

# Academic Research Monitor

## UBS Quantitative Conference Highlights

### Equities

Global

Quantitative

#### ARM's Special Edition: Quant Conference in London

The ARM departs this month from its standard format in order to provide an overview of the presentations that featured in the agenda of our Annual Quantitative Investment Conference that took place in London on March 29-30, 2017. Also note that next year's conference has already been scheduled for March 14-15, 2018. Save the Date!

#### Presentation summaries and download links

We provide detailed summaries of all the talks that were given at the conference. Those from our academic speakers are dealt with in more depth. We also provide links enabling one to download the slides and any relevant documents.

#### Four academic guest speakers

Mungo Wilson (Oxford University), Ioannis Ioannou (London Business School), James Sefton (Imperial College London) and Tomaso Aste (University College, London) were invited to present their current research projects. They presented on a wide range of topics: the influence of scheduled FOMC meetings on global equity markets, sustainable business models, the implicit style rotation of low-volatility, and modelling complexity.

#### Talks by UBS Speakers

Our team presented a long list of research topics which we are currently working on. These topics include stock-bond correlation, ESG investing, the impact of crowding on equity factor investing, ideas on turnover reduction, the impact of interest rate changes on equity and bond systematic factors, active versus passive investing, multi-asset systematic strategies, news sentiment, and EPS forecasting using machine learning.

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## Introduction

This issue of our Academic Research Monitor takes a slight detour from its normal approach in order to summarise all the talks from our recent Annual Quantitative Conference which took place in London on the 29<sup>th</sup> and 30<sup>th</sup> March, 2017.

**A summary of our London  
Quantitative Research Conference**

We have divided the summaries into two sections. The first gives quite in depth summaries of the talks from our four invited academic speakers (see Figure 1)

**Figure 1: Talks by External Academic Speakers**

Presentation Title	Paper(s)	Page
<a href="#"><u>"One Central Bank to Rule them all"</u></a> Mungo Wilson	<a href="#"><u>SSRN working paper, February 2017</u></a>	3
<a href="#"><u>"Sustainable Business Models; an Academic Overview"</u></a> Ioannis Ioannou	Review of recent academic findings Main paper: <i>Management Science</i> , 2014 ( <a href="#"><u>SSRN version</u></a> )	6
<a href="#"><u>"Why does low volatility style time value and quality"</u></a> James Sefton	Working paper, 2017	8
<a href="#"><u>"Predictive Modelling for a Complex World: a Data-driven Perspective"</u></a> Tomaso Aste	Review of two papers: - <i>Physical Review E</i> , 2016 ( <a href="#"><u>arXiv preprint</u></a> ) - <i>Journal of Complex Networks</i> , 2017 ( <a href="#"><u>arXiv preprint</u></a> )	9

Source: UBS.

The second section gives shorter summaries of the talks given by members of the Global Quantitative Research team here at UBS (see Figure 2). In every case, we have given links to both the presentation and any related research that is available.

**Figure 2: Talks by UBS Research**

Presentation Title	Page
<a href="#"><u>"Understanding Stock-Bond Correlation"</u></a> by David Jessop	11
<a href="#"><u>"Modelling Uncertainty"</u></a> by Geoff Robinson	12
<a href="#"><u>"ESG Investing – the UBS View"</u></a> by Julie Hudson & Josie Gerken	12
<a href="#"><u>"The Impact of Crowding on Factor Investing"</u></a> by Nick Baltas	13
<a href="#"><u>"Simple approaches to reducing turnover"</u></a> by Claire Jones	14
<a href="#"><u>"The effect of Macroeconomic Regimes on Equity and Bond Factors"</u></a> by David Jessop & Nick Baltas	15
<a href="#"><u>"Active vs Passive: How is Asset Management evolving?"</u></a> by Paul Winter	16
<a href="#"><u>"Multi-Asset, Multi-Factor Systematic Premia"</u></a> by Nick Baltas	16
<a href="#"><u>"News Sentiment and Cash-flow News"</u></a> by Josie Gerken	18
<a href="#"><u>"Forecasting EPS – can a machine beat a human?"</u></a> by Desi Ivanova	19

Source: UBS.

# Talks by Academic Speakers

## "One Central Bank to Rule them All"

by Mungo Wilson

We were very happy to welcome back Mungo Wilson from the University of Oxford (who had previously presented at our conference back in 2014) in order to give an overview of his recent paper "One Central Bank to Rule them All".

The starting point for the analysis was the observation that not all news is truly random: for scheduled central bank (and macro-economic) news the content may be random, but the timing isn't! So if investors care about the news then given the uncertainty surrounding the content, they should demand an "announcement premium" to hold assets on announcement days.

Earlier work by Mungo Wilson and his co-author Pavel Savor (2013, 2014) – which we have reviewed in the ARM back in September 2013 – has shown that the aggregate US market returns are 10.9 bps during announcements days versus only 1.3 (which is statistically insignificant) on all other days. Additionally, CAPM seems to work only during announcement days and the risk-return trade-off is strong.

The question then becomes: do international investors care about major monetary policy announcements? The objective of the paper that was presented by Mungo Wilson was to classify central banks into those that have strong premia associated with their announcements and those that do not. The analysis focuses on the impact of the macro releases of the four major central banks in the world – Fed, BoE (Bank of England), BoJ (Bank of Japan) and ECB (European Central Bank) – on 38 global equity markets, including their respective local markets (US, UK, Japan and Germany respectively). Return data for the various markets are obtained from Datastream; announcement dates are collected from the websites of the various central banks under consideration.

The quantity of interest is the "announcement premium", which is defined as the return differential over days around the announcement versus all other days (of no announcement). As the analysis is done across the globe, there are time differences which should be dealt with. For this reason, the window around announcement is determined to be a 2-day one (for more information on the timings, please see the paper). To allow for an "apples-to-apples" comparison against no announcement days, all days without a scheduled central bank announcement are grouped in pairs to form 2-day windows. The spread of the average 2-day announcement returns and the average 2-day no announcement returns is finally the announcement premium for each equity market.

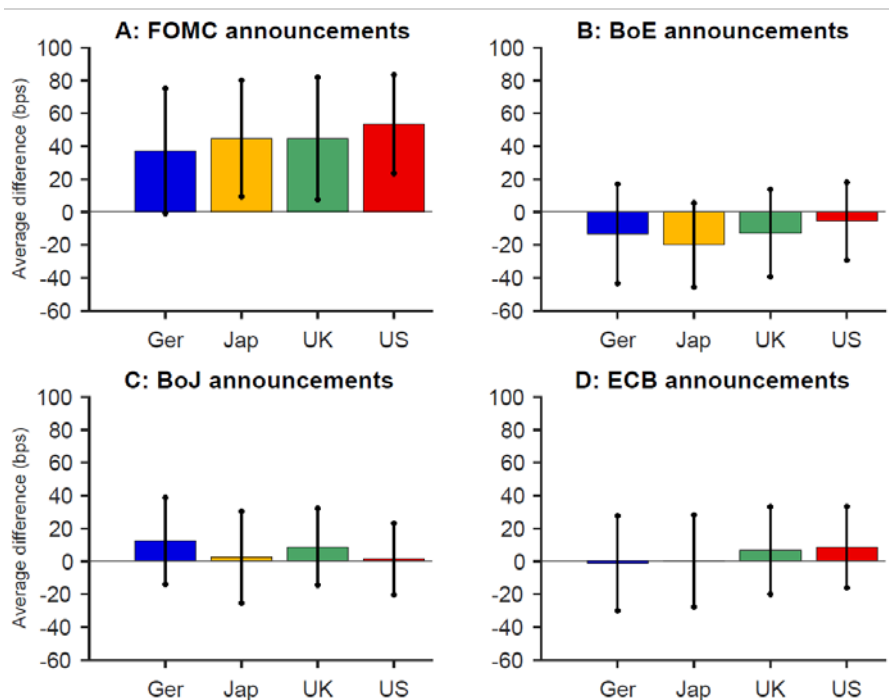
The first important result of the paper is presented in Figure 3, which reports the announcement premium for the four major economies during announcement days of the four major central banks. In short, all four equity markets exhibit a statistically strong announcement premium during FOMC announcements. No other central banks matter; not even for their respective equity market! The announcement premium is small but insignificant for the Japanese and German markets around scheduled announcements by BoJ and ECB respectively. Even more interestingly, the premium is negative (though statistically insignificant) for the UK market around scheduled announcements by BoE. If anything, there seems to be *less* risk around scheduled announcements of the BoE.

**What is the impact of scheduled macroeconomic announcements?**

**Estimating the announcement premium using 2-day windows**

**Only the Fed matters, both domestically and internationally.**

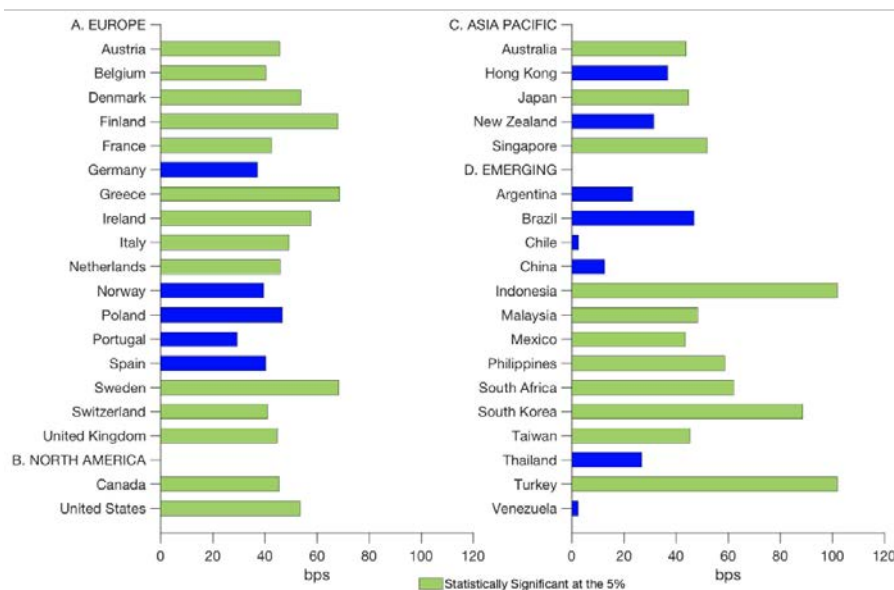
**Figure 3: One central bank (Fed) to rule them all**



Source: "One Central Bank to Rule them All" by F. Brusa, P. Savor and M. Wilson; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the announcement premium (including a 95% confidence interval band) for the four major equity markets around scheduled announcement of the four major central banks. Sample period is from 1998 to 2015.

The findings extend strongly beyond these four major economies. As shown in Figure 4 below, the announcement premium around scheduled FOMC announcements is positive across all 38 global equity markets considered in the analysis and it is statistically significant at the 5% level for 25 of them; it is also especially pronounced in countries that experienced financial crises. Sharpe ratios are also much greater around scheduled FOMC announcement days.

**Figure 4: FOMC Two-Day Announcement Premia**



Source: "One Central Bank to Rule them All" by F. Brusa, P. Savor and M. Wilson; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the announcement premium for 38 equity markets around scheduled FOMC announcements. Sample period is from 1998 to 2015.

Conversely, similar analyses for the other banks show that there are no statistically strong premia around scheduled announcements of BoE, BoJ or ECB. It is only the Fed that matters. This finding constitutes quite a strong result, as it seems that a very large and highly disproportionate share of excess market returns earned by equity investors across the globe is generated around scheduled FOMC announcement days that only represent 3% of all trading days.

The presentation then went on to try and explain the documented phenomena by looking into a number of potential explanations that we review briefly below.

One possibility is that the Fed generally surprises investors positively, whereas other central banks disappoint investors (hence obscuring the premium). Using a regression analysis that controls for monetary policy surprises, the results show no support for this explanation.

Another possibility is that FX changes drive the results (all the analyses so far have been conducted in USD). For this explanation to hold, higher beta currencies should have higher returns on days of scheduled FOMC announcements. Estimating equity market returns at the local currencies, however, does not change the results. The Fed remains equally dominant.

The last possibility that is checked is whether the results are driven by equity styles. Or, to put it differently, are there any stocks that are sensitive to local central bank announcements. Looking at small-cap, large-cap, value, and growth baskets for the four major countries, the results are very much in line with the earlier analyses. All baskets generate strong returns around FOMC announcements, but not around announcements of other central banks.

Following all of the above, Mungo Wilson presented evidence that a World CAPM does actually price global equity only on FOMC announcement days. A market-cap weighted portfolio of country equity indices was used as a proxy for the world market returns, against which betas can be estimated. Beta-sorted global portfolios (whether accounting for differences in country-specific betas or otherwise, the results remain strong) were shown to be aligned across the security market line on FOMC announcement days (see Figure 5). This is not the case across no announcement days or even across announcement days of the other major central banks.

Overall, the evidence is very strong. The FOMC announcements are associated with very high risk premia and there is no comparable result for the other large central banks. The Fed is clearly dominant and unique in its importance to global equity investors. The presentation ended with a big "Why". Why is the Fed different? Future research should address this.

#### Conference Presentation:

[One Central Bank to Rule Them All](#)

#### Related academic paper (link to SSRN):

[One Central Bank to Rule Them All](#)

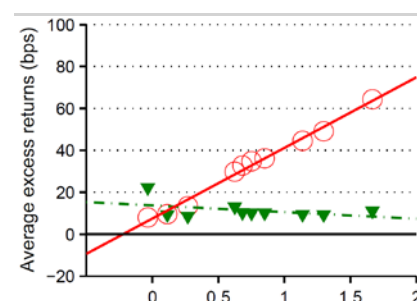
#### Related documents from UBS Quant Research:

- [Quantitative Conference Highlights 2014](#) (May 2014)
- [Academic Research Monitor reviewing Savor & Wilson \(2013, 2014\)](#) (Sep 2013)
- [Macro-economic announcements and market returns](#) (November 2013)

#### Looking for explanations...

- Does the Fed positively surprise the investors?
- Is it a currency premium?
- Are the results due to specific equity styles?

Figure 5: World CAPM and FOMC



Source: "One Central Bank to Rule them All" by F. Brusa, P. Savor and M. Wilson; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the average excess returns of 10 beta-sorted global portfolios around FOMC announcement days (red circles) and on no announcement days (green triangles). Sample period is from 1998 to 2015.

## "Sustainable Business Models; an Academic Overview"

by Ioannis Ioannou

Over the recent years, we have witnessed increased client interest in incorporating ESG (Environmental, Social and Governance) signals in systematic quant investment strategies. For this reason, we invited Ioannis Ioannou from London Business School to give an overview of recent academic advances on sustainable business models and their contribution to building a sustainable future.

In particular, Ioannis Ioannou discussed some recent pioneering academic work in the domain of corporate sustainability that provides empirical evidence for the emergence of the "Sustainable Organization"; a new type of the modern business organization that genuinely and effectively integrates environmental and social issues into its business model, strategy, organizational structure and conduct.

In order to identify what differentiates Sustainable Organisations from traditional business models, Ioannis Ioannou (with R. Eccles and G. Serafeim, 2014) went back to 1993 in order to find pairs of statistically identical firms based on a number of criteria (same industry, total assets, RoA, turnover, leverage, book-to-price ratio), which, however, would differ in the adoption of environmental and social policies. This matching exercise led to the identification of 90 pairs of identical firms, where in each pair one of the firms had voluntarily adopted several corporate policies that reflected a solid commitment to sustainability (explicit emphasis on employees, customers, products, the community and the environment as part of their business model) and the other firm had not adopted any such policies. The former group was termed as High Sustainability firms, and the latter group was termed as Low Sustainability firms. The question then was: what happened to those pairs of identical firms over the next two decades?

In short, the portfolio (either value-weighted or equally-weighted) of High Sustainability firms exhibited lower volatility, higher Carhart (1997) four-factor alpha and higher profitability measured by ROE than the portfolio of Low Sustainability firms between 1993 and 2009. Looking at analyst recommendations, the evidence shows that the market underestimated the profitability of Sustainable organizations, and that the sell-side analysts were positively surprised by the earnings of these companies. During the 1990s, the analysts were penalising firms with high ESG scores and this trend only changed after 2000. More experienced analysts from larger brokerage houses have been driving this shift.

Following the above empirical evidence, one can then naturally ask: what did these companies actually do to achieve outperformance both in terms of stock market and accounting performance? Ioannis Ioannou outlined four pillars that characterise the "Sustainable Organisation". We give the broad description of each pillar (please see the presentation of Ioannis Ioannou for examples of corporate actions relating to each of these pillars of sustainability):

- **Corporate Governance:** Sustainable Organizations are characterized by distinct governance mechanisms, reflecting the joint interests of all stakeholders of the corporation. They more directly involve the Board of Directors in sustainability issues and link executive compensation to sustainability objectives.
- **Stakeholder Engagement:** Sustainable Organizations are more focused on understanding the needs of their stakeholders, making investments in managing these relationships, and reporting internally as well as externally on

The emergence of ESG investing

A case study: tracking the performance of 90 pairs of companies that looked (back in 1993) almost identical on everything except corporate policies relating to Sustainability

The "Sustainable Organization"

the quality of their stakeholder relationships. Hence, they are more proactive, more transparent, and more accountable in the way they engage with their stakeholders.

- **Decision Making Time Horizons:** Sustainable Organizations are effective communicators of their long-term approach: not only do they speak in terms of the long run, but in fact, they are persuading long-term investors to invest in their stock. As a result, they manage to attract dedicated rather than transient investors.
- **Transparency & Accountability:** Sustainable Organizations are more likely to measure information related to key stakeholders such as employees, customers, and suppliers, and to increase the credibility of these measures by using auditing procedures. They do not only measure but also disclose relatively more and higher quality nonfinancial data.

The next topic that Ioannis Ioannou presented looked at whether superior sustainability performance can provide easier access to finance. Using a panel dataset between 2002 and 2009 across 29 countries, the analysis showed that firms with superior sustainability performance face significantly lower capital constraints. This has been primarily due to better stakeholder engagement, and increased transparency around sustainability issues. The relation between sustainability and capital constraints is driven by both the social as well as the environmental dimensions. Interestingly, the causality works also in the reverse way of capital constraints on sustainability performance, but it is economically much smaller compared to the impact of sustainability on capital constraints.

**Sustainability and access to finance**

At the last part of his talk, Ioannis Ioannou presented some recent academic findings on how companies react during crisis periods. During such periods, intangible resources should become more important; these include (i) efficiency and innovativeness, (ii) adaptation to shifting needs, demands and expectations, and (iii) organisational resilience. Using a panel dataset between 2007 and 2009 and a two-stage least squares regression, the analysis showed that companies generally reduced the number of employees and their capital expenditure. Conversely, they retained R&D and investments in sustainability. Most importantly, those firms that did not cut down on intangible resources during the 2008 crisis, performed well in the years after the crisis.

**How do companies react during crises?**

#### **Conference Presentation:** [Sustainable Business Models](#)

#### **Related academic papers (links to SSRN):**

- [The Impact of Corporate Sustainability on Organizational Processes and Performance](#)
- [Mind the Gap: The Interplay Between External and Internal Actions in the Case of Corporate Social Responsibility](#)
- [Corporate Social Responsibility and Access to Finance](#)
- [The Impact of Corporate Social Responsibility on Investment Recommendations: Analysts' Perceptions and Shifting Institutional Logics](#)
- [The Dog that Didn't Bark: Long-Term Strategies in Times of Recession](#)



## "Why does low volatility style time value and quality"

by James Sefton

This presentation by James Sefton from Imperial College Business School picked up from the recent UBS publication ["Are you already timing styles successfully?"](#) (September 2016). In this publication, we showed that low volatility is an effective implicit style timing strategy, rotating to quality in stressed markets and value in relaxed (or normal) markets. The presentation aimed to uncover the underlying economic fundamentals driving this rotation.

**Low-volatility is an effective implicit style timing strategy**

The presentation argued that this rotation was an interesting puzzle. Firstly, quality stocks had lower cash flow volatility than value stocks over the entire economic cycle. Hence time-varying volatility of cash flows could not explain the rotation. Secondly, the average earnings growth rate of quality stocks is higher than that of value stocks over the entire economic cycle; and hence quality stocks could be considered longer duration and so more sensitive to shocks to market discount rates. However, discount rates are more volatile in stressed markets just when low volatility tilts heavily towards quality. So, the rotation could not be explained either in terms of sensitivity to market discount rates.

In unpicking the mechanism, the presentation demonstrated that the timing of the rotation could be described accurately by the credit spread (Moody's BAA yields relative to 10 year government bond yields). When credit spreads were high (stressed markets), returns to low volatility were positively correlated to returns to a quality strategy and negatively to a value strategy; and when spreads were low the correlations were reversed. This suggested that exposure to a credit risk factor could explain the rotation.

**The timing of the rotation is strongly related to the credit spread**

To investigate this hypothesis, the presentation decomposed the returns to quality and value strategies into cash flow and discount rate news using the approach of Vuolteenaho (2002). It then showed that when spreads were low, the cash flow and discount rate news of value stocks were positively correlated, effectively reducing the volatility of the returns. However when spreads were high, the cash flow and discount rate news were negatively correlated, effectively increasing the volatility of returns to value. This mechanism could therefore explain the rotation.

This time-varying correlation could have either a behavioural or a rational pricing explanation. The behavioural would run on the lines that in unstressed markets, prices of value stocks under-reacted to good (bad) cash flow news, resulting in higher (lower) future returns and so explain the positive correlation between cash flow and discount rate news. In contrast, in stressed markets, the price of value stocks over-reacted to good (bad) cash flows news – maybe because market participants are more 'jittery' – resulting in lower (higher) future returns to value and a negative correlation between cash flow and discount rate news. A rational pricing explanation would involve the exposure of value stocks to a time-varying credit risk premium. In unstressed markets the credit premium is low and so cash flow news and discount rate news are only lightly correlated. However, in stressed markets, bad cash flow news results in a rise in the exposure to the credit risk factor resulting in negative correlation between cash flow and discount rate news.

### Conference Presentation:

[What drives the style rotation within low volatility?](#)

### Related documents from UBS Quant Research:

[Are you already timing styles successfully?](#) (September 2016)



## "Predictive Modelling for a Complex World: a Data-driven Perspective"

by Tomaso Aste

One of the most tedious and data demanding tasks in financial econometrics is the estimation of the dependence structure between a – typically large – number of random variables. In the context of portfolio construction, risk analysis and forecasting, this amounts to the estimation of well-behaved covariance matrices. Factor models, principal components analysis, and shrinkage are just some of the tools in the palette of a quant analyst for overcoming the so called "curse of dimensionality"; little data, many variables.

The curse of dimensionality

Motivated by this, Tomaso Aste (from University College London) highlighted the importance of constructing models that require estimation of a small number of parameters. In this regard, he presented a new and innovative way of estimating the joint multivariate distribution of a number of random variables using graphical models. The high-level objective of the methodology is to generate a graph (topology) where only the conditionally significant interactions are kept. This generates a sparse covariance structure where the conditionally independent pairs are not connected (which effectively amounts to zero covariance). This effectively amounts to constructing a graph with the smallest number of edges.

Estimating the joint distribution using graphical models

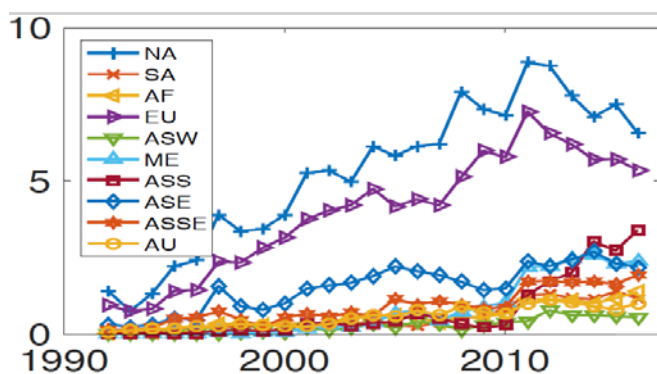
At a more technical level, the model is calibrated in a way so that it can reproduce observed moments, while maximising the entropy of the system. Using simulated data with known causality links, Tomaso Aste presented results that illustrate that the suggested methodology performs better than ridge regression or graphical lasso in terms of identifying these causality links.

During the last part of his presentation, Tomaso Aste presented an application of the suggested graph methodology in an effort to predict the propagation of uncertainty across 10 banking regions (North America, South America, Africa, Europe, West Asia, Middle East, South Asia, East Asia, Southeast Asia, Australia). The uncertainty propagation is measured using the metric of Transfer Entropy.

Predicting the propagation of uncertainty across the world banking system

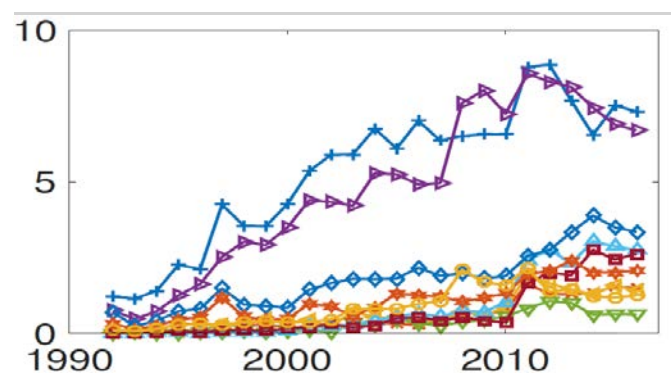
Figure 6 presents one-week predictions of the impact of each region to the world banking system, whereas Figure 7 presents one-week predictions of the vulnerability of each region to uncertainty propagation from the rest of the world. The net effect (impact – vulnerability) is presented in Figure 8.

Figure 6: One-week prediction of impact, Region → World



Source: "Predictive Modelling for a Complex World: a Data-driven Perspective" by Tomaso Aste; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the 1-week prediction of the impact of each region to the world banking system in terms of transfer entropy.

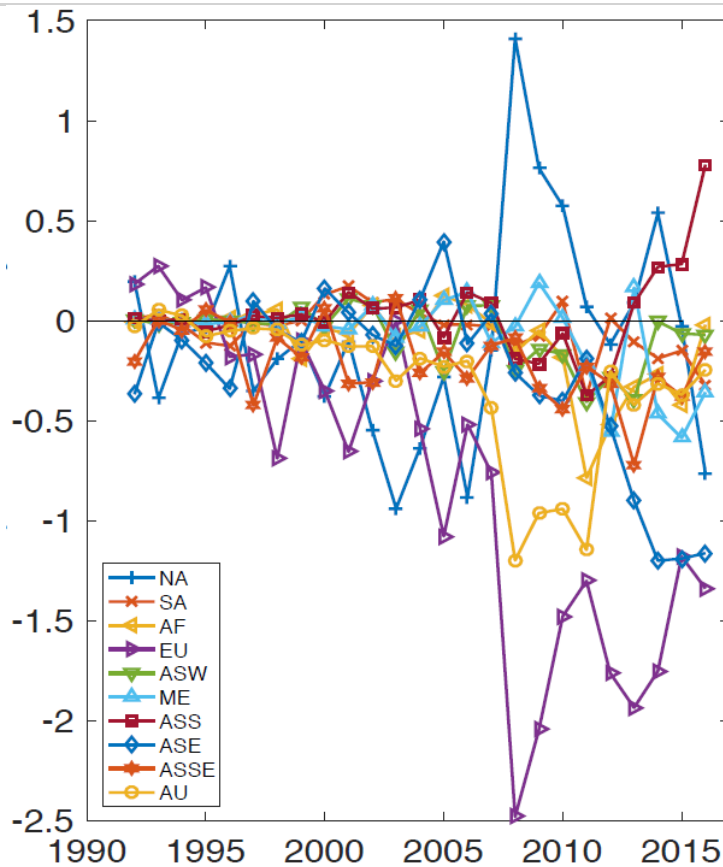
Figure 7: One-week prediction of vulnerability, Wld → Reg



Source: "Predictive Modelling for a Complex World: a Data-driven Perspective" by Tomaso Aste; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the 1-week prediction of the vulnerability of each region in terms of transfer entropy.

Even though the results in Figure 6 and 7 show that both the global impact and the vulnerability of the US and Europe have significantly increased over time (they have relatively fallen since 2011), the net effect is quite different. Figure 8 illustrates that the US has a significant net impact to the world economy during the 2008 crisis, whereas the impact of Europe increased, relatively speaking, during the Eurozone debt crisis.

**Figure 8: Difference in one-week predictions of impact vs. vulnerability**



Source: "Predictive Modelling for a Complex World: a Data-driven Perspective" by Tomaso Aste; reproduced from the presentation at UBS Quantitative Investment Conference, March 29-30, 2017. The figure presents the one-week prediction of the impact of each region to the world banking system minus the one-week prediction of the vulnerability of each region to the world banking system in terms of Transfer Entropy.

Finally, using similar plots for the impact and vulnerability of 4 industry classifications (Banks, Diversified Financials, Insurance, Real Estate), Tomaso Aste noted the increased importance of banks up to 2008. Since then, however, their impact has fallen; it is Diversified Financials that have become the dominant source of impact to the global markets.

#### Conference Presentation:

[Predictive modeling for a complex world: a data-driven perspective](#)

#### Related academic papers (links to arXiv):

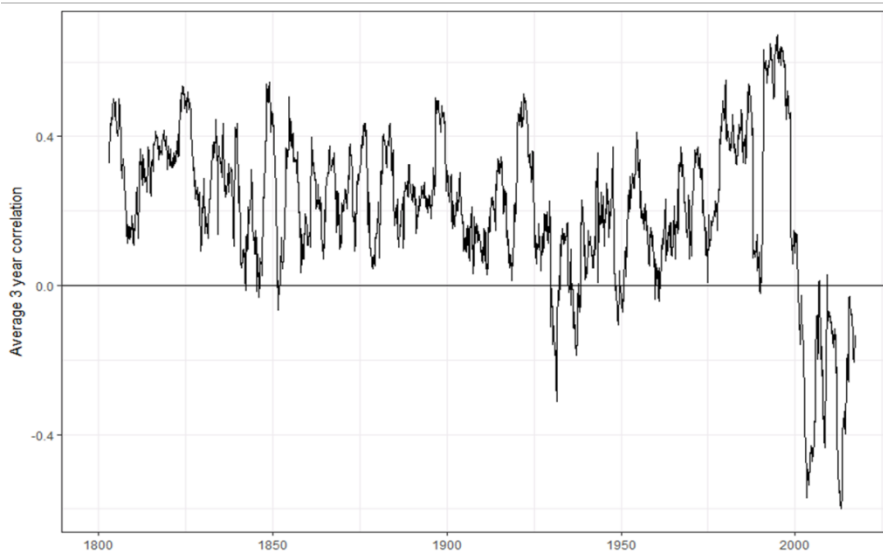
- [Parsimonious modeling with Information Filtering Networks](#)
- [Network Filtering for Big Data: Triangulated Maximally Filtered Graph](#)

# Talks by UBS Speakers

## "Understanding stock-bond correlation" by David Jessop

Prior to the start of this century, the average correlation between stocks and bonds was, for the majority of the time, positive. Since we entered the 21<sup>st</sup> century the correlation has been negative in the UK and US for much of the time (Figure 9). This presentation attempted to answer the question of what drove this dramatic change.

**Figure 9: Average US & UK equity bond correlation**



Source: UBS Quantitative Research. Average between 3-year rolling correlation between equities and bonds in the US and the UK.

The presentation went through a few potential drivers of equity / bond correlation. The first possible driver was changes in volatility. Increasing volatility appears to reduce correlation – a "flight to quality" effect – and this relationship seems to have remained relatively unchanged over the whole period from 1990 onwards, even as the underlying level of correlation has fallen but the effect remains the same.

The next potential driver discussed was recessions, but the evidence around how they affect correlation is both mixed and very weak.

This leaves inflation as the most likely candidate. Unexpectedly rising inflation is invariably bad for bonds – higher inflation raises expected future short rates and potentially increases the risk premium. For equities the story is more complex: increasing inflation could increase future cash flows from equities, but also has the effect of raising the discount rate. The evidence presented showed that the response of equities has changed: in the past rising inflation was seen as bad (so the increase in discount rates overwhelmed the effect of rising cash flows); today the opposite appears to be the case.

### Conference Presentation:

[Understanding stock-bond correlation](#)

## "Modelling uncertainty" by Geoff Robinson

Since November 2016 and President Trump's election to office, clients have asked "What impact could US tax reform have on equity prices?" The tax proposals vary from lowering marginal and cash repatriation tax rates to administering border tax adjustments on imports and exports. The proposals can have positive and negative impacts on equity prices. The magnitude of the equity price impacts can be company specific. Some proposals may have second degree impacts on inflation, government debt commitments and foreign exchange behaviour. There is no one-size-fits-all answer to these issues.

To conceptualise the equity impact a tax simulation model was built that allows users to structure their own take on the shape of the tax reform. The structure can then be applied to over 400 US stocks covered by UBS to simulate the equity impact.

### Conference Presentation:

[Modelling uncertainty](#)

### Related documents from UBS Research:

[Q-Series – How could US border tax adjustment reform impact equity prices?](#)

## "ESG Investing – a UBS View" by Julie Hudson & Josie Gerken

Increasing numbers of portfolio managers have a vested interest in incorporating ESG in their investment mandates. We gave an overview of how we see ESG investing from a quant perspective. If the objective is to be ethical, then the traditional approach is to screen out those stocks or industries which score poorly according to ESG criteria. This is how a typical SRI (socially-responsible) fund would be constructed.

The most critical question is whether we can be "ESG" and make money. If so, what are the trade-offs, if any, of achieving this? That is, what are the opportunity costs of successfully implementing ESG investing? From a mathematical point of view, how do we define our utility function to characterise how we balance satisfying ESG criteria and making a profit? These are the points we discussed when considering how to systematically incorporate ESG in quant strategies.

The presentation went through two main approaches to ESG investing: negative screening and alpha generation. We discussed two recent academic papers which back-tested both approaches (Verheyden, Eccles and Feiner, 2016; Nagy, Kassam and Lee, 2016). The overall conclusion was that opportunities exist to outperform a benchmark based on overweighting/underweighting stocks according to a function of ESG. At the very least, the research documents that it is possible to build an ESG portfolio without underperforming its respective benchmark.

A third paper which was discussed in the presentation (Statman and Glushkov, 2016) looked at evaluating the performance of Socially Responsible (SR) funds. To do so, two SR-related factors were appended to Carhart's (1997) four-factor model: **Top minus Bottom (TMB)**, a value-weighted return differential between top and bottom stocks ranked according to five ESG criteria and **Accepted minus Shunned (AMS)**, a value-weighted return differential between stocks accepted in SR funds and those rejected:

Negative screening or alpha signal?

Evaluating the performance of Socially Responsible funds

$$r_t^{XS} = \alpha + \underbrace{\beta_{RMRF} \cdot RMRF_t + \beta_{SMB} \cdot SMB_t + \beta_{HML} \cdot HML_t + \beta_{MOM} \cdot MOM_t}_{\substack{\text{Fama and French (1993)} \\ \text{Carhart (1997)}}} + \underbrace{\beta_{TMB} \cdot TMB_t + \beta_{AMS} \cdot AMS_t}_{\text{SR-related factors}} + \epsilon_t$$

SR funds are expected to exhibit large betas to these two additional factors. We concluded the presentation by summarising the challenges we face for incorporating ESG into a quant research framework. In the immediate term, short data history and non-standardised scoring mechanisms will limit how robust any backtests are. Finally, those ESG components which are material for one industry will not necessarily be material for other industries.

## Conference Presentation:

### [UBS Approach to ESG](#)

## Related documents from UBS Quant Research:

[Academic Research Monitor: ESG Quant Investing](#) (December 2016)

## "The Impact of Crowding on Factor Investing" by Nick Baltas

Smart beta products have recently become very popular and have attracted significant assets. One of the questions we have been receiving recently relates to the impact that crowding can have on the profitability of equity factors. This presentation went on to discuss recent findings in this space.

To analyse the implications of capital inflows in the profitability of equity factor premia, it is important to comprehend what is actually driving the premia themselves; is it systematic risk (in which case the premia constitute compensation for bearing this risk) or mispricing (in which case the premia are only prevalent due to human behaviour or are only significant due to limits-to-arbitrage)?

Genuine risk premia are generally anchored/contrarian strategies. Hence, all else being equal, capital flows would cause valuation spreads to converge, hence pushing managers to identify new opportunities; this, in turn, should lead to higher turnover and associated costs. Along these lines, the presentation suggested that crowding of genuine premia would make valuation spreads tighter and the premia harder to harvest.

### Risk premia

Conversely, market anomalies are generally non-anchored strategies; take momentum as an example. It becomes stronger, the more capital flows into those recent winners. All else being equal, capital flows should make the strategy perform strongly in the short-term, while at the same time increasing the likelihood of a drawdown, primarily due to funding liquidity becoming scarce.

### Market anomalies

Given that we could theoretically track the level of crowding in equity factors (using institutional holdings data, using analyst recommendations or even pairwise correlations of stocks in the same peer group) the next question is whether one can time the exposure to these factors. The presentation went on to discuss that timing of genuine premia is extremely hard. This is because genuine risk premia are only strong because they constitute compensation for exposure to an unforeseeable type of systematic risk. Conversely, market anomalies could in theory be timed (so when crowding increases, one should exit). However, exiting early can be detrimental for a portfolio manager, especially when he or she is evaluated against their peers and competitors.

### Is style timing easy?

The final part of the presentation focused on the theoretical links between the two technical equity styles, momentum and betting-against-beta, which are generally considered as the two strongest market anomalies. Academic evidence documents that these two factors suffer from drawdowns following periods of extreme crowding, that they can generally be timed, and that volatility-targeting improves their performance. Additionally, one of our papers in 2016 has shown that these two premia also exhibit significant style timing abilities.

**The links between momentum and betting-against-beta**

#### Conference Presentation:

[Crowding and Factor Investing: A synthesis of ideas](#)

#### Related documents from UBS Quant Research:

- [Where are the crowded trades?](#) (January 2015)
- [Follow the smart money](#) (July 2016)
- [What crowded positions are bubbling up in equity markets?](#) (February 2016)
- [Academic Research Monitor: Momentum Investing](#) (January 2015)
- [Academic Research Monitor: Volatility Targeting](#) (January 2017)

### "Turnover Reduction" by Claire Jones

Turnover drives up trading costs and reduces the capacity of strategies, making it harder for portfolio managers to scale up as their AUM increases. In this analysis, we looked at simple approaches to drive down turnover in factor portfolios without significantly reducing the performance of the signal or the factor exposure of the holdings.

Starting from the observation that investors should only permit turnover when there has been "significant" new information, we tried two naïve approaches to the problem: reducing the trading frequency and including a "buffer". These methods successfully reduced the turnover and didn't consistently reduce alpha, but led to very high tracking errors.

**Buffers and reducing rebalancing frequency**

We then tried a slightly more sophisticated approach - a simple linear optimisation. We don't buy or sell a position unless the portfolio weight is significantly different to the weight in the original factor portfolio. Once again, although this approach did reduce the turnover, the resulting tracking error was unacceptably high.

**Simple linear optimisation**

Finally, we attempted a full optimisation with a risk model to minimise the tracking error subject to a turnover constraint. We set the constraint to be a fixed proportion of the turnover between the portfolio you hold and the original factor portfolio i.e. you can move e.g. 70% of the way towards the ideal portfolio, and the optimiser will give you the best trade schedule.

**Simple approaches do reduce turnover, but using a full optimisation cuts turnover *and* keeps a low tracking error**

This approach appeared to work. It allows investors to substantially reduce the portfolio turnover, by more than 60% for the risk and quality factors or between 40% and 60% for the other styles, while maintaining a tracking error of less than 2%. It was also notable that for the quality, risk and growth styles you did not appear to get lower returns with the low turnover versions of the portfolios. For these styles it appears that high turnover is simply wasteful.

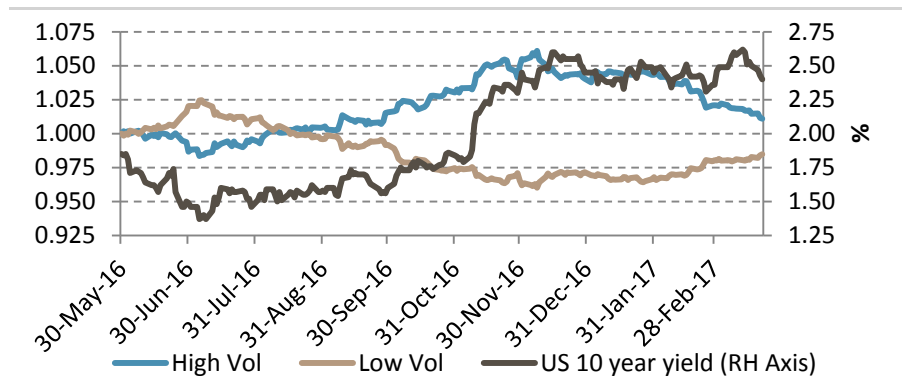
#### Conference Presentation:

[Simple approaches to reducing turnover](#)

## "The effect of Macroeconomic Regimes on Equity and Bond Factors" by David Jessop & Nick Baltas

At last year's conference we presented some results on the effect of changing interest rates on low risk investing. Events in the latter half of 2016, as shown in Figure 10 showed the analysis to have been rather timely. This also led to questions as to which other factors, both bond and equity, are affected by moves in interest rates and other macroeconomic factors.

**Figure 10: Global low volatility portfolio returns and interest rates**



Source: UBS Quantitative Research.

For equities, the only other factor apparently influenced by interest rates is the dividend yield factor – rising rates lower the alpha from buying high yield names.

The second factor investigated was volatility which has a well-known interplay with momentum. The results suggest that it is only "priced based" factors (momentum, low risk) which are influenced by this factor – high volatility suggests lower future returns. A similar result holds for recessions – betting-against-beta and momentum do much better in expansionary periods and are the factors where the effect of being in a recession is significant. High yield does better in recessions but the effect is smaller.

The talk went on to discuss the impact of the recent interest rate changes on the profitability of systematic bond strategies. The recent 35-year bond rally has been driven equally by two components: falling yields (positive trend signals) and upward sloping yield curves (positive carry signals). It has therefore benefitted systematic strategies, like trend-following or carry. This becomes more critical now that bond yields have started increasing, hence causing signal disagreement.

Using data back to 1857, we presented what we believe to be the longest backtest of systematic bond strategies. Trend and carry long/short signals can significantly improve the performance of a long-only bond strategy. The performance is even stronger when the signals agree; this agreement occurs more often than possibly expected (two thirds of the time) and lasts on average for 8 months. Conversely, an investor should reduce the risk on bonds in periods of signal disagreement.

### Conference Presentation:

#### [How do economic factors affect equity and bond factors?](#)

#### Related documents from UBS Quant Research:

- [Do low-volatility stocks have interest rate risk?](#) (September 2016)
- [Q-Series: What times the bond market?](#) (March 2017)

#### Timing using factor volatility

#### Interest rate changes and bond trend and carry strategies



## "Active vs Passive: How Will the World of Investing Evolve?" by Paul Winter

There is a tectonic shift taking place in the asset management industry, but not for broadcasted reasons. It is not new that in aggregate, actively managed equity funds have been underperforming and losing market share, whilst index funds and ETFs have gained share. The common explanation is normally associated with lower cost structure and higher operational scalability; however, this is not the full story. The reality is that technology has driven both market efficiency and a proliferation of choice which have allowed investors to specifically select the exposures they are comfortable with at the right price. This is causing a fundamental shift in how investors think about capital allocation, track risk adjusted returns and remunerate underlying managers.

When do active managers outperform? In a nutshell, active managers tend to outperform when dispersion of returns is high, and correlation of returns is low, hence allowing for unique insights to be used in the investment process. We explicitly show that only in top quintile of dispersion and bottom quintile of correlation environments have active managers in aggregate beaten their respective benchmarks. Unfortunately for active managers, since 2007 macro factor risk has driven correlation to historically high levels. We believe the ingredients are in place for future outperformance.

As a consequence of ageing demographics leading to a world of low earnings growth, as well as living in an incredibly unpredictable geopolitical environment, we believe that equity market returns are likely to be subdued over the next ten years, and as a result return dispersion is likely to remain high. Accordingly, superior active managers should continue to earn an economic rent. The trend of AUM shifting might still continue, however, active management will only grow in importance, as the passive ecosystem needs active management to maintain market efficiency.

In this environment, (to reaffirm) we prefer active exposures over passive exposures. Strategies that are likely to perform well are: high quality growth, high quality income, sector specialist funds, and hedge funds (in particular, equity, quantitative, merger arbitrage, macro, and volatility).

### Conference Presentation:

[How will the world of investing evolve?](#)

### Related documents from UBS Quant Research:

- [Q-Series: Active vs. Passive: How will the world of investing evolve?](#) (Jan. 2017)
- [Passive opportunities for active managers](#) (February 2017)
- [Q-Series: What will demographics mean for growth and stock market returns?](#)

## "Multi-Asset, Multi-Factor Systematic Premia" by Nick Baltas

Over the last four years, we have written a good number of research reports exploring the systematic premia that are prevalent across all asset classes commodities, government bonds, currencies, equity indices (see the end of this summary for links to all the respective UBS papers). The strongest cross-asset premia are: carry (extract yield from higher-yielding assets), momentum (benefit from return continuation patterns) and value / long-term reversal (capture return out of cross-sectionally undervalued assets).

Value – Momentum – Carry

This presentation suggested that combining these premia in a multi-asset, multi-factor framework can benefit an investor from market state diversification (carry strategies perform better during side-ways markets, momentum strategies perform better during trending markets and value strategies capture the turning points of regime changes), asset class diversification as well as diversification across time (time-series definitions of the premia exhibit beneficial time-varying conditional directional dependence on the underlying markets).

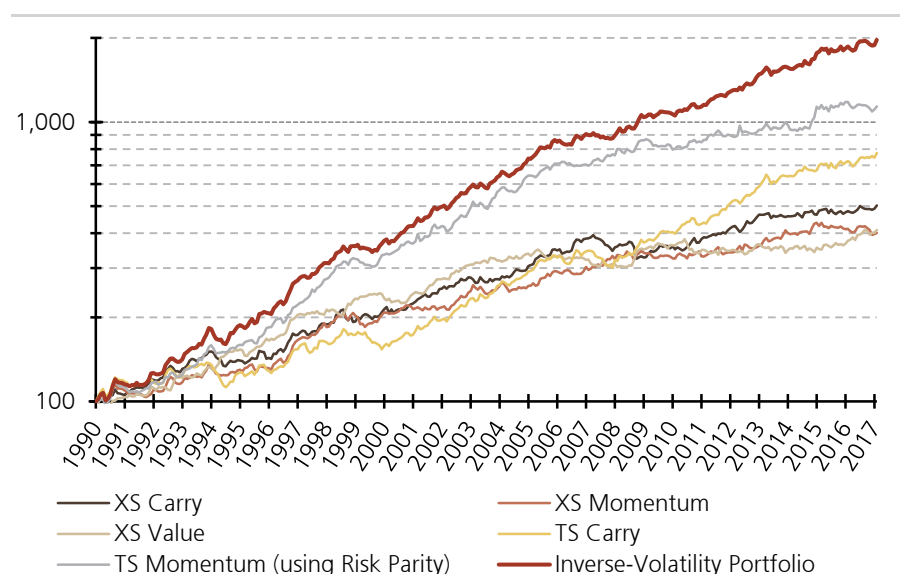
The analysis that was presented was conducted across 52 assets from all asset classes for the period between January 1990 and February 2017. All strategies were constructed using front futures contracts. Cross-sectional strategies based on carry, momentum and value signals generate positive Sharpe ratios across all asset classes (ranging from 0.12 to 0.82). The Sharpe ratios increase uniformly when constructing multi-asset single premia or when constructing multi-factor (carry-value-momentum) portfolios for each asset class (ranging from 0.51 to 0.91). Finally, constructing a multi-asset, multi-factor portfolio generates a Sharpe ratio of 1.36, benefitting from the relatively low correlations between the single premia.

The presentation then went on to identify any unintended exposures of the various strategies. The focus was on equity and bond downside risk as well as on funding liquidity risk. The main findings were: cross-sectional carry is significantly exposed to increases in VIX, whereas cross-sectional value generally benefits from large equity market moves. Additionally, value performs poorly when credit conditions (as captured by the TED spread) improve, whereas carry performs well when credit conditions improve, which however can raise concerns regarding the ability to employ leverage for carry strategies.

The final part of the presentation focused on the timing ability of the momentum and carry premia. In particular, as opposed to ranking assets, one can construct time-series versions of momentum (also known as trend-following) and carry strategies. The analysis that was presented showed that the time-series strategies add significant alpha above and beyond what is achieved by their (close to market-neutral) cross-sectional equivalents.

## Downside risk and funding liquidity risk

**Figure 11: Strategy Performance (7% volatility target)**



Source: UBS Quantitative Research. All cross-sectional (XS) portfolios and the time-series (TS) carry are constructed as inverse-volatility portfolios of asset-class specific premia. TS momentum uses a risk-parity allocation across the asset-class specific TS momentum portfolios.

To illustrate the diversification across asset classes, across systematic premia and across time (with the value-add of time-series strategies), Figure 11 presents the cumulative returns of cross-sectional multi-asset carry, value and momentum, the cumulative returns of time-series multi-asset carry and momentum and finally the cumulative returns of an inverse-volatility portfolio of all five strategies. All strategies in this Figure employ a volatility-targeting overlay. The Sharpe ratio of the overall portfolio is 1.54 and its three-year rolling Sharpe ratio has not fallen below 0.60 across the entire sample period.

## Conference Presentation:

### [Multi-Asset, Multi-Factor Systematic Premia](#)

## Related documents from UBS Quant Research:

- [Trend-following meets Risk-parity](#) (December 2013)
- [Harvesting Cross-asset Value](#) (December 2014)
- [Profiting from Cross-asset Seasonality](#) (March 2015)
- [Low-Risk Investing: Perhaps not everywhere](#) (July 2015)
- [Harvesting Yield from Cross-Asset Carry](#) (August 2016)

## "News Sentiment and Cash-flow News" by Josie Gerken

News data contains fundamentally driven information about equities and is continuously updated, so naturally, applications of news data are widespread in finance. We presented two applications of news data; news-based portfolio construction and cash-flow news modelling.

The data we used (provided by Alexandria) is collated at the millisecond frequency on a real-time basis and is categorised according to the subject, or event, the content is associated with, the country in which the company is listed and the news source to which the story originates from. Sentiment scores are assigned to each news story via a set of proprietary algorithms.

We first presented our results from back-testing a news volume strategy and sentiment-sorted portfolios at various frequencies, mainly on a universe of US stocks (although we found similar results when carrying out the same analysis on stocks in MSCI Europe). The key takeaway was that any alpha opportunities from using news data as a signal for investment decisions decay very quickly. Consequently, one has to look at the shorter end of the time-scale when deciding the rebalancing frequency.

**News data contains alpha but it decays quickly**

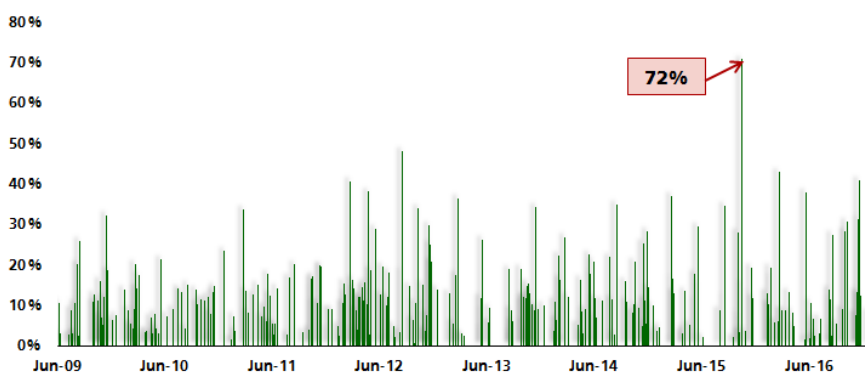
During the second part of this talk, we presented a novel application of news data motivated by the findings of Campbell and Schiller (1988) and Campbell (1991). In these papers, by approximating the logarithmic return on a dividend paying asset using a Taylor series expansion around the long-term mean of the logarithmic dividend-price ratio, an identity is uncovered. Unexpected returns are due to cash flow news and discount rate news.

$$\text{Unexpected Return} \equiv \text{Discount Rate News} + \text{Cash Flow News}$$

Given two components of this identity, the third can be "backed out". What Campbell and Schiller (1988) found was that, at the stock level, cash flow news plays a more vital role than discount rate news. The story, though, is different at the index level, with discount rate news being the main driver of returns.

Traditionally, the literature has focused on backing out cash flow news given returns and discount rate news. We, however, used news data to proxy cash flows so to back out discount rate news. We achieved this by capturing the 15 minute-returns following each news story associated with cash flow related subjects (earnings, earnings guidance, operations, dividends and clinical trials & announcements). A few company-specific case studies showed that total variation in returns due to cash flow news can reach as high as 72% over the course of a day, even when the proportion of the trading day attributed to cash flow news is below 10%. A snapshot of the relationship between size and variance explained by cash flow news (as of end of February 2017) showed that large cap stocks typically have more news and therefore have more of their daily returns explained by cash flow news.

**Figure 12: A case study of total variation in daily returns due to cash flow news**



Source: UBS Quantitative Research. A case study of Walmart cash flow news returns vs. actual returns (June 2009 – Dec 2016).

Aggregating actual daily and news returns to the index level, using market-cap weights, paints a slightly different picture. Here, in agreement with the literature, discount rate news appears to represent a higher proportion of returns than cash flow news.

Whilst our analysis requires further refinement, notably on how we manage overnight price changes and over which time period we should consider returns to be due to news, our preliminary findings offer a novel way of directly modelling cash flow news. Between discount rates and cash flows, it is only the latter which analysts typically forecast. How news flows into returns is therefore of paramount interest.

## Conference Presentation:

### [New sentiment and cash-flow news returns](#)

## "EPS Forecasting" by Desi Ivanova

A number of academic studies show that sell-side analysts are superior to any statistical model in predicting EPS, particularly at short horizons. In their recent paper, however, Ball, Ghysels and Zhou (2014) proposed a method to predict current quarter earnings, which is significantly more accurate than analysts' estimates. Motivated by their findings, we looked into constructing a number of

predictive models using similar explanatory variables<sup>1</sup> but found the results less convincing.

As a first step we fitted two econometric models: standard AR with lags 1,2,3 choosing the best one according to AIC and an automatic ARIMA model, which selects the optimal parameters using the stepwise approach outlined in Hyndman and Khandakar (2008). These models performed well for certain companies in industries such as Consumer (staples and discretionary), and poorly in industries that are more dependent on macro factors such as Energy and Materials.

To incorporate the state of the economy in the EPS forecasts, we fitted a number of machine learnings (ML) models: random forest, principal component regression and partial least squares regression. The reason behind choosing these ones is that regression and tree-based models tend to capture different aspects of the data and have different assumptions on the dependency between response and predictors (linear vs. non-linear), thus generally producing different results.

Although the ML models improved forecasting accuracy, we noticed that the predicted values captured the overall trends, but were unable to capture the extremes. To correct for the bias, we set the forecast for quarter  $q + 1$  to:

$$F_{q+1} = f_{w,q+1} + \frac{e_{w,q}}{b},$$

where  $f_{w,q+1}$  is the model that has achieved the lowest absolute error in quarter  $q$ ,  $e_{w,q}$ , and  $b$  is some constant. Applying this method decreased the error by ~8%, implying that some of the autocorrelation in the target variable has not been captured.

On average, the final ML model outperformed the Econometric one; however both methods were found inferior to analysts' forecasts (in root mean squared error sense). We showed this might be due to:

- EPS being a very noisy metric as it incorporates many idiosyncratic effects, non-cash items and one-off charges
- Analysts being able to incorporate company's guidance, which has become increasingly important after the introduction of Regulation FD in the US
- The sample of companies we used in the analysis was biased towards bigger and more successful companies, meaning that they are covered by a large number of analysts.

The automatic EPS forecasts are nonetheless useful in their own rights as they are free from idiosyncratic effects but instead capture the historical trends as well as the current economic environment.

## Conference Presentation:

### [EPS Forecasting](#)

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<sup>1</sup> Quarterly accounting data (Capex, CFO, CFF, CFI). monthly macroeconomic data (CPI, industrial production, oil price, term spread, 3-month Treasury bill yield and VIX), monthly stock returns in excess of industry ones and return volatility; the target variable is q/q change in EPS,  $\Delta EPS_q = EPS_q - EPS_{q-4}$

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## UBS Equity Quantitative Research publications

Monographs, Keys and Q-Series		Academic Research Monitor	
Title	Date	Topic	Date
<a href="#">What times the bond market?</a>	Mar-17	<a href="#">Recession and Tail Risk?</a>	Mar-17
<a href="#">Passive Opportunities for Active Managers</a>	Feb-17	<a href="#">Where does Volatility Targeting Work?</a>	Jan-17
<a href="#">Active vs Passive: How Will the World of Investing Evolve?</a>	Jan-17	<a href="#">ESG Quant Investing</a>	Dec-16
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## Valuation Method and Risk Statement

The articles in this document are based on third party research as disclosed in each piece; however, where this methodology has been applied to a dataset, full responsibility for its application and/or extrapolation is accepted by the analyst.

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.

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12-Month Rating	Definition	Coverage <sup>1</sup>	IB Services <sup>2</sup>
Buy	FSR is > 6% above the MRA.	46%	30%
Neutral	FSR is between -6% and 6% of the MRA.	38%	28%
Sell	FSR is > 6% below the MRA.	16%	18%
Short-Term Rating	Definition	Coverage <sup>3</sup>	IB Services <sup>4</sup>
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 31 March 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.

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