows. Providing we don't have any major macro-economic shock (that is likely to drive correlation higher) active managers are likely to perform well in 2018.

Quality is still King and Queen

A recent study by Russ Wermers points out that analysts add 2% per annum through correctly forecasting cashflows, and then subtract 0.8% per annum through incorrect discount rate assumptions. Quant models can overcome this challenge by using analysts' cashflow forecasts and using financial statement quality metrics to select high quality companies with high cashflow yields. Implicitly, the correct discount rate is captured in the financial statement quality score. We take this one step further and look for companies with improving fundamentals, as this forecasts improvement in the cost of capital. Our analysis show that markets are already pricing a premium for high quality companies, however the high delta quality subgroup (i.e., companies with strong growth in quality factors) is not an expensive cluster right now. The combination of a potential positive dispersion outlook for active managers and the fact high delta quality cluster could be the first to be acted upon, can create an interesting trade window for investors seeking alpha in the medium term.

We list high delta quality businesses with improving fundamentals

Focusing on high quality businesses with improving fundamentals provides us with a low risk approach as if we're wrong and volatility and dispersion remains low, these stocks are likely to outperform slightly. If volatility and dispersion increase, these stocks are likely to outperform significantly. Right now our screen is highlighting: NetApp, Bristol-Myers Squibb, Costco, Lowe's, Berkeley Group, Aena, Covestro, Telenor, United Arrows, ANTA Sports, Haier Electronics, Tsingtao Brewery, CSPC Pharmaceutical, Harvey Norman, Rio Tinto. See page 22 for a full list of stocks.

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Executive summary

Volatility is close to its all-time lows despite structurally lower growth and unprecedented monetary policy. What is causing this low volatility regime? When is this likely to change? How will this affect active managers? How should we position portfolios?

Volatility is close to its all-time lows driven by a larger weighting of low volatility stocks and falling correlation

Firstly, from a portfolio perspective, volatility is a function of the volatility of the stocks as well as the correlation of the stocks. Over the past 20 years the weight of low volatility stocks in the index has doubled (from around 30% in the late 1990s to 65% today), driven by demographics, low interest rates and the rise of indexing. As a consequence of low volatility stocks making up a greater weight in the index, index volatility is lower. When we look at correlation, it increased dramatically through the Global Financial Crisis (2007-06 to 2009-03) and has subsequently reduced. However, correlation has fallen significantly over the past 12 months. This has further reduced index volatility to the point where index volatility is now close to all-time lows.

So when is volatility, and hence the dispersion of returns, likely to increase? The long-term structural drivers of low volatility seem here to stay. However, in the short term stock market volatility is a function of certainty. In the stock market, this relates to certainty surrounding corporate earnings. So what is likely to drive corporate earnings in 2018? The Federal Reserve tightening cycle is likely to constrain corporate margins of highly geared firms, whilst demographics, corporate vs consumer spending, margins, tax cuts, and technological disruption are all likely to drive dispersion of returns in 2018.

The Federal Reserve tightening cycle, demographics, corporate vs consumer spending, margins, tax cuts, and technological disruption are all likely to drive dispersion of returns in 2018

This is good news for active managers. As we've shown previously, active managers need opportunities to outperform. We can measure the opportunity set for active managers by assessing both dispersion and correlation. In a world where correlation remains at reasonable levels whilst dispersion increases, active managers should outperform.

This is good news for active managers. Active managers perform well when the dispersion of returns increases.

Where's the opportunity? From a Quant perspective we prefer high quality companies with improving fundamentals. Why the focus on quality? Quite simply, analysts tend to correctly forecast cashflows, and add around 2% per annum through their efforts, and then subtract 0.8% per annum through their incorrect discount rate assumptions. Quants overcome this problem by looking for the intersection of quality and value, ie using a financial statement quality score to imply a discount rate. Importantly, our Delta Quality score predicts future changes in a company's WACC. As a result, buying high quality companies with improving fundamentals generates a significant alpha as the discount rates improve into the future. Right now our screen is highlighting:

We prefer high quality companies with improving fundamentals.

Our Delta Quality score predicts future changes in a company's WACC. As a result, buying companies that are generating solid cashflows with improving fundamentals generates a significant alpha.

United States: NetApp, Bristol-Myers Squibb, Costco, Lowe's.

Europe: Berkeley Group, Aena, Covestro, Telenor

Japan: United Arrows

Asia: ANTA Sports, Haier Electronics, Tsingtao Brewery, CSPC Pharmaceutical

Australia: Harvey Norman, Rio Tinto

Please see page 22 for a full list of names.

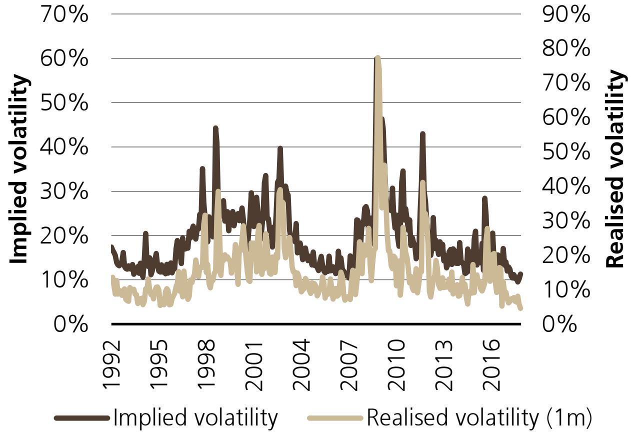
Why is volatility so low?

There are a few parts to this story: Firstly, we need to understand the relationship between implied and realised volatility; secondly, we need to understand the structural components of realised volatility; and finally we need to explore the potential drivers of demand for volatility.

Implied vs realised: has the relationship changed?

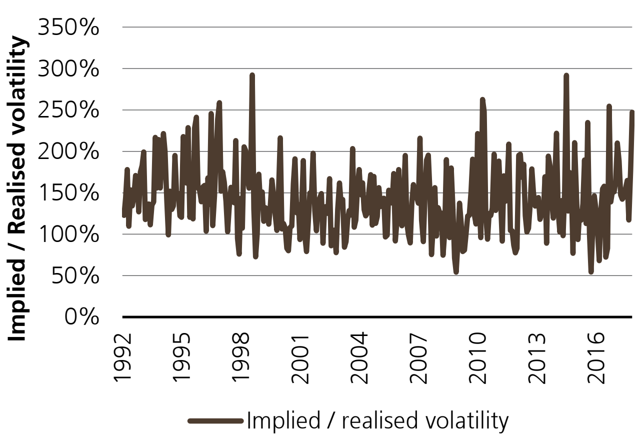
We assess the relationship between implied volatility (VIX) which by definition is an expectation of the future 30-day volatility, against 30-day trailing realised volatility. Overall, we find that the relationship between implied volatility and realised volatility hasn't changed. If anything, implied volatility is high relative to realised volatility right now. As a consequence, we can conclude that implied volatility is low because realised volatility is low.

Figure 1: Implied and realised volatility



Source: Factset, UBS Quant Index: S&P 500

Figure 2: Implied/realised volatility



Source: Factset, UBS Quant Index: S&P 500

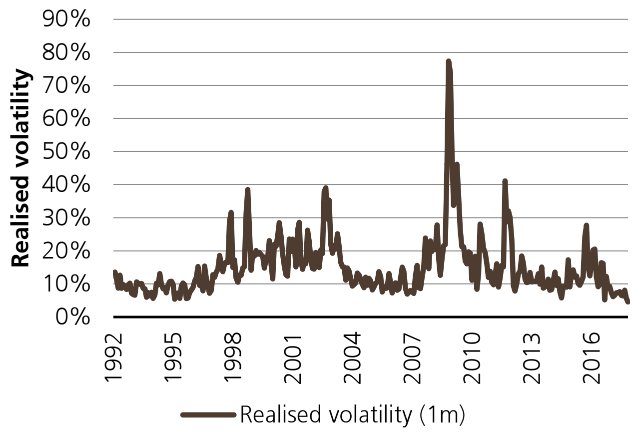
What is driving realised volatility lower?

There are two components to volatility, a structural component that is driving volatility lower (this trend remains intact), and a cyclical component that is likely to drive volatility higher in 2018.

The structural component

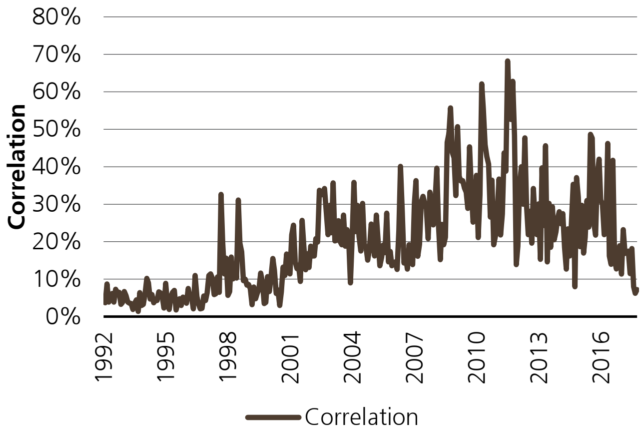
Realised volatility is a function of two inputs, the volatility of the stocks in the index and the correlation of the stocks. Both realised volatility and correlation have fallen significantly in recent years.

Figure 3: Realised volatility (Trailing 1m index volatility)



Source: UBS Quant Index: MSCI World

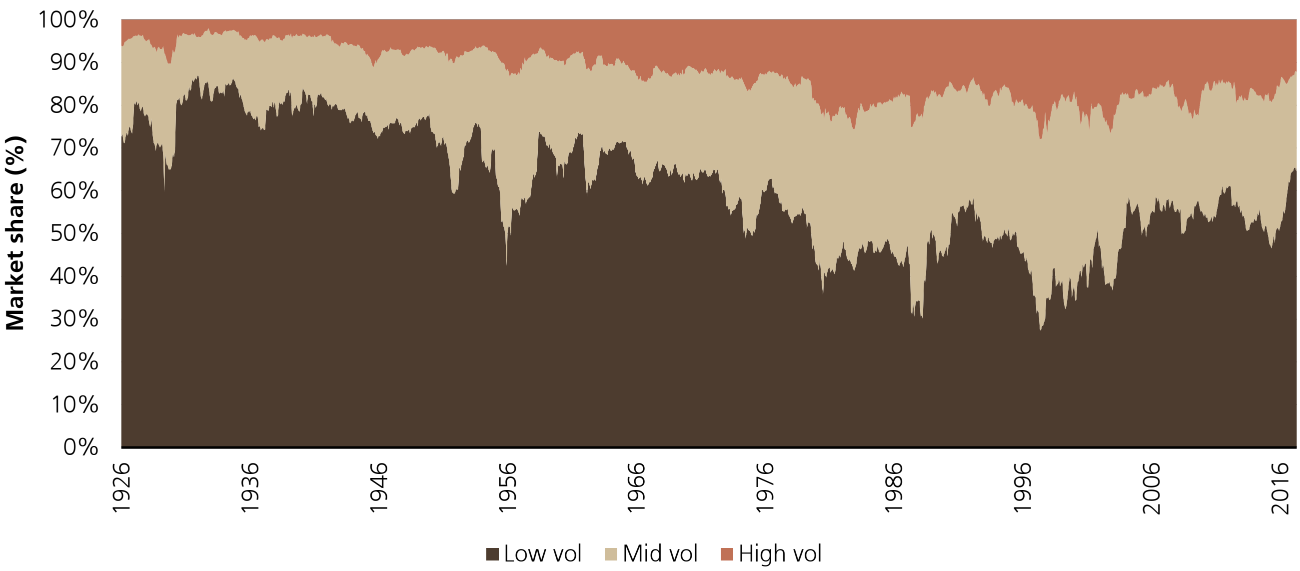
Figure 4: Realised pairwise correlation



Source: UBS Quant Index: MSCI World Average stock-level pairwise correlation using the last 12 months of weekly returns

So why is index volatility low? Quite simply, the weight of low volatility stocks in the index has increased, and the correlation of these stocks has fallen. In the 1930s low volatility stocks made up around 80% of the market by market capitalisation. By the late 1990s the weight of low volatility stocks had traded down to around 30% of the index. This trend has subsequently reversed and has traded back up to low volatility stocks making up around 65% of the index.

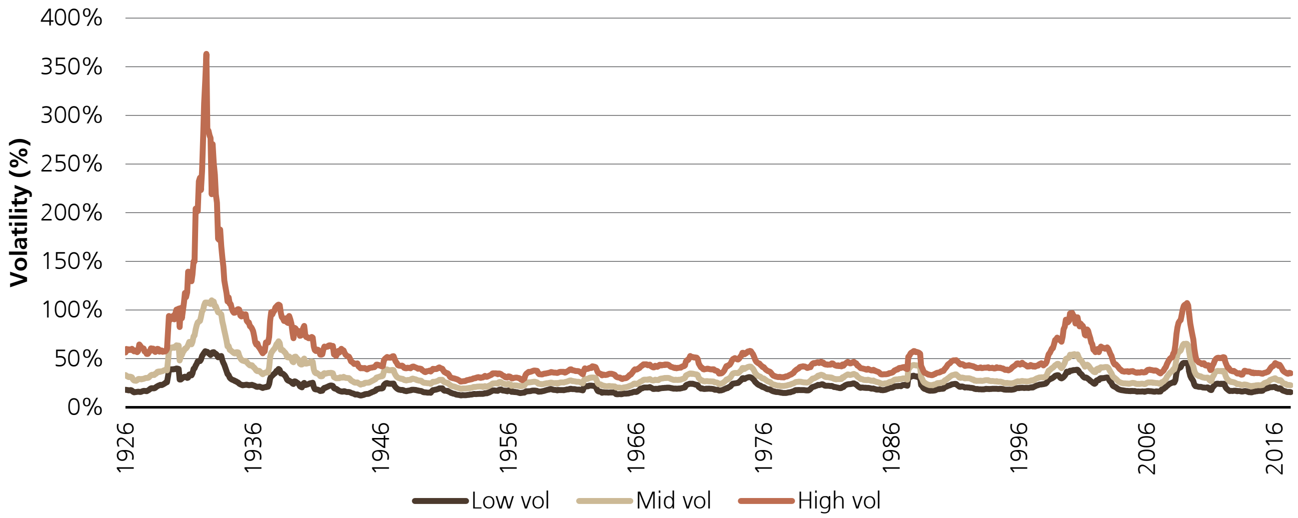
Figure 5: Weight of low, mid and high volatility stocks over time



Source: Compustat, UBS Quant Universe: largest 1000 stocks in the US, ranked by volatility and split into thirds

Importantly, the median volatility of each of the low, mid and high volatility buckets hasn't changed over time. It has certainly been cyclical, however, the aggregate level of volatility of each tercile hasn't changed.

Figure 6: Volatility of low, mid and high volatility stocks over time (median)



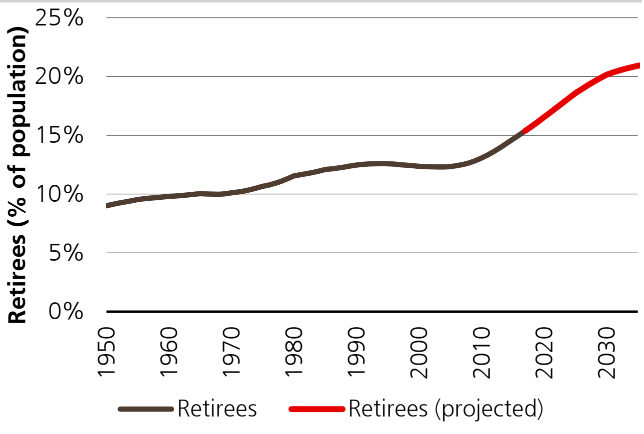
Source: Compustat, UBS Quant   Universe: largest 1000 stocks in the US, ranked by volatility and split into thirds

What's driving the demand for low volatility stocks?

There are a number of potential drivers for the move into low volatility equities that we can identify:

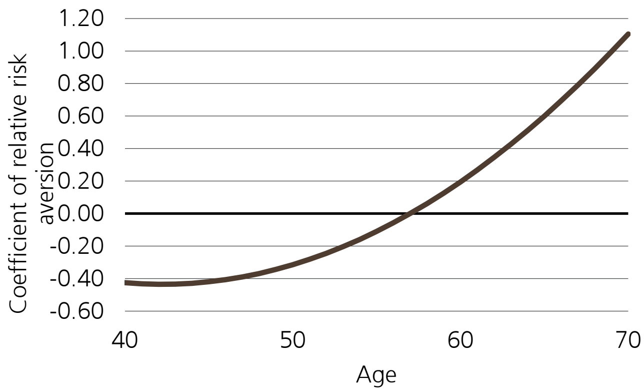
1. **Demographics**: as the population continues to age and baby-boomers migrate into retirement, they become more risk averse (see figures 7 & 8). As a consequence, they tend to invest in low-beta, income-producing equities. Given the magnitude of the baby-boomer cohort and the fact that they began rotating into low-risk, income producing equities around ten years prior to retirement (1998), this could potentially explain the increase in weight of low volatility equities in the index.

Figure 7: Retirees as a proportion of the population (US)



Source: Haver, UBS Quant

Figure 8: Risk aversion by age



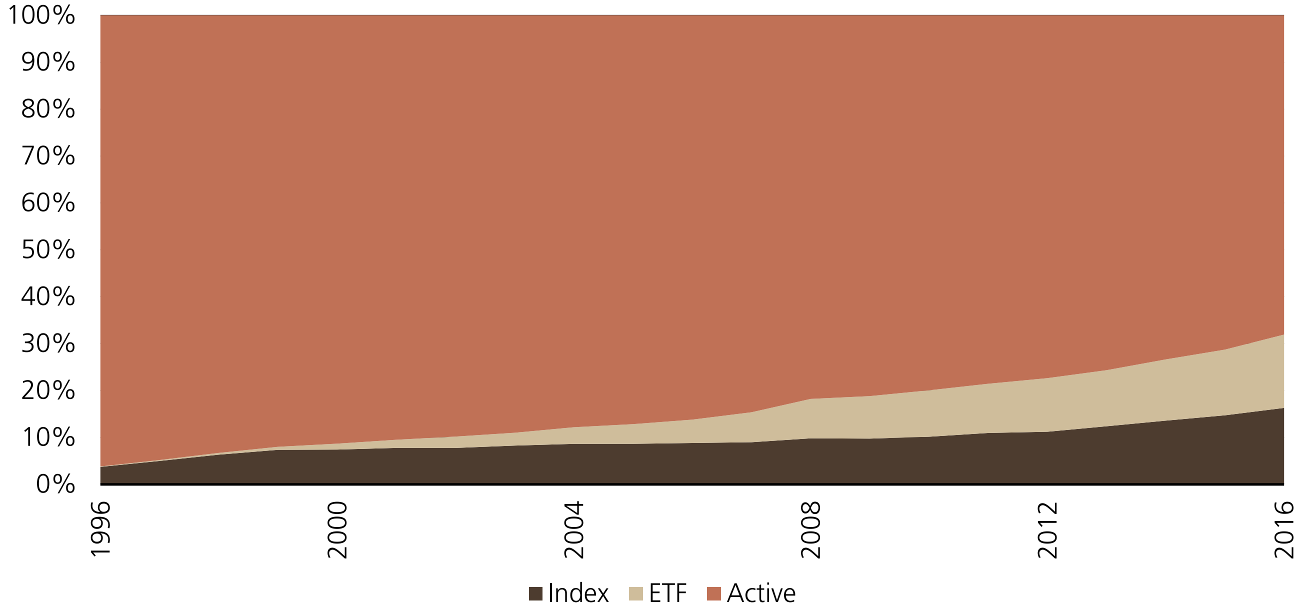
Source: Lin 2009, UBS Quant

2. **Low interest rates**: In a low growth, low interest rate environment we expect both low returns and higher volatility. As a consequence, investors can improve their risk adjusted returns by investing in low volatility stocks. So perhaps the increase in weight in low volatility stocks is simply a rational response to a low growth, low interest rate environment?

We should note that despite economic growth and inflation being structurally challenged, asset price inflation has been robust. We suggest that this could be a result of quantitative easing anchoring bond yields.

3. **Index and low volatility investing**: Index funds and low volatility strategies have grown significantly over the past 20 years. Given that index funds favour large cap stocks that are typically lower volatility and low volatility strategies explicitly target low volatility stocks, it stands to reason that this is likely to be driving the increase in weight of low volatility stocks in the index.

Figure 9: The rise of index investing (global data)



Source: Investment Company Institute, UBS Quant

In summary, whilst we cannot categorically prove which of these drivers are causing the rotation into low volatility equities, we can point to the fact that none of these drivers looks set to reverse any time soon. Developed world populations continue to age and baby-boomers continue to retire demanding low-risk, income-producing equities. We have argued for some time now that low growth and low interest rates are likely to remain for the foreseeable future as baby-boomers exit the workforce, taking with them their labour, capital and productivity. And finally, the growth in index and low volatility investing seems to be intact. There certainly don't seem to be any short term drivers for a reversal in this trend.

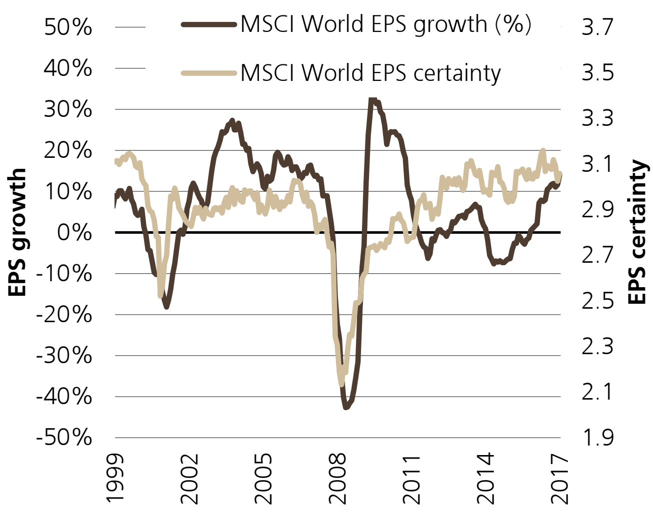
As a consequence, the structural demand for low volatility equities is likely to remain intact.

The cyclical component

The cyclical component to volatility has been well researched and is generally understood to be a function of uncertainty. We've previously covered the relationship between equity market volatility and certainty surrounding GDP and inflation ('The end of low volatility' Jessop et al), as well as the relationship between equity market volatility and equity market earnings growth rates and earnings certainty ('Why does increasing volatility matter?' Winter et al).

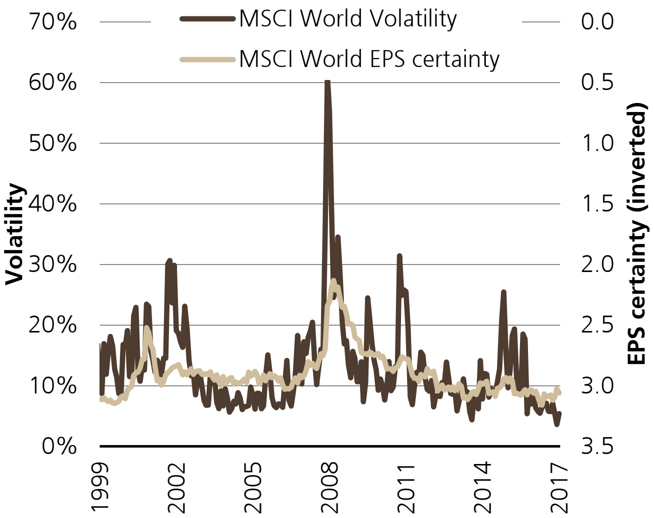
In summary, we believe the cyclical component to volatility is a function of corporate earnings growth and earnings certainty.

Figure 10: Earnings growth and earnings certainty



Source: Factset, UBS Quant

Figure 11: Earnings certainty and volatility



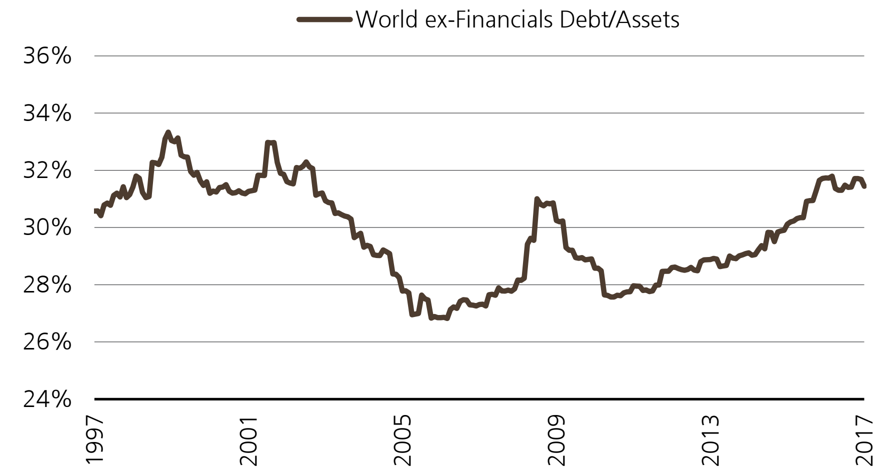
Source: Factset, UBS Quant

Earnings growth:	12m change in the 12m forward earnings estimate
Earnings certainty:	median earnings certainty score across the index constituents.

When is volatility likely to pick up?

The structural component driving the demand for low volatility equities is likely to remain intact for the foreseeable future. However, 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.

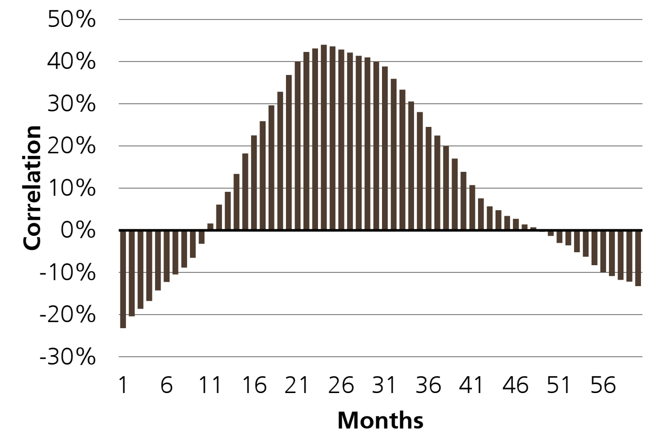
Figure 12: World ex-financials debt / assets



Source: Factset, UBS Quant Universe: MSCI World ex-financials

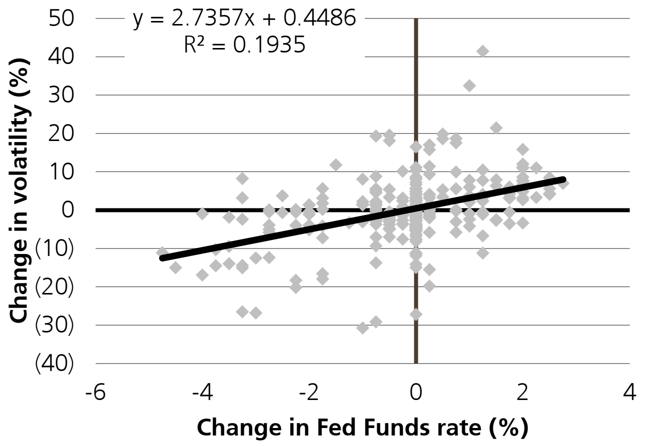
Given that the average firm finances on a three to five year view, it stands to reason that the cost of funding would affect the index on a two year horizon. Below, we find that the lagged correlation peaks at 24 months. So by extension, the Fed both reacts to and causes the cycle.

Figure 13: Lagged correlation of changes in the Fed Funds rate and the VIX (12m changes)



Source: Factset, UBS Quant

Figure 14: Relationship between changes in the Fed Funds rate and the VIX lagged by 24 months

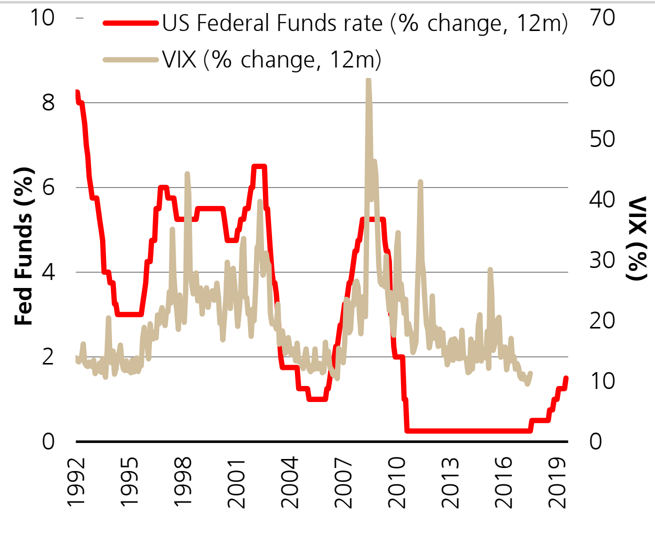


Source: Factset, UBS Quant

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.

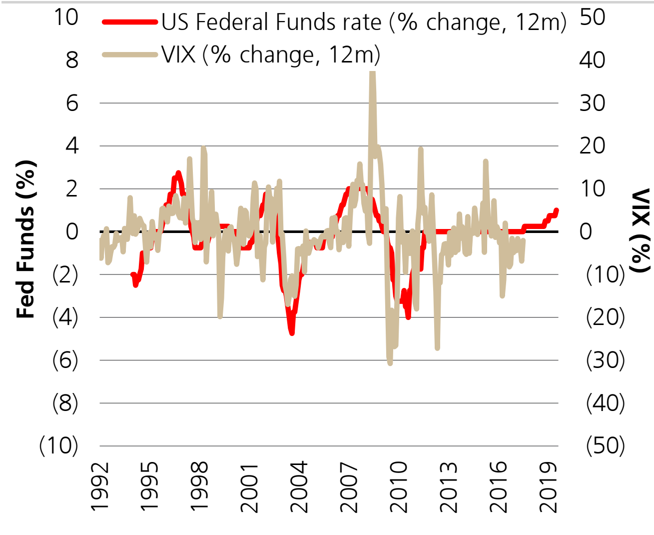
Having said that, this particular tightening cycle has been more gradual than previous cycles. As a consequence, it's likely that the tightening affects highly geared firms, and rather than ending the cycle is likely to simply drive dispersion of returns.

Figure 15: Fed Funds rate and volatility



Source: Factset, UBS Quant

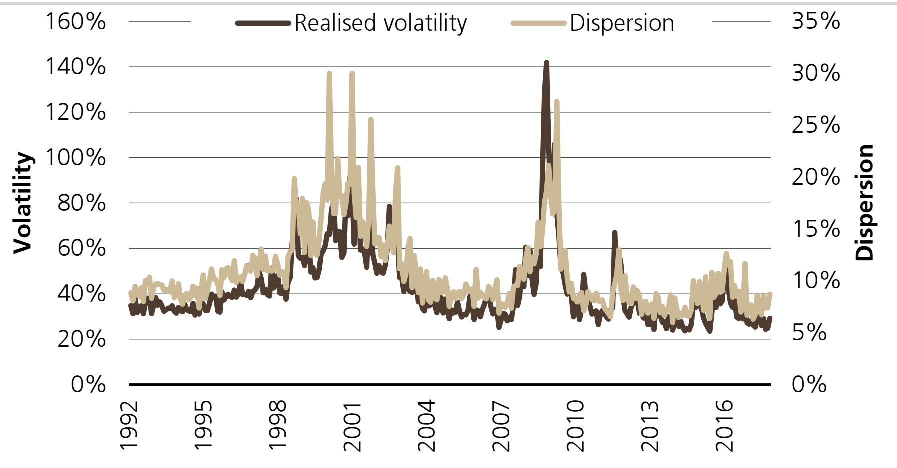
Figure 16: Change in Fed Funds rate and volatility



Source: Factset, UBS Quant

What about dispersion of returns?

Figure 17: Volatility and dispersion of returns



Source: Factset & UBS Quant Universe: S&P 500

Firstly, volatility and the dispersion of returns are almost perfectly correlated. As a consequence, if volatility is likely to pick up, so is dispersion.

However, there is more to dispersion than simply gearing and the cost of capital. As highlighted by Keith Parker our Equity Strategist recently, demographics, corporate vs consumer spending, margins and tax cuts are all likely to drive dispersion of returns in 2018 as these effects will affect sectors and stocks very differently. Key takeaways:

1. **Demographic shifts**: Using our proprietary database of 100 spending categories across 7 age cohorts, we estimate 5yr PCE category growth differences to be sizeable (3-4pp real). We overweight Healthcare as the demographic tailwind (+2pp) is underpriced. Data also supports home builders/improvement, insurance, HH products, and new cars over REITs, apparel, asset managers, education and tobacco.

2. **Corporate vs consumer**: The rise in corporate profits and fall in the personal savings rate points to business spending growth outpacing consumption by 5pp. With business spending well below trend, firms should continue to invest to drive ROE. We overweight Tech and Industrials given business spending upside and higher FCF yield; and u/w Cons Disc as the savings rate drop points to further underperformance.

3. **Margin path**: Higher highs are more likely than a turn lower in margins. Firm margins track productivity, which has lagged wages/hr by 17pp since 2006. The record gap of 30pp between high and low margin firms should narrow. Low margin stocks are at a record discount and cheap firms with low+rising margins have historically outperformed the market (3-4pp) and those firms with falling margins (8-9pp).

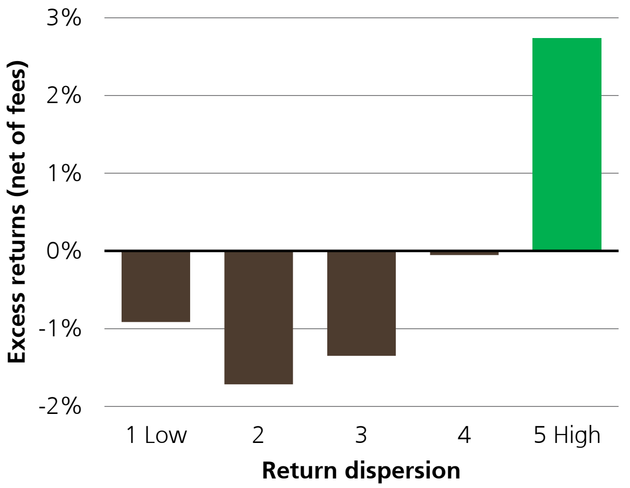
4. **Tax impact**: Relative P/Es of the top tax rate beneficiaries are at pre-election levels, and not pricing EPS upside of 13%+ from a 25% rate. We think our approach to assessing tax effects is more accurate since we use US Federal tax data (book + cash) for 3000 firms. With such large relative impacts, a tax cut could undermine fundamental portfolios. Exposure to stocks with high cash tax/market cap impact can help hedge that risk. We underweight Utilities, REITs, Materials, which benefit the least from lower tax rates.

We would add to this list that **technological disruption** is likely to play a significant role as a driver of dispersion. Please see Josh Holcroft's report 'Who benefits from automation?.

What is the outlook for active management?

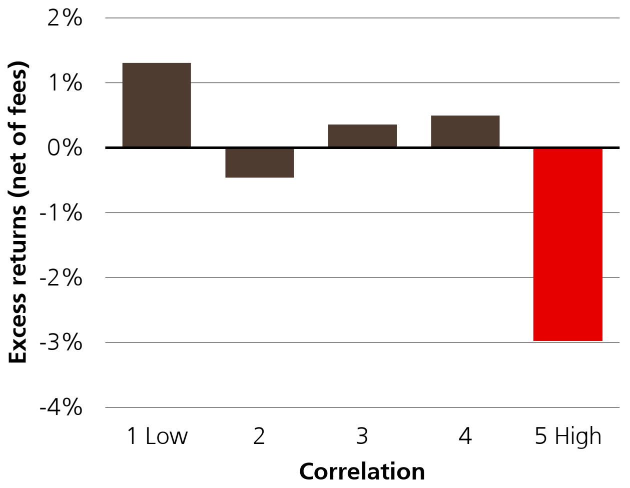
As noted by Dr Anna von Reibnitz in her study on US retail mutual funds from 1972 to 2015 'When opportunity knocks', active managers tend to perform well when the dispersion of returns is high, however, they tend to not like periods of high correlation.

Figure 18: Dispersion and excess returns to active management (net of fees)



Source: Dr Anna von Reibnitz (ANU), Factset, UBS Quant

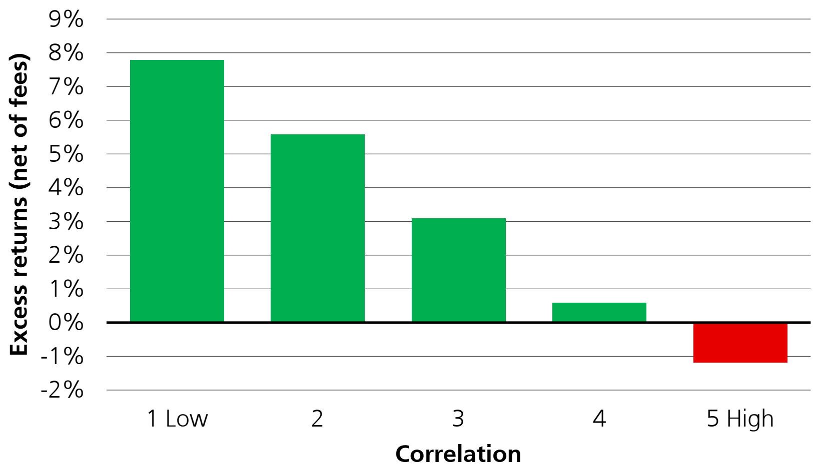
Figure 19: Correlation and excess returns to active management (net of fees)



Source: Dr Anna von Reibnitz (ANU), Factset, UBS Quant

When dispersion is high (quintile 5), it's all down to correlation.

Figure 20: Excess returns to quintile 5 of dispersion



Source: Dr Anna von Reibnitz (ANU), Factset, UBS Quant

2018 is shaping up to be a positive year for active managers as the dispersion of returns is likely to increase, driven by a Federal Reserve tightening cycle, demographic shifts in demand, changes in corporate vs consumer spending, margins, tax cuts, and technological disruption; whilst correlation is at all-time lows. Providing we don't suffer a macro-economic shock (that is likely to drive correlation higher) **active managers are likely to perform well in 2018.**

Why focus on Quality?

We believe the key to outperformance in 2018 is likely to be driven by a focus on quality. The concern we have with most definitions of quality is that, firstly, they appear both crowded and expensive, and secondly, they don't consider whether the firm is able to sustain its quality score, that is, if the quality of the business is improving or deteriorating.

Why does Quality work?

Quality is one of the strongest and most scalable anomalies within equities. There are two theoretical reasons for the anomaly to exist.

1. **Risk**: This assumes that high quality firms tend to be low beta, and as such represent a risk to active managers as they are likely to underperform in a rising market. Given that markets tend to increase in the long run, active managers are more likely to overweight higher beta stocks and underweight low beta stocks. Consequently, buying low beta names leads to outperformance as they are under-valued relative to their fundamentals.

2. **Behavioural**: Investors persistently under-estimate the earnings persistence of high quality firms, and tend to assume mean-reversion in their estimates. Contrary to this belief, high quality firms tend to continue to perform well, whilst low quality firms tend to continue to disappoint.

We prefer the behavioural argument as high quality firms are not necessarily low volatility.

In a recent study, "The Excess Returns of 'Quality' Stocks: A Behavioral Anomaly," Jean-Philippe Bourchard et al found that "the returns from investing in quality firms are abnormally high on a risk-adjusted basis, and are not prone to crashes. We provide novel evidence in favour of the "behavioural view": In their forecasts of future prices, and while being overall overoptimistic, analysts systematically underestimate the future return of high quality firms, compared to low quality firms".

So the question is: how do we distinguish between high quality firms that are likely to continue to outperform versus those that are likely to revert to the mean?

How do we define Quality?

There are two ways to think about Quality: firstly, as investing in high quality stocks, and secondly, as investing in companies with improving versus deteriorating fundamentals.

Investors tend to think about Quality as either investing in high quality stocks, or picking up on companies with improving quality.

Defining Quality

Ranking models… linear or binary?

The literature to date has approached the definition of Quality from two perspectives:

Firstly, a simple ranking model, which on the positive side is easy to define, however, its weakness is that it assumes that the relationship between each variable and stock market excess returns are best described by a linear relationship which is constant over time.

And secondly, a binary scoring model which Piotroski[1] used to describe the nine factor F-score. The strength of this model is that it doesn't look at extremes, but rather aims to separate companies based on whether they meet minimum thresholds of investability and subsequently whether the fundamentals are improving or deteriorating. Each variable is assigned a score of '0' or '1' based upon whether the realisation is regarded as 'bad' or 'good'. The Delta Quality score is the sum of the twenty indicator variables.

We use both approaches in our definition of quality. We define High Quality (HQ) using a linear ranking model, and the change in Quality (Delta Quality or DQ) using a binary scoring approach.

How we model Quality

We evaluate Quality factors based on their ability to predict future earnings growth, excess returns over the relevant benchmark, and volatility. Volatility is one of the most important factors as ultimately volatility is inversely correlated to earnings certainty, a quality measure.

Where we believe our research differs from other research is that we have tested each Quality factor across different economic regimes, as well as in up and down markets. This has led to a more intimate understanding of factors and how they perform.

We investigate 20 factors across profitability, financial health, efficiency, management signalling and risk, based on the extant literature as well as their merits as indicators of good quality investments.

We have conducted backtests on the MSCI World universe back to 1996. Within the regional results, we have tested MSCI Asia (including emerging markets). All returns are total returns in US Dollars. Backtests are conducted using equal weighted returns against an equal weighted benchmark rebalanced monthly. Both global and regional tests are unconstrained for sector and country.

[1] Piotroski, Joseph D. (2000). "Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers". The University of Chicago Graduate School of Business

Figure 21: Metrics evaluated within each model

	High Quality	Delta Quality
Profitability		
Cash-flow to assets	Ranked	Binary
Change in cash-flow to assets		Binary
Gross profit to assets	Ranked	Binary
Change in gross profit to assets		Binary
Return on assets	Ranked	Binary
Change in return on assets		Binary
Return on assets: variation - sector neutral	Ranked	Binary
Accruals (Sloan definition)	Ranked	Binary
Change in accruals		Binary
Operating cash-flow		Binary
Cash Flow Variation	Ranked	Binary
Financial health		
Change in Current Ratio		Binary
Debt to Assets - sector neutral	Ranked	Binary
Change in Debt to Assets		Binary
Efficiency		
Change in Sales to Assets		Binary
Gross margins	Ranked	Binary
Change in gross margins		Binary
Management signalling		
Equity issuance	Ranked	Binary
Risk		
Distance to Default		Binary
Volatility		Binary

Source: UBS Quant

For full details of each variable, please see Appendix A.

For full details on the Financial Statement Quality model as well as our Financials model, please see

"Investing in Quality" Winter et al.

"Extending our quality model to Financials" Antrobus et al.

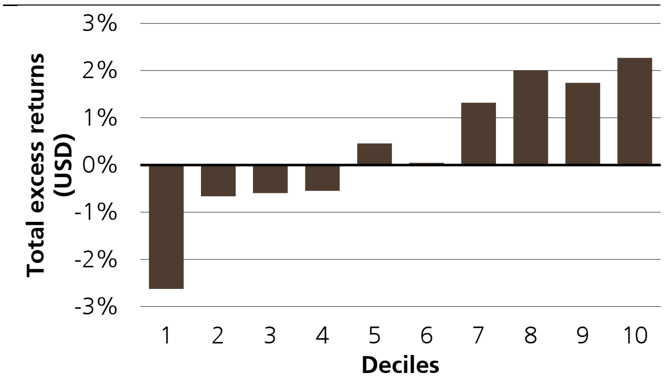
How does Quality perform?

High Quality

Firstly, companies that score well tend to exhibit positive excess returns over the benchmark with low levels of volatility over the 12 months post score formation (that is, post their annual reporting date). High scoring companies also tend to have growing earnings with low levels of dispersion in earnings outcomes. Those that score poorly tend to demonstrate negative excess returns with high levels of volatility and high dispersion in earnings outcomes reinforcing the lottery payoff associated with low quality companies.

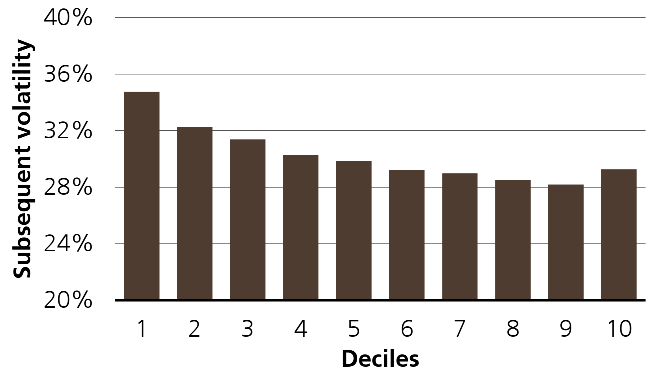
Note: in all decile ranks, decile 10 is regarded as desirable, and decile 1 as undesirable.

Figure 22: High Quality: total excess returns



Source: Factset, UBS Quant Universe: MSCI World

Figure 23: High Quality: subsequent volatility (12m, monthly)

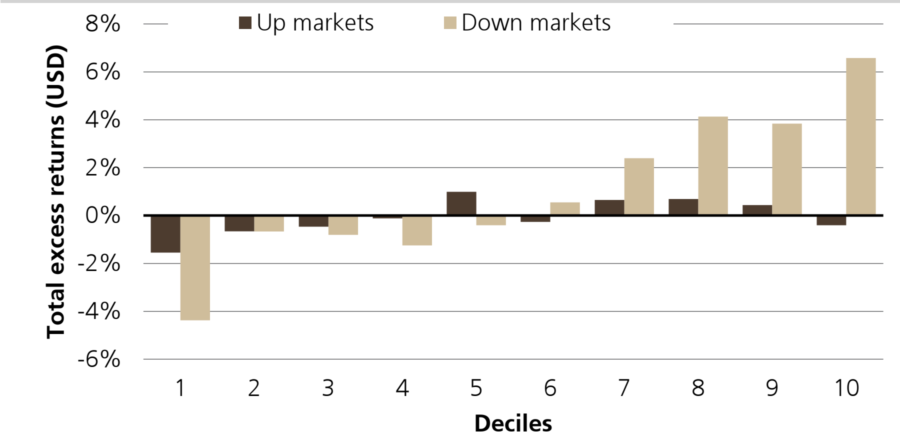


Source: Factset, UBS Quant Universe: MSCI World

Performance in up and down markets

In down markets, there is a high dispersion of returns with high quality companies tending to outperform whilst low quality companies tend to underperform, as expected. What is really interesting is that in up markets, there is little dispersion in returns, high quality companies tend to underperform slightly (decile 10), importantly, low quality companies tend to underperform. In other words, low quality companies are seldom worth owning.

Figure 24: High Quality: total excess returns in up and down markets



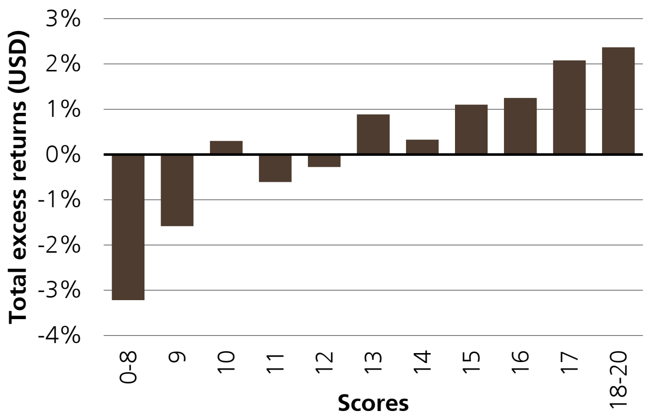
Source: Factset, UBS Quant Universe: MSCI World

Delta Quality

The Delta Quality model aims to highlight companies that exhibit either improving or deteriorating fundamentals. Firstly, companies that score well tend to exhibit positive excess returns over the benchmark with lower levels of volatility over the 12 months post score formation. High scoring companies also tend to have positive earnings growth rates with low levels of dispersion in earnings outcomes. Those that score poorly tend to demonstrate negative excess returns with high levels of volatility and high dispersion in earnings outcomes.

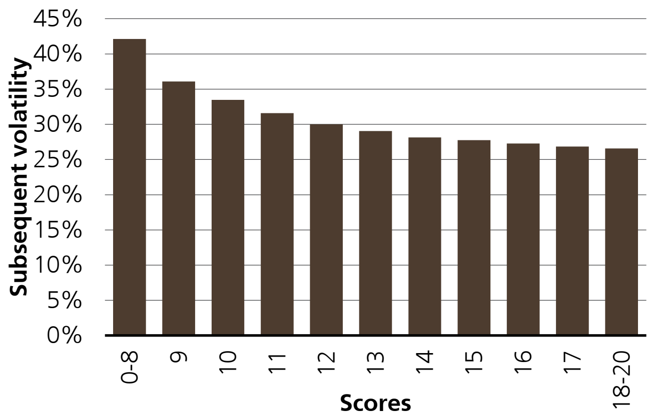
Note, as we are using a binary scoring model, there are very few companies at either extreme, as a consequence we group scores 1 to 8 and 18 to 20.

Figure 25: Delta Quality: total excess returns



Source: Factset, UBS Quant Universe: MSCI World

Figure 26: Delta Quality: subsequent volatility (12m, monthly)

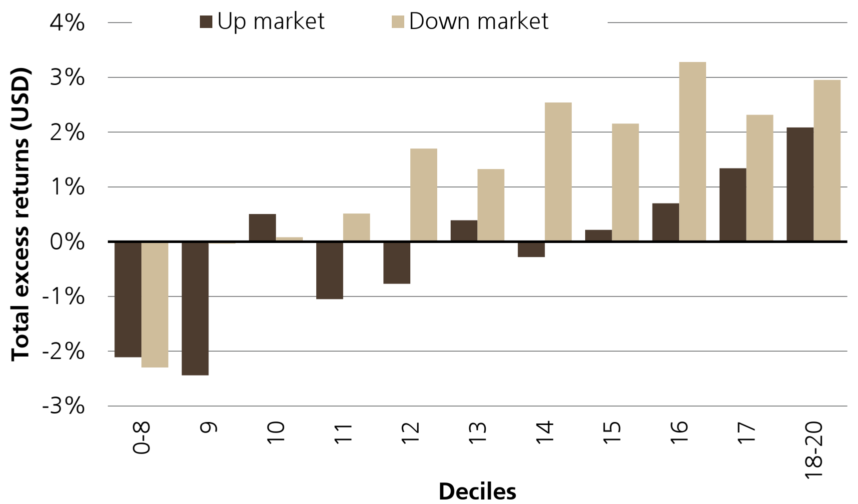


Source: Factset, UBS Quant Universe: MSCI World

Performance in up and down markets

In down markets, there is a higher dispersion of returns with high scoring companies tending to outperform whilst low scoring companies tend to underperform. In up markets, there is less dispersion in returns, high scoring companies tend to outperform slightly (scores 16 to 20).

Figure 27: Delta Quality: total excess returns in up and down markets



Source: Factset, UBS Quant Universe: MSCI World

Note, the High Quality and Delta Quality model results are robust when tested on a sector neutral basis.

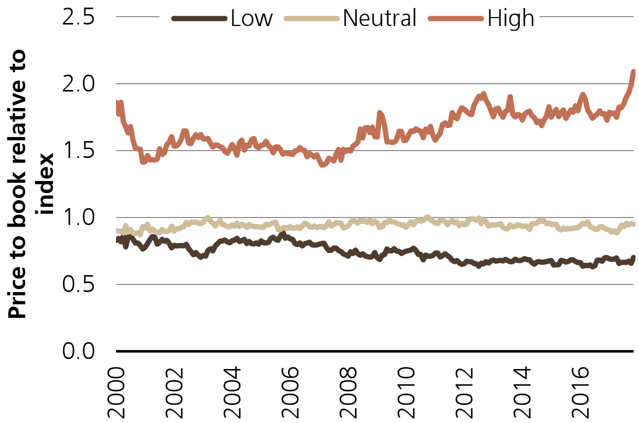
Surely it's priced?

In order to assess whether Quality is priced in, we assess the average price-to-book of each third of each Quality model.

Overall, we find that absolute quality, that is our High Quality model, is partially priced. High Quality companies are always more expensive than Neutral Quality companies, which are always more expensive than Low Quality companies. However, we find that the change in quality, our Delta Quality model, is less efficiently priced.

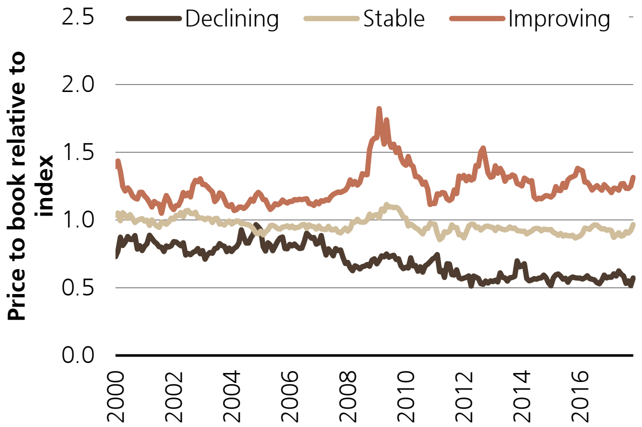
Overall, the market has focussed significantly on Quality since the Global Financial Crisis, leading to a large gap in the pricing of high versus low quality stocks and improving versus declining quality stocks.

Figure 28: High Quality: Price to Book relative to index



Source: Factset, UBS Quant Universe: MSCI World

Figure 29: Delta Quality: Price to Book relative to index



Source: Factset, UBS Quant Universe: MSCI World

Right now, high quality companies are trading at historical highs relative to the market. As a consequence, we recommend focussing on companies with improving fundamentals, or high Delta Quality.

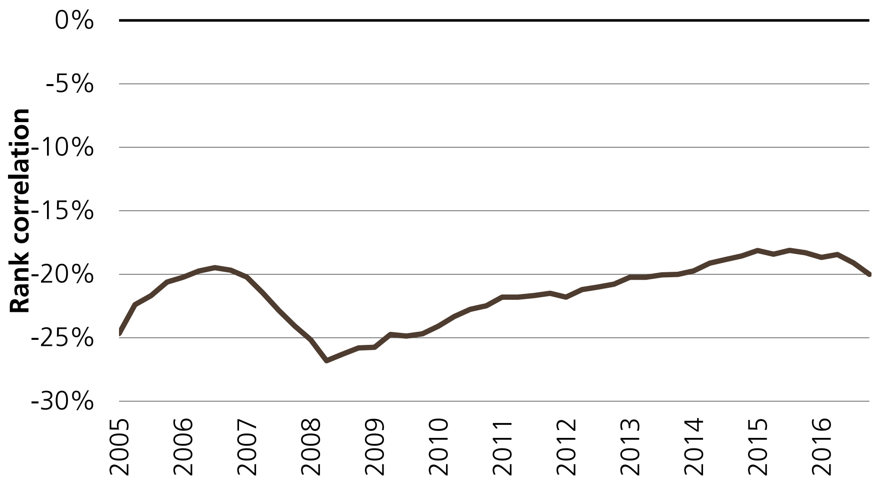
Why do we like Quality as a factor?

Russ Wermers recently pointed out[2] that analysts add 2% per annum through correctly forecasting cashflows, and then subtract 0.8% per annum through incorrect discount rate assumptions. Quant models overcome this challenge by using analysts' cashflow forecasts and scaling them by price to come up with a valuation, and then using financial quality metrics to select high quality companies with high cashflow yields. Implicitly, the discount rate is captured in the financial quality score.

This method eliminates the requirement for selecting an appropriate discount rate. However, it is reliant on the idea that our measure of Quality accurately captures the correct discount rate. Below we illustrate the rank correlation of cashflow volatility and the weighted average cost of capital (WACC). Overall, this metric alone seems to do a good job of capturing the correct WACC (with a T-stat of -4.37, which reduces to a T-stat of -1.75 after controlling for Carhart.

[2] Lan, Chunhua and Wermers, Russ, Cash-Flow Timing vs. Discount-Rate Timing: A Decomposition of Mutual Fund Market-Timing Skills (July 1, 2016).

Figure 30: Rank correlation of cashflow volatility and the WACC



Source: Factset, UBS Quant Universe: MSCI World

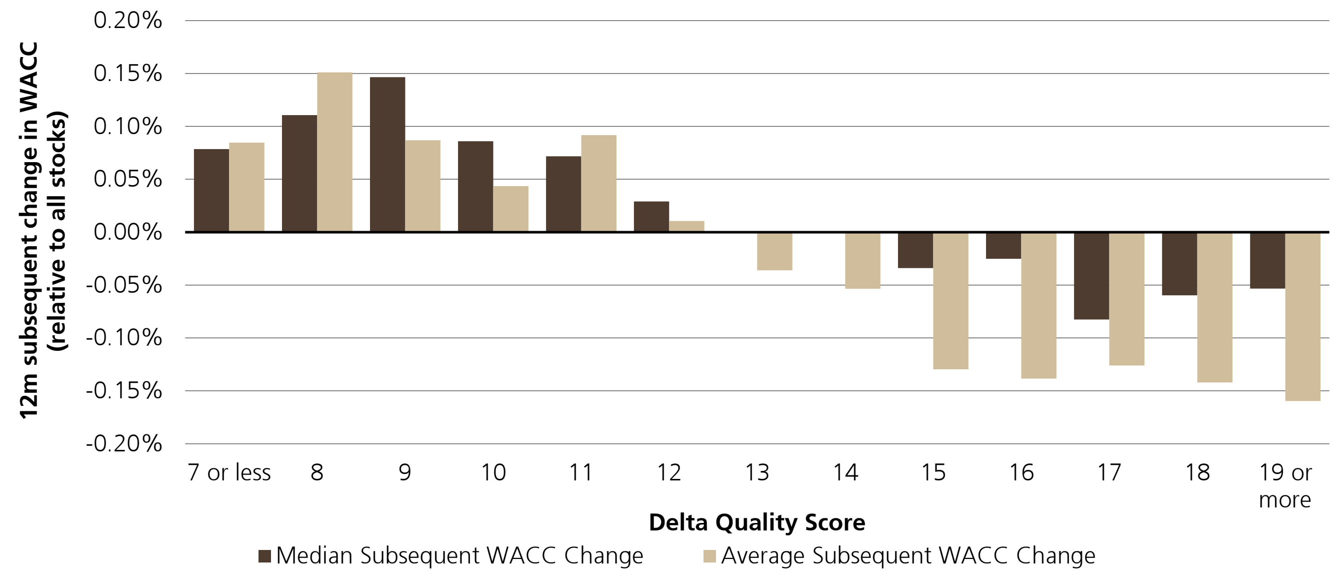
Note: We have estimated the WACC based on: the current average interest rate (interest expense and total debt based on last reported information), the cost of equity (calculated using 2y risk free rate, PAS beta (5y model) and 6% equity risk premium). We eliminate financials from this study.

So High Quality matters, why use Delta Quality?

Given that the absolute level of quality seems to give us a good idea of what the WACC should be, the question is: does our Delta Quality score forecast changes in the WACC?

Overall, we find that companies with improving fundamentals enjoy a falling cost of capital over the subsequent twelve months, whilst companies with deteriorating fundamentals suffer an increase in the cost of capital.

Figure 31: Delta Quality scores and changes in the weighted average cost of capital



Source: Factset, UBS Quant Universe: MSCI World

This point is critical to our understanding of Quality as a factor. Whilst absolute measures of quality are priced (see figure 28), changes in quality are not well appreciated by the market (figure 29). Consequently, as improving quality companies attract a lower cost of capital, they are likely to re-rate.

Building a Quality factor model

We take a simple intersection approach to the final Quality model by taking the intersection of High Quality stocks with Improving Quality. We're not aiming to develop a significant alpha here, but rather, to eliminate downside risk. As a consequence, we eliminate low quality companies, and deteriorating quality companies.

The intersection has an average of 157 stocks in it at any point in time. Overall, the model outperforms the benchmark by 2.9%% per annum, with 6% volatility, a Sharpe ratio of a t-stat of 2.13, with a maximum drawdown of 43% versus the index at 56%.

Figure 32: Quality Model excess returns over MSCI World (equal weighted)

Source: Factset, UBS Universe: MSCI World

Note: Total excess returns in USD. Quality is run region and sector unconstrained allowing the model to tilt into the highest quality stocks globally.

Figure 33: Performance statistics

	MSCI World (Equal Weighted)
Annualised Excess Arithmetic	2.9%
Annualised Excess Geometric	2.7%
Volatility	6.0%
Avg No Of Stocks	157
No Of Periods	262
Sharpe RF 0	0.46
T Stat	2.13

Source: Factset, UBS Quant

So where's the opportunity?

In order to demonstrate where the opportunity set lies, we intersect each model with Cashflow Yield. Overall, we find that there is a significant improvement in the Value premium amongst High Quality and Increasing Quality stocks, whilst on the other extreme, we find there to be a significant penalty associated with Low Quality, and Deteriorating Quality, expensive stocks.

Figure 34: High Quality and cashflow yield

	1 Low quality	2	3	4	5 high quality
1 expensive	-4.3%	-0.5%	0.8%	-0.4%	1.9%
2	-5.5%	-3.4%	-1.3%	0.5%	0.0%
3	-1.6%	1.2%	-0.5%	2.4%	1.1%
4	-0.8%	1.1%	0.6%	1.4%	3.0%
5 cheap	2.0%	2.5%	3.0%	4.6%	4.8%

Source: Factset, UBS Quant Universe: MSCI World

Figure 35: Delta Quality and cashflow yield

	Declining	Stable	Improving
1 expensive	-3.1%	-1.6%	1.1%
2	-7.1%	-1.5%	-0.7%
3	-3.2%	1.0%	1.1%
4	-1.3%	1.2%	1.9%
5 cheap	5.4%	2.6%	3.9%

Source: Factset, UBS Quant Universe: MSCI World

Returns are annualised total excess returns in USD. Backtest 1996 to 2017.

Note that there is a risk premium located at the intersection of stocks that are cheap on a free cashflow yield basis with deteriorating fundamentals. However, the volatility associated with this premium is also significant.

High quality businesses with improving fundamentals?

Figure 36: High quality companies with improving fundamentals: United States, Europe and Japan

Ticker	Company	Country	Sector	HQ score	DQ score	FCF Yield*
S&P 500						
CMCSA-US	Comcast Corporation Class A	US	Consumer Discretionary	8	17	6.3%
LOW-US	Lowe's Companies, Inc.	US	Consumer Discretionary	10	16	7.2%
AZO-US	AutoZone, Inc.	US	Consumer Discretionary	10	14	7.0%
CCL-US	Carnival Corporation	US	Consumer Discretionary	8	16	2.3%
COST-US	Costco Wholesale Corporation	US	Consumer Staples	9	17	2.3%
PFE-US	Pfizer Inc.	US	Health Care	8	15	7.4%
BMY-US	Bristol-Myers Squibb Company	US	Health Care	9	17	3.6%
CSCO-US	Cisco Systems, Inc.	US	Information Technology	8	13	6.3%
NTAP-US	NetApp, Inc.	US	Information Technology	9	17	7.2%
EBAY-US	eBay Inc.	US	Information Technology	7	14	5.8%
INTC-US	Intel Corporation	US	Information Technology	9	14	4.8%
MSFT-US	Microsoft Corporation	US	Information Technology	7	14	6.1%
PPG-US	PPG Industries, Inc.	US	Materials	9	14	6.1%
APD-US	Air Products and Chemicals, Inc.	US	Materials	8	14	3.9%
AVB-US	AvalonBay Communities, Inc.	US	Real Estate	7	16	3.4%
MSCI Europe						
BKG-GB	Berkeley Group Holdings plc	GB	Consumer Discretionary	10	17	10.1%
WPP-GB	WPP Plc	GB	Consumer Discretionary	8	13	10.3%
NXT-GB	Next plc	GB	Consumer Discretionary	10	15	8.1%
PSN-GB	Persimmon Plc	GB	Consumer Discretionary	8	17	8.7%
CCL-GB	Carnival plc	GB	Consumer Discretionary	9	15	2.3%
CPG-GB	Compass Group PLC	GB	Consumer Discretionary	9	12	4.4%
HEIA-NL	Heineken NV	NL	Consumer Staples	7	15	4.6%
VPK-NL	Royal Vopak NV	NL	Energy	7	14	0.6%
BAYN-DE	Bayer AG	DE	Health Care	7	15	8.2%
NOVO.B-DK	Novo Nordisk A/S Class B	DK	Health Care	10	14	3.8%
IAG-ES	International Consolidated Airlines Group SA	ES	Industrials	7	16	6.7%
AENA-ES	Aena SME SA	ES	Industrials	9	17	6.8%
ALFA-SE	Alfa Laval AB	SE	Industrials	8	16	5.2%
CAP-FR	Capgemini SE	FR	Information Technology	8	15	6.6%
BLT-GB	BHP Billiton Plc	GB	Materials	7	17	10.5%
RIO-GB	Rio Tinto plc	GB	Materials	9	15	7.9%
1COV-DE	Covestro AG	DE	Materials	10	16	8.9%
MNDI-GB	Mondi plc	GB	Materials	9	13	4.4%
BLND-GB	British Land Company PLC	GB	Real Estate	8	13	4.4%
TEL-NO	Telenor ASA	NO	Telecommunication Services	9	16	8.3%
ENEL-IT	Enel SpA	IT	Utilities	7	16	12.0%
Topix 1000						
7269-JP	Suzuki Motor Corp.	JP	Consumer Discretionary	7	15	6.9%
7606-JP	UNITED ARROWS LTD.	JP	Consumer Discretionary	10	17	5.0%
7259-JP	Aisin Seiki Co Ltd	JP	Consumer Discretionary	7	12	7.8%
6326-JP	Kubota Corporation	JP	Industrials	7	14	2.7%
3632-JP	GREE, Inc.	JP	Information Technology	7	12	20.2%
4208-JP	UBE Industries, Ltd.	JP	Materials	8	16	6.5%

Source: Factset, UBS Quant   Note: FCF Yield is UBS analyst forecast (if not available: trailing, or DY)

Figure 37: High quality companies with improving fundamentals: Asia Pacific

Ticker	Company	Country	Sector	HQ score	DQ score	FCF Yield*
MSCI AC Asia ex Japan						
3008-TW	LARGAN Precision Co., Ltd.	TW	Information Technology	10	18	5.4%
2020-HK	ANTA Sports Products Ltd.	HK	Consumer Discretionary	10	18	3.9%
532540-IN	Tata Consultancy Services Limited	IN	Information Technology	10	16	4.3%
1093-HK	CSPC Pharmaceutical Group Ltd.	HK	Health Care	10	16	2.9%
27-HK	Galaxy Entertainment Group Limited	HK	Consumer Discretionary	10	15	4.5%
LPPF-ID	PT Matahari Department Store Tbk Class A	ID	Consumer Discretionary	10	14	7.2%
500182-IN	Hero Motocorp Limited	IN	Consumer Discretionary	10	13	3.2%
EDU-US	New Oriental Education & Technology Group, Inc.	US	Consumer Discretionary	10	12	2.1%
2474-TW	Catcher Technology Co., Ltd.	TW	Information Technology	9	19	9.3%
036570-KR	NCsoft Corporation	KR	Information Technology	9	18	7.2%
1169-HK	Haier Electronics Group Co., Ltd.	HK	Consumer Discretionary	9	17	7.4%
6505-TW	Formosa Petrochemical Corp	TW	Energy	9	17	5.5%
168-HK	Tsingtao Brewery Co., Ltd. Class H	HK	Consumer Staples	9	16	5.3%
Z74-SG	Singapore Telecommunications Limited	SG	Telecommunication Services	9	14	5.4%
ADRO-ID	PT Adaro Energy Tbk	ID	Energy	8	20	14.5%
1193-HK	China Resources Gas Group Limited	HK	Utilities	8	18	6.1%
BSDE-ID	PT Bumi Serpong Damai Tbk	ID	Real Estate	8	16	11.9%
011170-KR	Lotte Chemical Corp.	KR	Materials	8	15	13.5%
2688-HK	ENN Energy Holdings Limited	HK	Utilities	8	15	10.0%
1113-HK	CK Asset Holdings Limited	HK	Real Estate	8	15	7.7%
2388-HK	BOC Hong Kong (Holdings) Limited	HK	Financials	8	15	3.8%
2333-HK	Great Wall Motor Co., Ltd. Class H	HK	Consumer Discretionary	8	14	10.1%
GLOW-TH	Glow Energy Public Co., Ltd.	TH	Utilities	8	13	12.2%
PTT-TH	PTT Public Co., Ltd.	TH	Energy	7	18	11.6%
S63-SG	Singapore Technologies Engineering Ltd	SG	Industrials	7	18	3.5%
1301-TW	Formosa Plastics Corporation	TW	Materials	7	18	2.0%
857-HK	PetroChina Company Limited Class H	HK	Energy	7	17	6.8%
386-HK	China Petroleum & Chemical Corporation Class H	HK	Energy	7	16	8.4%
A17U-SG	Ascendas Real Estate Investment Trust	SG	Real Estate	7	16	6.0%
2628-HK	China Life Insurance Co. Ltd. Class H	HK	Financials	7	16	2.4%
C09-SG	City Developments Limited	SG	Real Estate	7	16	0.2%
PTTEP-TH	PTT Exploration & Production Plc	TH	Energy	7	15	8.9%
000030-KR	Woori Bank	KR	Financials	7	15	4.4%
BBTN-ID	PT Bank Tabungan Negara (Persero) Tbk	ID	Financials	7	15	0.6%
576-HK	Zhejiang Expressway Co. Ltd. Class H	HK	Industrials	7	13	13.4%
SCC-TH	Siam Cement Public Co. Ltd.	TH	Materials	7	13	7.9%
SCC.F-TH	Siam Cement Public Co. Ltd.(Alien Mkt)	TH	Materials	7	13	3.6%
BIDU-US	Baidu, Inc. Sponsored ADR Class A	US	Information Technology	7	13	3.3%
867-HK	China Medical System Holdings Ltd.	HK	Health Care	7	13	2.7%
966-HK	China Taiping Insurance Holdings Co., Ltd.	HK	Financials	7	13	0.8%
ASX 200						
SRX-AU	Sirtex Medical Limited	AU	Health Care	10	14	5.3%
HVN-AU	Harvey Norman Holdings Ltd	AU	Consumer Discretionary	9	16	8.8%
RIO-AU	Rio Tinto Limited	AU	Materials	9	16	7.1%
SUL-AU	Super Retail Group Limited	AU	Consumer Discretionary	8	19	7.9%
FMG-AU	Fortescue Metals Group Ltd	AU	Materials	8	17	4.0%
BHP-AU	BHP Billiton Limited	AU	Materials	8	17	9.1%
ALL-AU	Aristocrat Leisure Limited	AU	Consumer Discretionary	8	17	5.0%
WPL-AU	Woodside Petroleum Ltd	AU	Energy	8	14	4.7%
WHC-AU	Whitehaven Coal Limited	AU	Energy	7	19	18.9%

Source: Factset, UBS Quant Note: FCF Yield is UBS analyst forecast (if not available: trailing, or DY)

Conclusion

Volatility is close to its all-time lows. This has occurred as a result of an increasing weight to low volatility stocks in the index, but also as a result of a decline in correlation.

We believe that volatility is likely to increase over the next 12 months primarily as a result of the Federal Reserve tightening resulting in highly leveraged firms coming under pressure. However, we believe that given the strength of top line growth and the slow pace of tightening, this is unlikely to flag the end of the cycle, but rather, is likely to drive dispersion of returns amongst stocks. Other drivers of dispersion in 2018 are: demographics, corporate vs consumer spending, margins, tax cuts, and technological disruption.

As a result, we believe the outlook for active management is positive as return dispersion is likely to increase and correlation is at all-time lows. Providing we don't have a macro-economic shock (that is likely to drive correlation higher) active managers are likely to perform well in 2018.

We believe that Quality and cashflows matters right now for two reasons: firstly, in a world of lower growth and increasing volatility, the market is repricing high quality stocks. The key to outperformance from here will be to focus on those companies with improving fundamentals and solid cashflows.

We find that Quality can be defined from two perspectives, High Quality and the Change in Quality each with its own application. Each model has a clear relationship with future earnings growth, excess returns and volatility.

In terms of valuation, absolute levels of Quality seem to be partially priced in, although High Quality companies tend to outperform and Low Quality companies underperform leading us to conclude that the effect is not fully priced. The change in Quality seems to be less efficiently priced.

Finally, we find that we can build a Quality model based upon the underlying model that delivers an excess return of 2.9% with volatility of 6% over MSCI World.

Furthermore, we find that the Value premium is significantly enhanced through the use of each of the Quality models.

So what can we do with this?

Long only managers should think about tilting their portfolios towards high quality stocks particularly those that look attractively priced. However, we need to be vigilant of the change in quality. If this declines significantly, these stocks should be removed. Importantly, low quality stocks should be avoided.

Long/short managers should be shorting low quality stocks, but should be vigilant of both the change in quality as well as the valuation, as a significant increase in the change in quality can cause a short squeeze.

Appendix A: Financial Statement items

Return on Assets: We use the latest reported full-year[3] ROA. An ROA greater than or equal to 0 leads to a '1' quality score.

Change in Return on Assets: We use the year-on-year change (delta) in the above ROA measure. A change in ROA greater than or equal to 0 leads to a '1' quality score.

Operating Cash-flow: We use the latest reported full-year Cash Flow from Operations. Cash Flow from Operations greater than or equal to zero leads to a '1' quality score.

Accruals (Sloan definition): For our income accruals metric we use Net Income minus Operating Cash Flow scaled by average total. Cash Flow from Operations greater than or equal to Net Income leads to a '1' quality score.

Change in Current Ratio: We use the year-on-year change in the last reported Current Ratio. A current ratio that is increasing leads to a '1' quality score.

Change in Debt to Assets: We use the year-on-year change in the last reported Debt to. Decreasing debt to assets leads to a '1' quality score.

Change in Sales to Assets: We use the year-on-year change in the last reported Sales to average Total Assets. Increasing Sales to Assets leads to a '1' quality score.

Change in Margins: We use the year-on-year change in the last reported Gross Profit Margin (defined as Gross Income / Net Sales or Revenues). A change in Margin greater than or equals to 0 leads to a '1' quality score.

Issuance: We use 12-month change in the number of (adjusted) shares outstanding. A share count of less than 105% of the previous value leads to a '1' quality score.

Industry-controlled ROA variation: We consider the standard deviation of ROA for each company (using the definition above), for the previous 10 years of reported data (with a minimum of 5 years). The variation is z-scored within global industry groups (first GICS level). A low variation leads to a '1' quality score.

Industry-controlled Leverage: The debt-assets factor (as above) is z-scored within global industry groups (first GICS level). Low leverage relative to industry leads to a '1' quality score.

Gross Profitability: We use gross profits (Sales minus COGS and D&A) scaled by average total assets. A gross profitability margin greater than 10% leads to a '1' quality score.

Cash Flow relative to Assets: We use the latest reported full-year Cash Flow from Operations, scaled by average total assets. Positive cash flow of greater than 6% of average total assets leads to a '1' quality score.

[3] If an announcement date for the financial data is available we use that. Otherwise we assume that financial data is published 75 days after the period end and we allow a 5 day lag for the information to be available in Factset.

Improving Gross Margins: We use the year-on-year change in the last reported Gross Profit Margin (defined as Gross Income / Net Sales or Revenues). A change in Margin greater than 10% leads to a '1' quality score**.**

Change in Gross Profitability: We use the year-on-year change (delta) in the above Profitability measure. A change in Profitability greater than or equal to 0 leads to a '1' quality score.

Change in Cash Flow relative to Assets: We use the year-on-year change (delta) in the above Cash Flow relative to Assets measure. A change in Cash Flow relative to Assets greater than or equal to 0 leads to a '1' quality score.

Change in Accruals: We use the year-on-year change (delta) in the above Accruals measure. A change in Accruals less than or equal to 0 (i.e. less accruals) leads to a '1' quality score.

Volatility: We use 12 months' historic price volatility, using US dollar prices. Stocks below the 80^{th} percentile across all data achieve a '1' quality score.

Distance to Default: We calculate distance to default using a proprietary implementation of the Merton model. A distance to default of greater than 3 leads to a '1' quality score.

Cash Flow Variation: We consider the standard deviation of cashflow for each company (using the definition above), for the previous 10 years of reported data (with a minimum of 5 years). Lower variation leads to a '1' quality score.

Valuation Method and Risk Statement

Our quantitative models rely on reported financial statement information, consensus earnings forecasts and stock prices. Errors in these numbers are sometimes impossible to prevent (as when an item is misstated by a company). Also, the models employ historical data to estimate the efficacy of stock selection strategies and the relationships among strategies, which may change in the future. Additionally, unusual company-specific events could overwhelm the systematic influence of the strategies used to rank and score stocks.

Required Disclosures

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UBS Investment Research: Global Equity Rating Definitions

12-Month Rating	Definition	Coverage[1]	IB Services[2]
Buy	FSR is > 6% above the MRA.	45%	26%
Neutral	FSR is between -6% and 6% of the MRA.	39%	23%
Sell	FSR is > 6% below the MRA.	16%	11%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 September 2017.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

KEY DEFINITIONS:Forecast Stock Return (FSR) is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months. **Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium). **Under Review (UR)** Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. **Short-Term Ratings** reflect the expected near-term (up to three months) performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets** have an investment horizon of 12 months.

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