Deutsche Bank
Markets Research

North America
United States

Quantitative Strategy
The Quant View

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Updating our best quant ideas

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Quantitative macro and micro forecasts for the month

In this report we present our latest quantitative forecasts for the coming month. Our models are designed to generate both bottom-up stock selection ideas as well as top-down asset, country, and style allocation calls.

The end of free money?

The prospect of quantitative easing coming to an end has roiled markets. In this report we look at how quant factors have reacted around the May 22nd and June 19th Fed commentary.

Tools for surviving volatile markets

It turns out factor performance was a mixed bag around these dates, and indeed quite unpredictable. With this in mind we revisit our Variance Risk Premium (VRP) indicator as a useful tool for gauging future market direction and risk appetite. Currently it is taking on a bearish stance.

Low volatility stages a comeback

The new wave of risk aversion has seen Low Volatility spring back to life. We update our crowding analysis and find that naïve low volatility strategies are still looking crowded, but the minimum variance portfolio is looking much less crowded following the major sell-off in April and May.

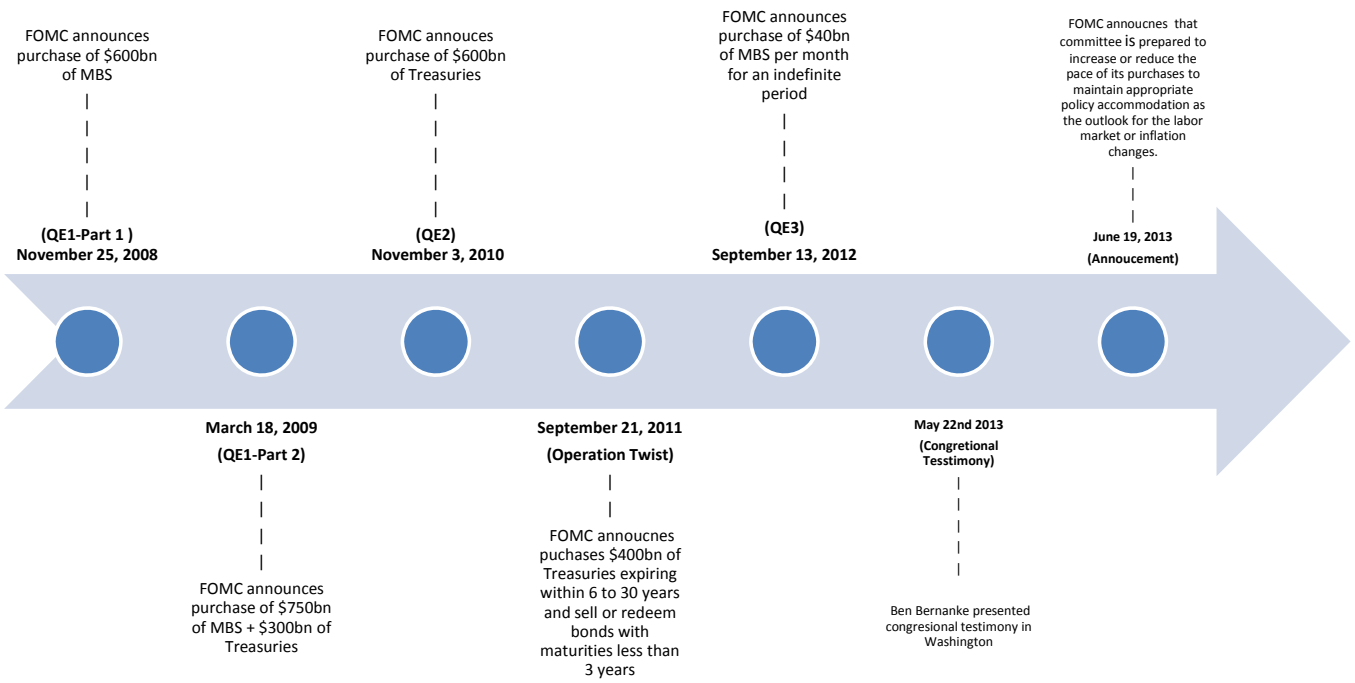
Quantifying markets

A quant's guide to the end of quantitative easing

The end of free money?

Markets were roiled this month with the realization that the age of quantitative easing (QE) may be coming to an end. On May 22nd Bernanke's Congressional testimony offered the first hint of things to come, and then on June 19th comments from the FOMC were interpreted as a clear signal that the days of QE are numbered. Equity markets were unimpressed.

Figure 1: Timeline of QE announcements



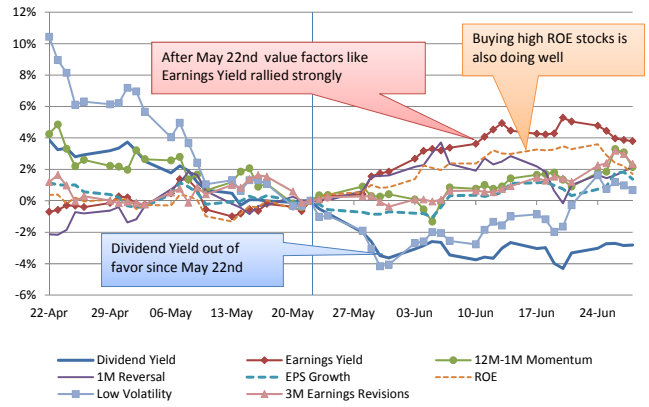
Source: Bloomberg Finance LLP, Deutsche Bank

In our past research, we have studied the impact of QE1, QE2, "operation twist", and QE3 on the performance of quant factors.[1] We found that in general each new episode of liquidity injection led to a strong rally in quant strategies that were tilted towards higher volatility names. In this note we take a quick look at whether the opposite applies when liquidity is removed (or at least when the market believes liquidity will be removed in the future).

Figure 2 shows the performance of some representative quant strategies around Bernanke's testimony on May 22nd, and Figure 3 shows the same for June 19th.

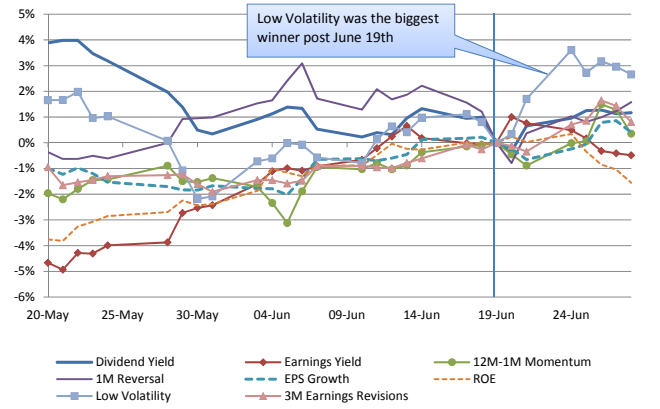
[1] Jussa et al., 2012, "Emerging Issues: QUANTitative easing", *Deutsche Bank Quantitative Strategy*, 28 September 2012

Figure 2: Russell 1000 factor performance around May 22nd



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 3: Russell 1000 factor performance around June 19th



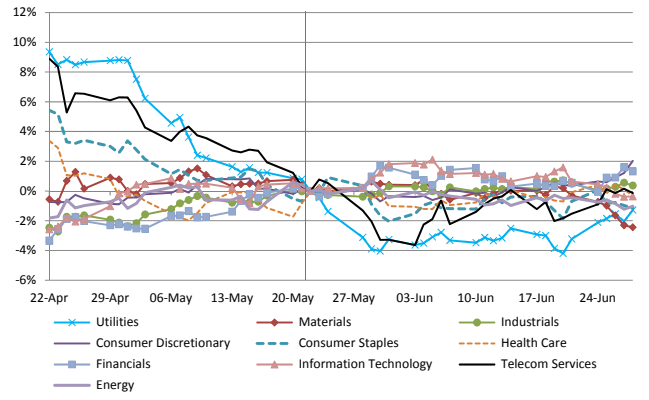
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Leading into the May testimony, Low Volatility was underperforming quite severely (Figure 2). After May 22nd it continued to fall for another week, but then turned around strongly. Dividend Yield was also sliding prior to the testimony. After the announcement, it stabilized but has not really shown the rally that Low Volatility has. Noteworthy winners after May 22nd have been Earnings Yield and ROE.

Turning to the events of June 19th, it is interesting to note that Low Volatility had a strong rally in the first few days afterwards, but ROE and Earnings Yield slipped a little. Surprisingly, Dividend Yield actually moved up, despite conventional wisdom that high yield names should suffer as they lose relative attractiveness compared to bonds.

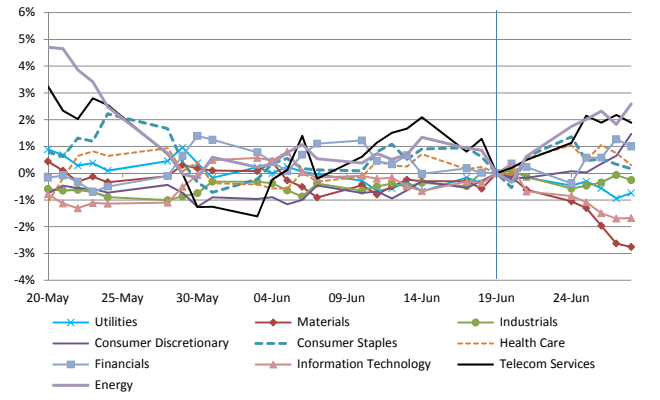
Figure 4 and Figure 5 shows the relative sector performance around both dates. We see a number of similar features. For example, Utilities were underperforming significantly prior to May 22nd, but then stabilized afterwards (c.f. Low Volatility, which of course contains a big sector tilt towards Utilities). After June 19th, Energy and Telecommunication Services have done best while Materials and Information Technology have lagged.

Figure 4: Relative sector performance around May 22nd



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 5: Relative sector performance around June 19th



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

So what does it all mean?

Looking at the past can be interesting, but only to the extent that it helps to inform the future. The charts above are a mixed bag, and while we could probably come up with

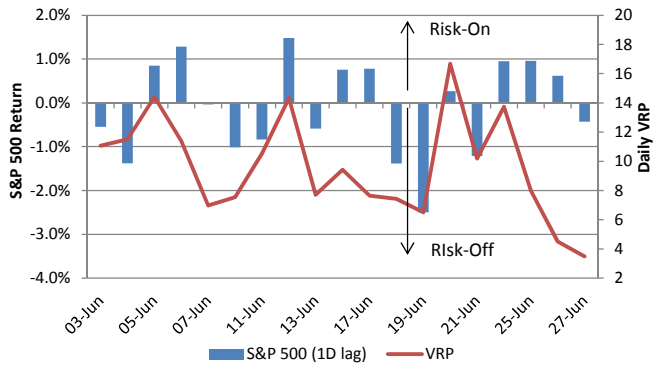
some stories as to why factors did this and that, we don't think that is a particularly productive approach. We think the key message is that, as usual, understanding a factor's exposure to changes in risk sentiment is crucial. Of all the styles, Low Volatility has been the one most impacted by the general risk aversion that has returned with the (assumed) end of QE. The events of June illustrate the importance of systematic tools to monitor the risk environment. Which brings us back to one of our favorite topics, the Variance Risk Premium.

A tool for surviving a volatile world

First, a quick refresher: our Variance Risk Premium (VRP) indicator is a contrarian indicator that measures market overreaction and underreaction to realized risk. In simple terms, VRP is the difference between options-implied risk (i.e. the VIX index) and realized risk (i.e. the actual risk in the market measured historically over the last month). If VRP is high, we see this as a buying opportunity for risky assets, like equities and high yield bonds. Why? The intuition is as follows. When VRP is high, VIX has typically shot up dramatically (i.e. the market is in panic mode). At the same time, realized risk has probably also risen, but not to the same extent. In other words, the market has overreacted relative to what the actual, realized data is telling us. Our research shows that such episodes are good buying opportunities for risky assets on about a three month horizon.[2] On the other hand, when VRP is low, it tends to be a complacency indicator: investors are failing to price in rising realized risk in the market, and as a result we should be selling risky assets like equities.

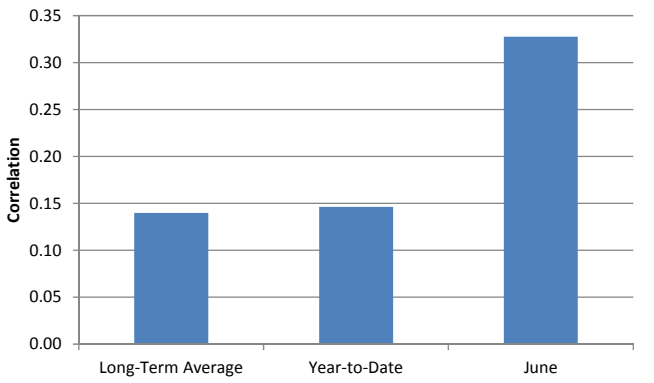
In ordinary circumstances we tend to watch the VRP at a monthly frequency. However, the end of the greatest liquidity injection in the history of markets is not exactly ordinary. Whenever there is elevated volatility in the market, the daily VRP indicator can be a useful tactical market timing tool. Figure 6 shows the daily VRP overlaid with day-ahead S&P 500 returns. It turns out it did quite a good job of giving a read on the following day's market move.

Figure 6: Daily VRP and next day S&P 500 returns



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 7: Time-series correlation between daily VRP and next day S&P 500 returns

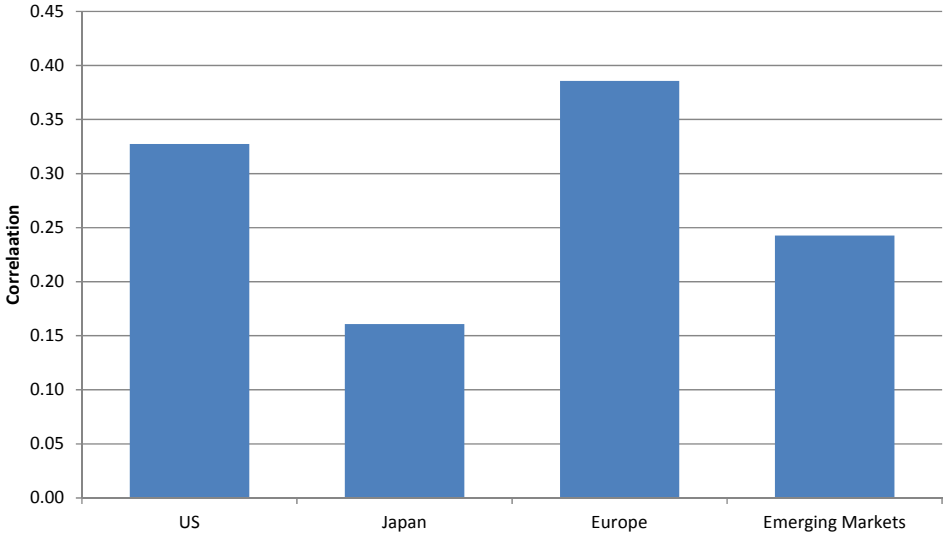


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

In fact, the normal time-series correlation between daily VRP and day-ahead market returns is around 15%, but in June that shot up to over 30% (Figure 7). The same is true for other markets – see Figure 8.

[2] For more details on the VRP, including our backtesting work, see: Luo et al., 2011, "Signal Processing: Quant Tactical Asset Allocation (QTAA)", *Deutsche Bank Quantitative Strategy*, 19 September 2011.

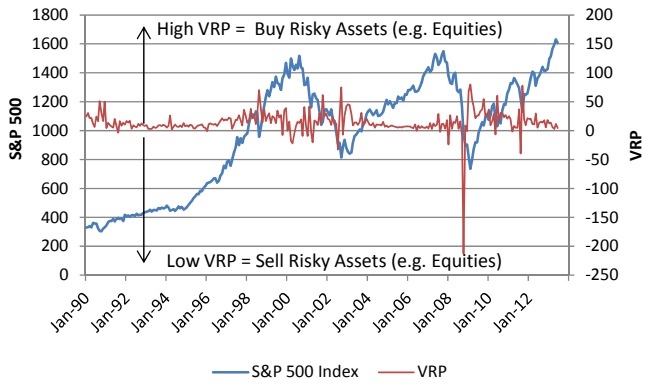
Figure 8: Time-series correlation between daily VRP and next day market returns in different markets during June 2013



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

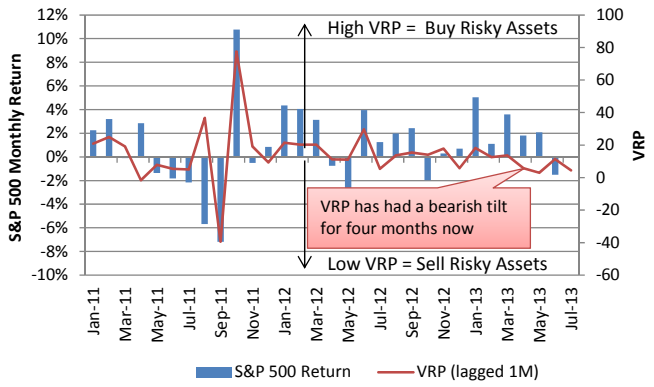
Zooming out to our monthly VRP, Figure 10 shows the indicator over the past 2.5 years. Currently the reading is 4.4, compared to a long-term average of 14.3. Interestingly, it has been tracking below average for the past four months now, which on balance indicates a bearish stance for future market returns.

Figure 9: Variance Risk Premium (VRP)



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 10: Recent VRP (lagged) and market returns



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

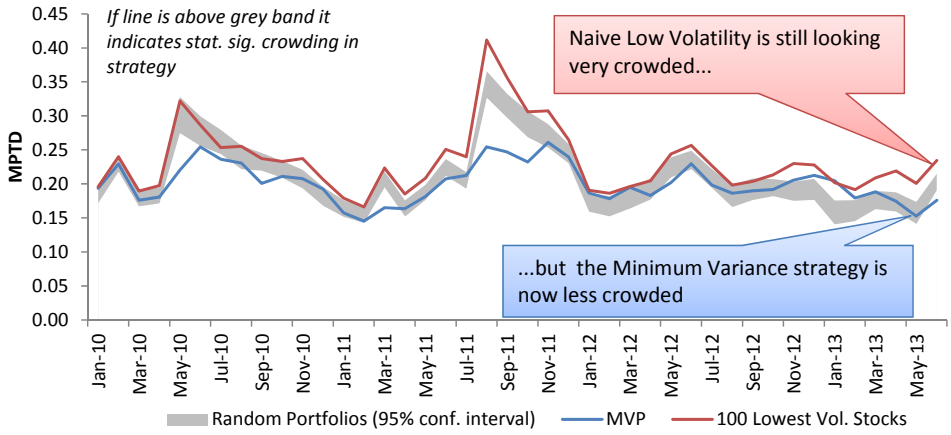
Macro update

Crowding in the low volatility strategy

In the May edition of this report, we argued that the Low Volatility/High Yield trade was looking crowded. That turned out to be a good call. Over the following month the Low Volatility strategy was down 11% and Dividend Yield fell 6%. However, as we saw in the previous section, both strategies are starting to bounce back. Now a common question we get from our clients is whether this is a good time to re-enter these strategies?

Figure 11 shows crowding in two versions of the Low Volatility strategy. The red line is a simple strategy that buys the 100 lowest volatility stocks in the Russell 1000. The blue line is the minimum variance portfolio. If the line is *above* the grey shaded band, that indicates there is statistically significant crowding in that strategy.[3] Interestingly, there has been a divergence between the two strategies in recent months: the naïve low volatility strategy (red line) is still showing elevated crowding, but the minimum variance portfolio (blue line) is not.

Figure 11: Crowding in low volatility strategies



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

This actually confirms something we think is important but often neglected: portfolio construction matters and it matters a lot. Both strategies above are ways of accessing the low volatility theme, but the crowdedness of the two strategies is very different. In our recent "Handbook of Portfolio Construction" paper we elaborate on better ways to build portfolios, which focus specifically on ways to mitigate crowding and downside risk.[4]

Therefore, the answer to whether now is a good time to get back into low volatility is not as straightforward as it appears. The empirical evidence suggests that naïve low volatility exposure is still quite crowded, whereas more sophisticated strategies like the minimum variance portfolio are looking more attractive. In investing, simple is often

[3] Our crowding measure is based on the idea that correlation among a basket of stocks that is crowded will be higher than the market on average. For complete methodology, see: Cahan et al., 2012, "The Risk in Low Risk", *Deutsche Bank Quantitative Strategy*, 19 July 2012.

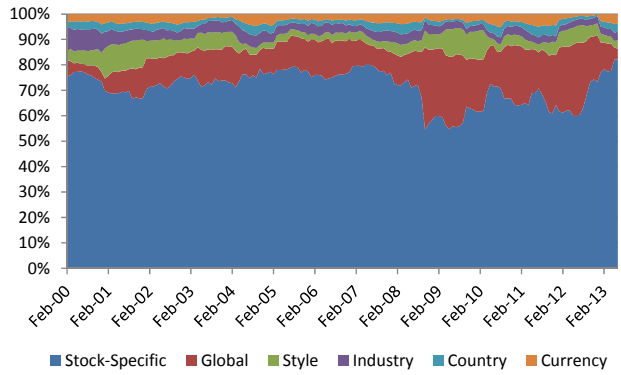
[4] Luo et al., 2013, "DB Handbook of Portfolio Construction, Part 1", *Deutsche Bank Quantitative Strategy*, 30 May 2013.

best, but in our view this is a case where the extra effort on the portfolio construction side will pay off.

The opportunity set for investors

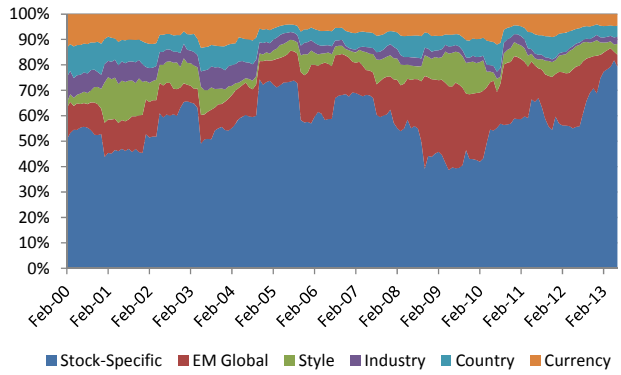
Another metric we keep a close eye on is the so-called "opportunity set" for investors. Think of this as the total alpha on the table. Our main interest is to understand what is driving that opportunity, because this can allow us to position our strategies to pick in the orchard with the juiciest fruit. In Figure 12 we show the opportunity set for global equity investors, and in Figure 13 we show the same thing for emerging market equity investors.

Figure 12: Global opportunity set



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 13: Emerging markets opportunity set



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

The key result is the size of the blue portion relative to the other colors. The blue represents the opportunity explained by stock selection, whereas we can think of the other colors as representing the opportunity from top-down calls like picking the right countries, industries, and styles. When the financial crisis exploded in 2008, we moved into a much more macro-dominated world. As a result, the portion of overall opportunity that could be explained by individual company characteristics (e.g. valuation, growth profile, earnings quality, etc.) shrunk sharply; no one cared if a stock looked good on fundamentals if it was exposed to Europe for example. Needless to say, such an environment was challenging for quants and non-quants alike, since both camps tend to use stock specific information to differentiate between stocks.

In the past year, however, things have improved dramatically. The good news is that both charts show that bottom-up stock picking is making a strong comeback. The blue area in both the global and emerging markets charts has reached levels last seen in 2007. The bad news is that in the last month, we saw quite a contraction in stock selection opportunity (masked a little in the charts because we smooth these using a 12-month moving average). This contraction was driven by the sharp shift in focus back to the macro world, specifically concerns around the loss of simulative demand from QE.[5]

Once again, we would reiterate that in a world where stock-picking opportunity is diminishing, top-down metrics like the VRP are an excellent way to bring a macro flavor into one's investment process. In the period from 2008-2012 (i.e. the period

[5] For technical details on our definition of the opportunity set, see: Alvarez et al., 2012, "Portfolios Under Construction: Correlation and Opportunity", *Deutsche Bank Quantitative Strategy*, 24 January 2012.

corresponding to low stock selection opportunity in the charts above) the VRP did a good job of helping to navigate the risk-on/risk-off shifts that are common in a macro-dominated investing environment.

The DB Quant Dashboard

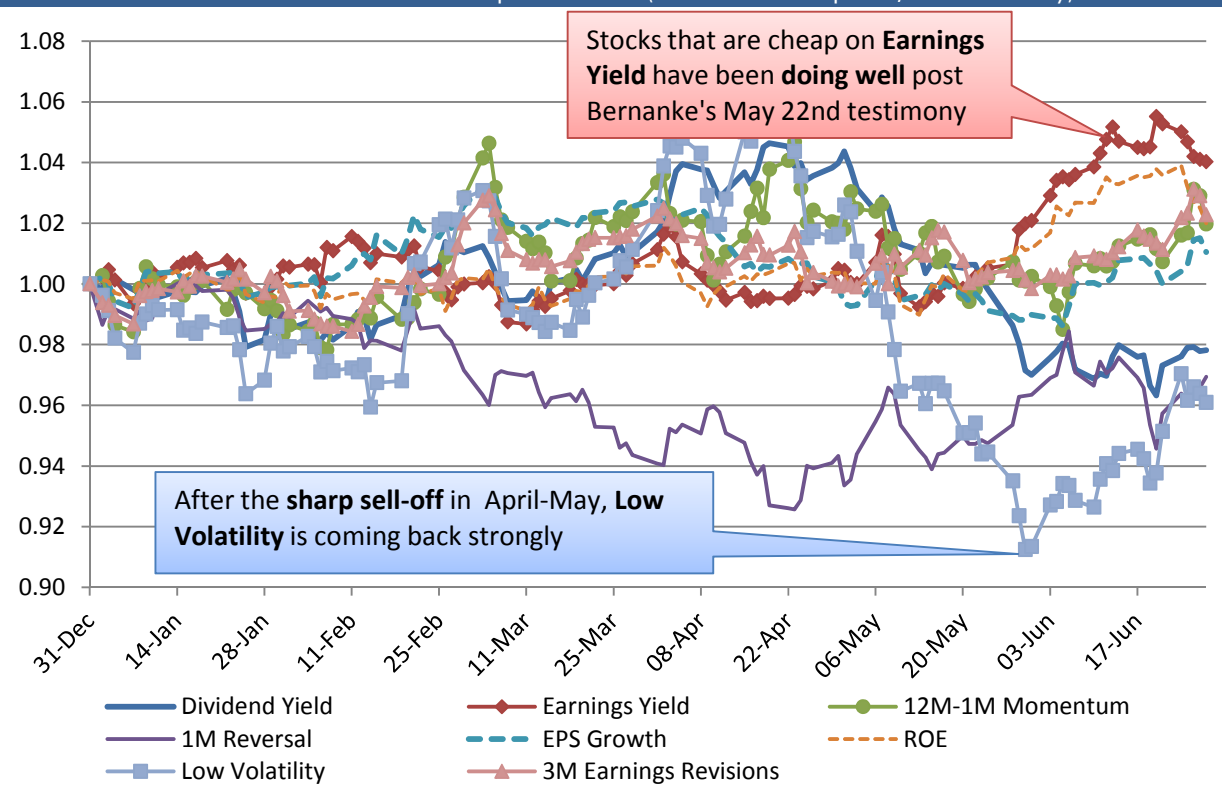
Which styles have been working around the world?

The DB Quant Dashboard is an easy-to-use cheat sheet that shows which styles have been working in key markets around the world. We track cumulative factor performance year-to-date, and highlight what we think are the noteworthy observations in each region. For those who prefer the previous tabular format (which includes more factors), you can find those results in the Appendix.

For more details see our website

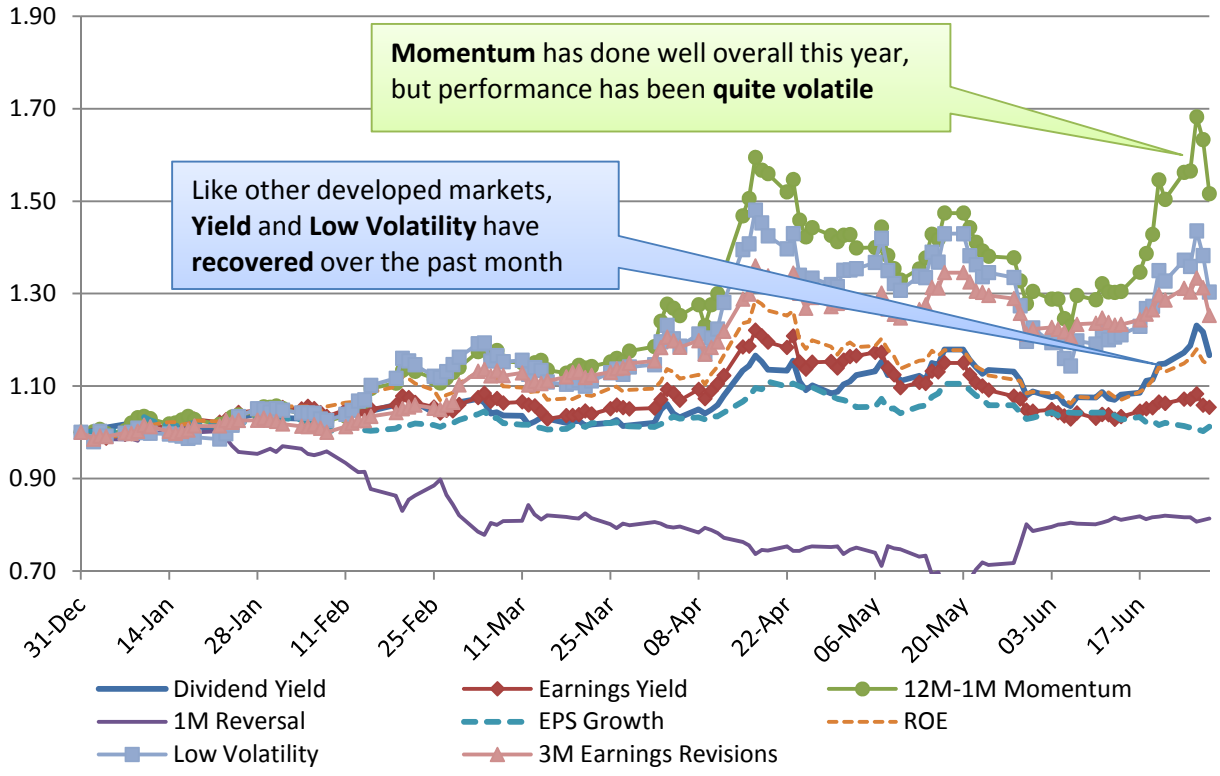
For the most recent daily factor performance, as well as factor performance delineated by different universes (e.g. large cap, small cap) and regions, please see our Global Quantitative Strategy website at https://eqindex.db.com/gqs/. Note that you need a username and password to log on to this website. If you don't have login details, please contact us at DBEQS.Americas@db.com and we'd be happy to set you up.

Figure 14: United States: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



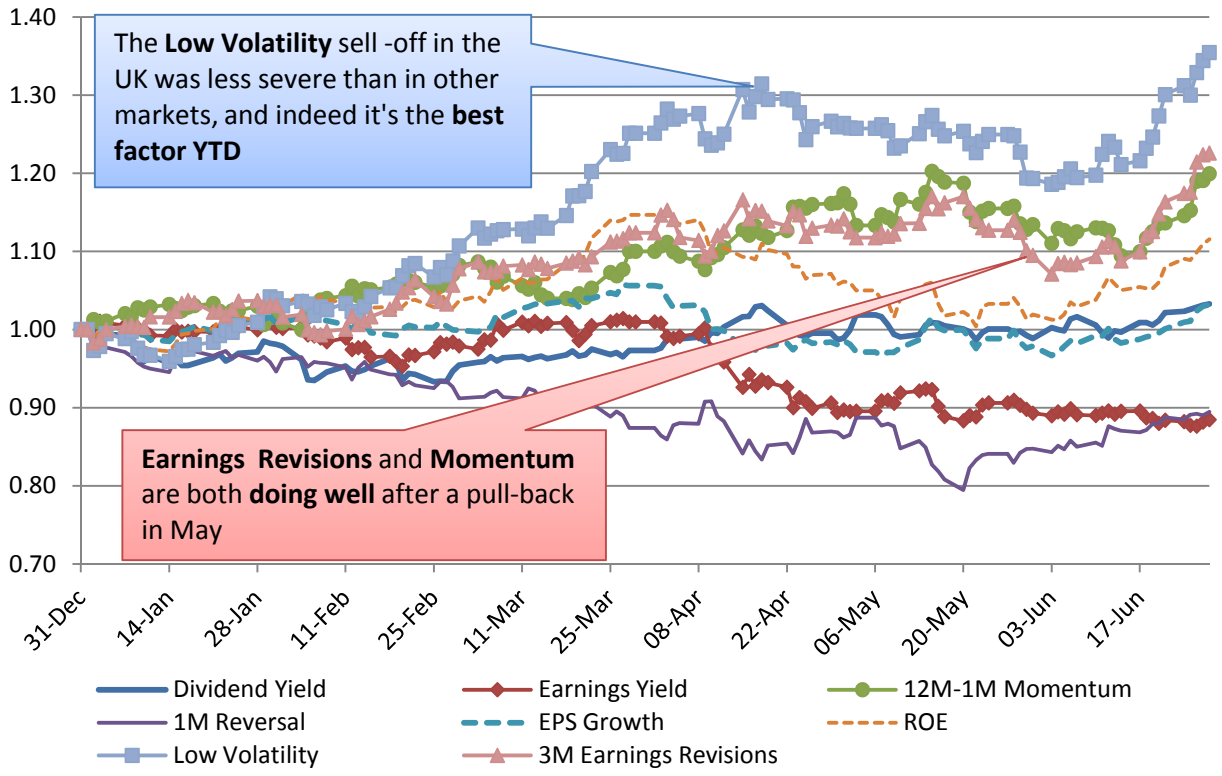
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 15: Canada: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



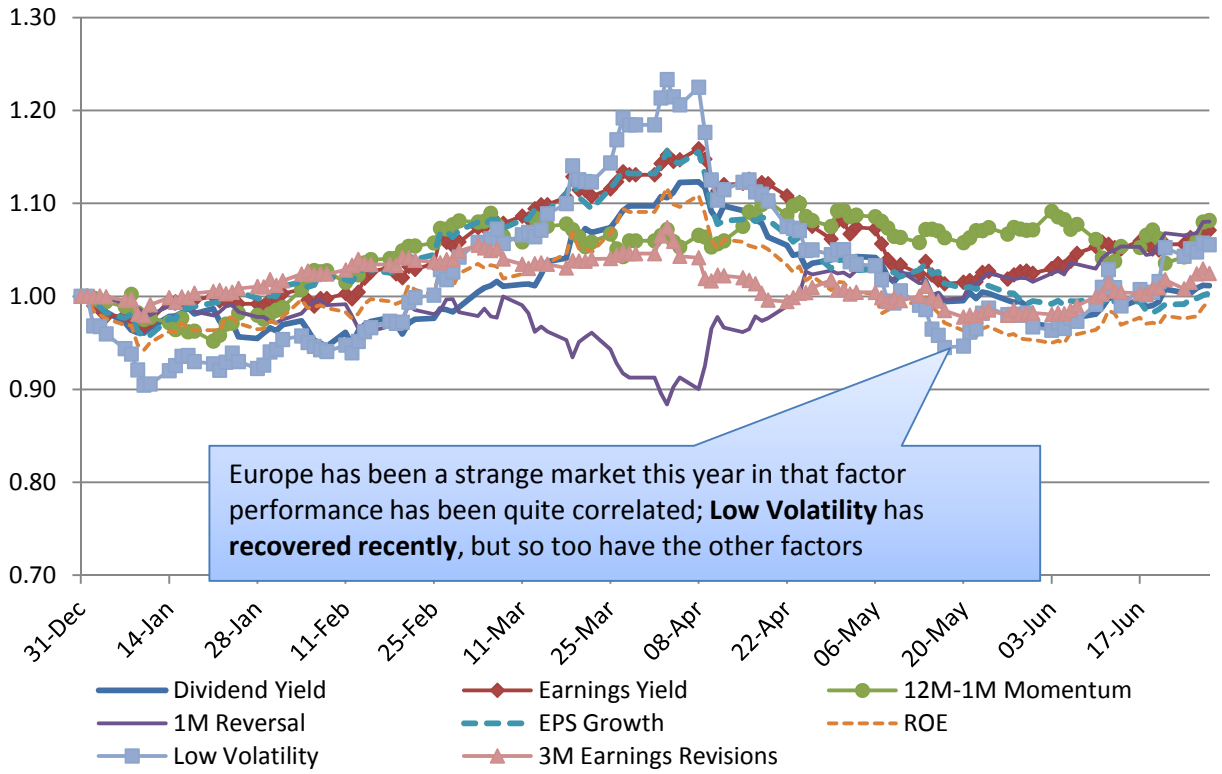
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 16: United Kingdom: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



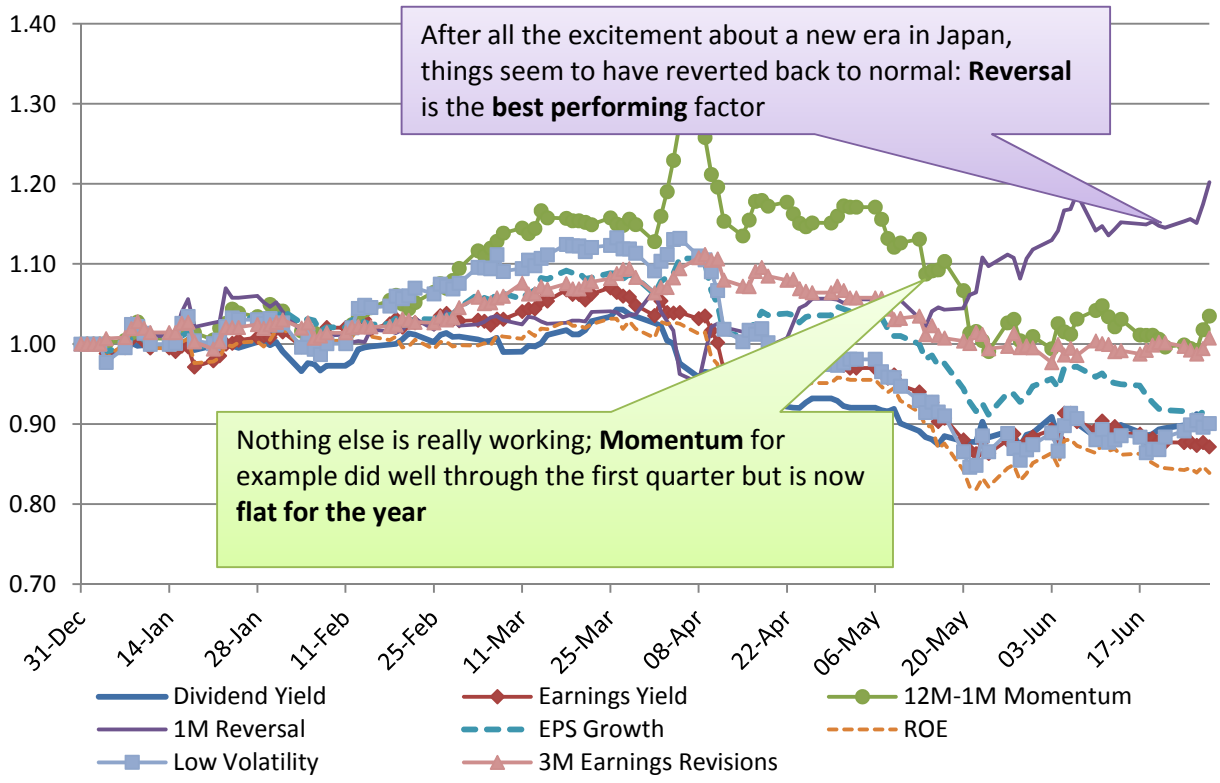
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 17: Europe ex UK: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



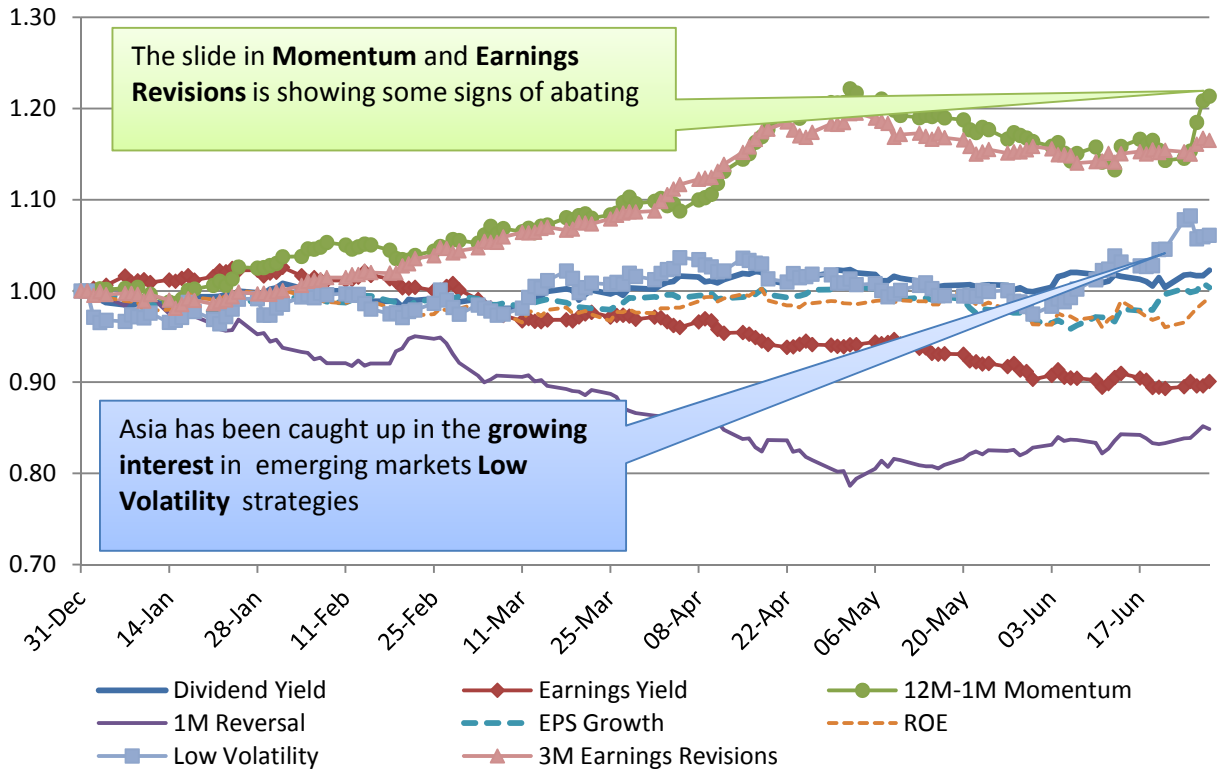
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 18: Japan: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



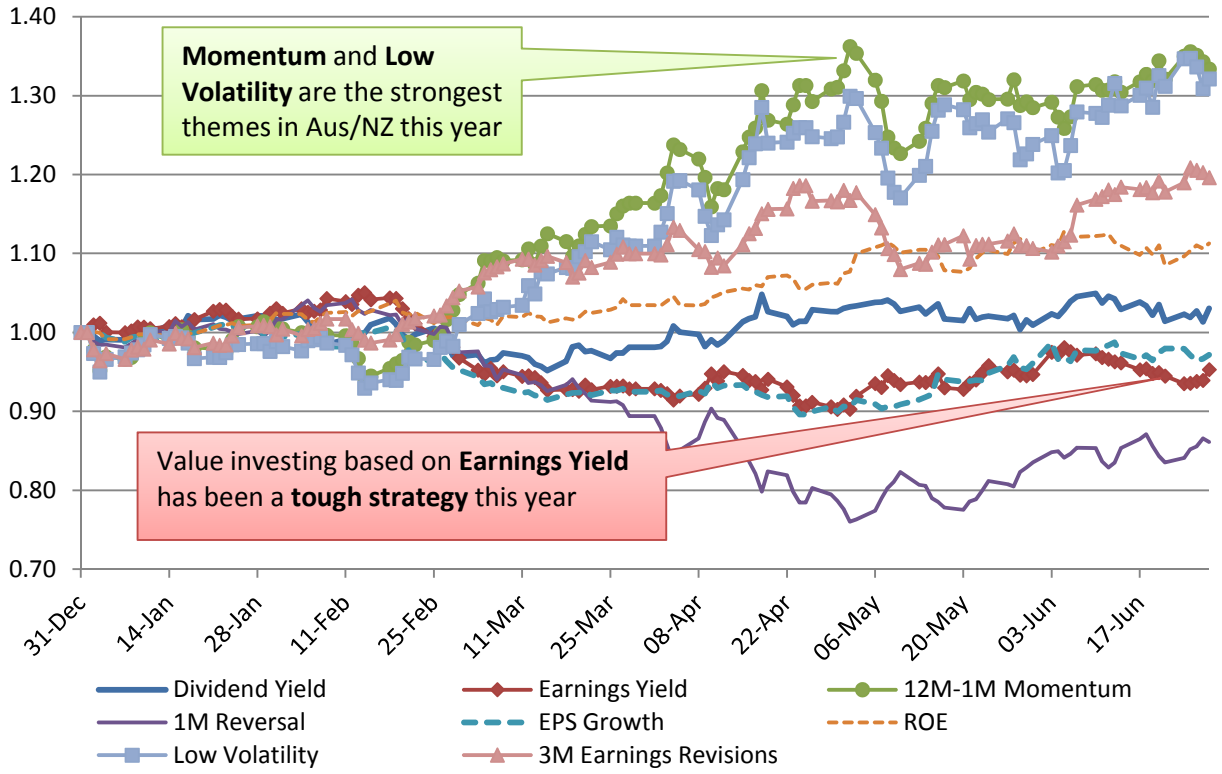
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 19: Asia ex Japan: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



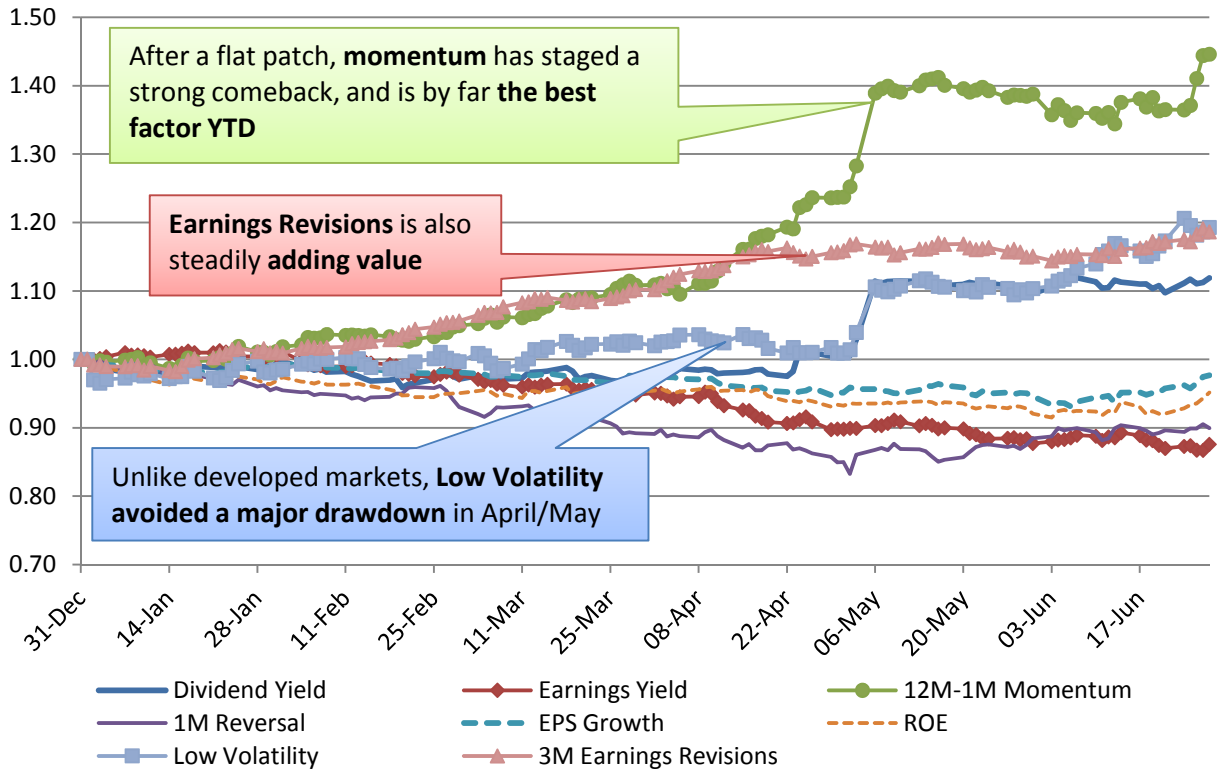
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 20: Australia/New Zealand: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 21: Emerging Markets: YTD cumulative factor performance (Q10-Q1 return spread, local currency)



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Bottom-up stock selection

QCD U.S. stock selection model

- The QCD model is our flagship stock selection model for U.S. equities.
- The model incorporates a number of unique features including dynamic factor selection, a non-linear TREE component, and active style and sector rotation.
- For complete details on the model, please see Luo et al., "QCD Model: DB Quant Handbook", 22 July 2010.

Current stock recommendations

Figure 22 shows the best 20 buy ideas and sell ideas from today's model. Note that a complete ranking for all Russell 3000 stocks is available in spreadsheet format. If you would like to get a copy of the spreadsheet, please contact us at DBEQS.Americas@db.com.

Figure 22: Current QCD model stock recommendations

BEST BUY IDEAS (SECTOR NEUTRAL)

Ticker	Name	CUSIP	GICS Sector	QCD Score (higher is better long)
SRI	STONERIDGE INC	86183P102	Consumer Discretionary	14.7%
ABC	AMERISOURCEBERGEN CORP	03073E105	Health Care	14.3%
DLPH	DELPHI AUTOMOTIVE PLC	G27823106	Consumer Discretionary	13.7%
NFP	NATIONAL FINANCIAL PRTNRS CP	63607P208	Financials	13.5%
TREE	TREE.COM INC	894675107	Financials	13.0%
COIX	COLEMAN CABLE INC	193459302	Industrials	12.8%
RUSHA	RUSH ENTERPRISES INC	781846209	Industrials	11.2%
AES	AES CORP	00130H105	Utilities	10.9%
CL	COLGATE-PALMOLIVE CO	194162103	Consumer Staples	10.6%
OMI	OWENS & MINOR INC	690732102	Health Care	10.4%
ADM	ARCHER-DANIELS-MIDLAND CO	039483102	Consumer Staples	10.1%
INT	WORLD FUEL SERVICES CORP	981475106	Energy	9.3%
MPC	MARATHON PETROLEUM CORP	56585A102	Energy	9.0%
CNP	CENTERPOINT ENERGY INC	15189T107	Utilities	8.7%
VG	VONAGE HOLDINGS CORP	92886T201	Telecommunication Services	6.4%
WOR	WORTHINGTON INDUSTRIES	981811102	Materials	5.1%
MSFT	MICROSOFT CORP	594918104	Information Technology	4.6%
GPK	GRAPHIC PACKAGING HOLDING CO	388689101	Materials	4.3%
CBR	CIBER INC	171638102	Information Technology	3.3%
IDT	IDT CORP	448947507	Telecommunication Services	2.7%

BEST SELL IDEAS (SECTOR NEUTRAL)

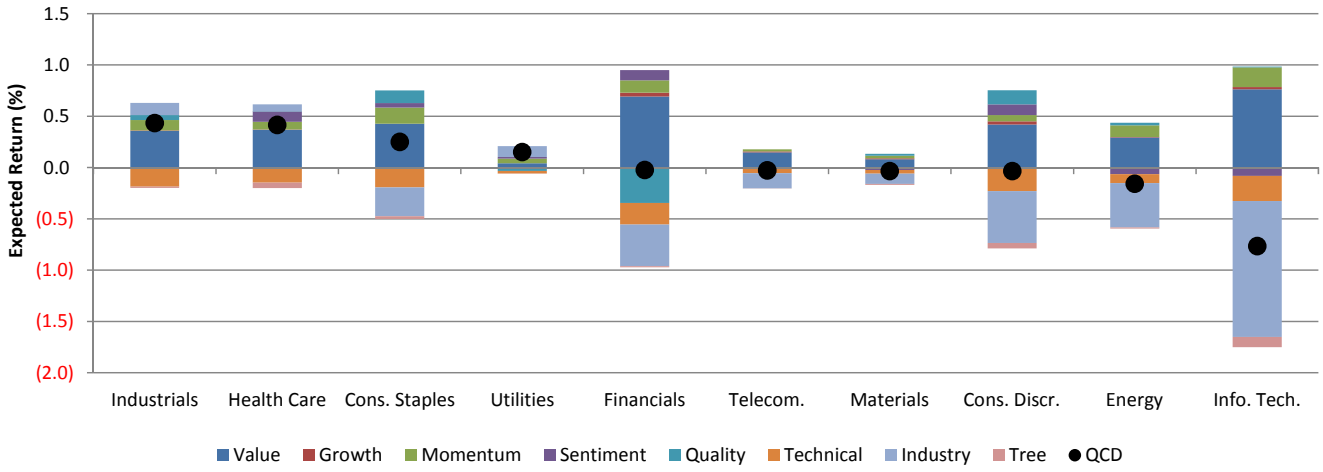
Ticker	Name	CUSIP	GICS Sector	QCD Score (lower is better short)
STEC	STEC INC	784774101	Information Technology	-39.4%
RBCN	RUBICON TECHNOLOGY INC	78112T107	Information Technology	-37.5%
ETRM	ENTEROMEDICS INC	29365M208	Health Care	-35.8%
CERE	CERES INC	156773103	Energy	-35.2%
AUMN	GOLDEN MINERALS CO	381119106	Materials	-33.6%
URZ	URANERZ ENERGY CORP	91688T104	Energy	-33.4%
TAHO	TAHOE RESOURCES INC	873868103	Materials	-32.6%
ZIOP	ZIOPHARM ONCOLOGY INC	98973P101	Health Care	-31.4%
TWER	TOWERSTREAM CORP	892000100	Telecommunication Services	-28.7%
MNTG	MTR GAMING GROUP INC	553769100	Consumer Discretionary	-24.8%
GNK	GENCO SHIPPING & TRADING	Y2685T107	Industrials	-24.5%
ZAGG	ZAGG INC	98884U108	Consumer Discretionary	-23.9%
WAC	WALTER INVESTMENT MGMT CORP	93317W102	Financials	-23.8%
CLWR	CLEARWIRE CORP	18538Q105	Telecommunication Services	-23.5%
GSVC	GSV CAPITAL CORP	36191J101	Financials	-22.5%
AMSC	AMERICAN SUPERCONDUCTOR CP	030111108	Industrials	-22.4%
NGVC	NATURAL GROCERS VITAMIN CTGE	63888U108	Consumer Staples	-19.3%
BDBD	BOULDER BRANDS INC	101405108	Consumer Staples	-17.4%
AT	ATLANTIC POWER CORP	04878Q863	Utilities	-16.1%
CDZI	CADIZ INC	127537207	Utilities	-13.1%

Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Current sector recommendations

The QCD model also implicitly makes sector predictions. Figure 23 shows the current ranking of the 10 GICS Level 1 Sectors, ranked from best (most likely to outperform this month) to worse (least likely to outperform). The bars show the key drivers for each call.

Figure 23: Current QCD sector recommendations

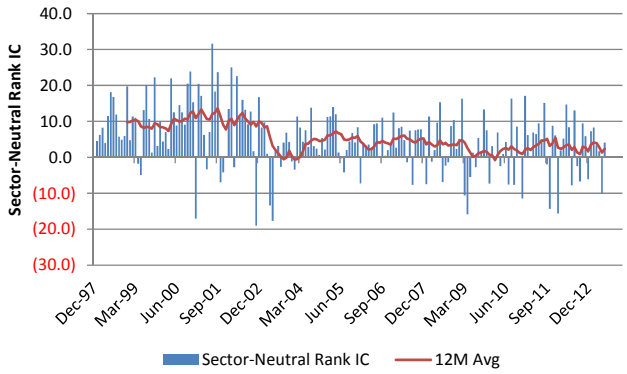


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Model performance

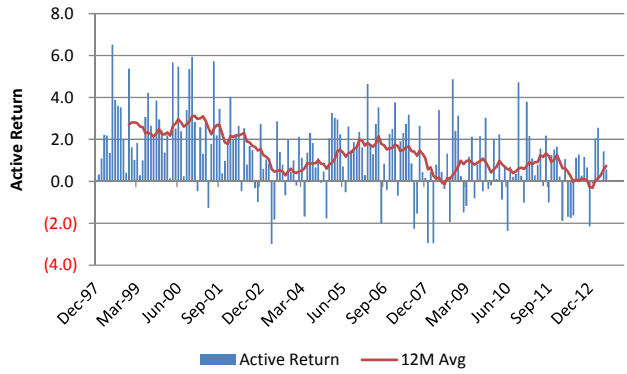
The QCD model has performed well since inception. Figure 24 shows the pure signal performance, measured as a monthly sector-neutral rank information coefficient (IC). Figure 25 shows the performance of an actual model portfolio, after costs, based on a realistically optimized market-neutral strategy.

Figure 24: Model performance, sector-neutral rank IC



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

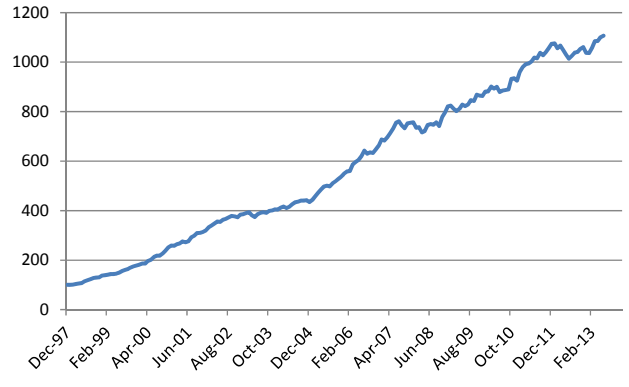
Figure 25: Model portfolio active return, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

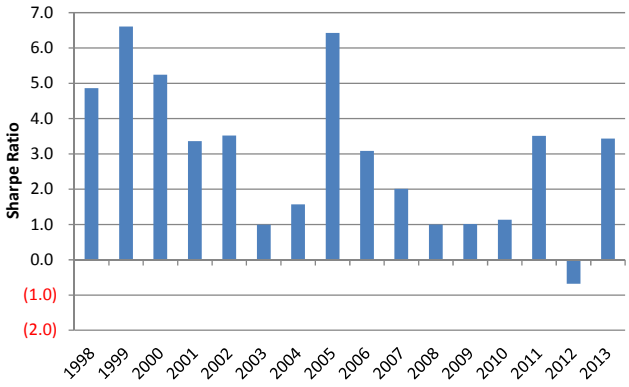
Figure 26 shows the cumulative performance of the optimized strategy, and Figure 27 shows the annualized Sharpe ratio (after costs) by calendar year.

Figure 26: Model portfolio cumulative, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 27: Annualized Sharpe ratio, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

N-LASR global stock selection model

- The N-LASR model is our flagship stock selection model for global equities.
- The model is based on a machine learning algorithm called AdaBoost, and is designed to adaptively learn which factors to use, often in a non-linear way.
- For complete details on the model, please see Wang et al., "Signal Processing: The Rise of the Machines", 5 June 2012.

Current stock recommendations

Figure 28 shows the best 20 buy ideas and sell ideas from today's model. Note that a complete ranking for all global stocks is available in spreadsheet format. If you would like to get a copy of the spreadsheet, please contact us at DBEQS.Americas@db.com.

Figure 28: Current N-LASR model stock recommendations

BEST BUY IDEAS

Ticker	Name	SEDOL	County	N-LASR Score (higher is better long)
MIC.	GENWORTH MI CANADA INC	B3NWJQ2	Canada	2.19
811 HK	Sichuan Xinhua Winshare Chainstore Co Ltd	B1XCJB	China	2.13
WPP LN	WPP Plc	B8KF9B	UK	2.06
RWT	REDWOOD TRUST INC	2730877	USA	2.04
API AU	Australian Pharmaceutical Ind	600284	Australia	2.02
CGF AU	Challenger Limited	672630	Australia	2.01
NAB AU	National Australia Bank Ltd	662460	Australia	2.00
AJA AU	Astro Japan Property Group	B06HD8	Australia	2.00
2685 JT	Point Inc	630001	Japan	1.99
017670 KS	SK Telecom Co Ltd	622487	Korea	1.99
AUSS NO	Austevoll Seafood ASA	B16MKT	Norway	1.98
CM.	CANADIAN IMPERIAL BANK	2170525	Canada	1.97
HCC	HCC INSURANCE HOLDINGS INC	2400426	USA	1.97
AH NA	Ahold NV	525260	Netherlands	1.97
IFL AU	Ioof Hldgs Ltd	671439	Australia	1.96
XL	XL GROUP PLC	B5LRLL2	USA	1.95
BOQ AU	Bank of Queensland Ltd	607624	Australia	1.95
F	FORD MOTOR CO	2615468	USA	1.94
3988 HK	Bank of China Ltd H Shares	B15456	China	1.93
6436 JT	Amano Corp	602730	Japan	1.92

BEST SELL IDEAS

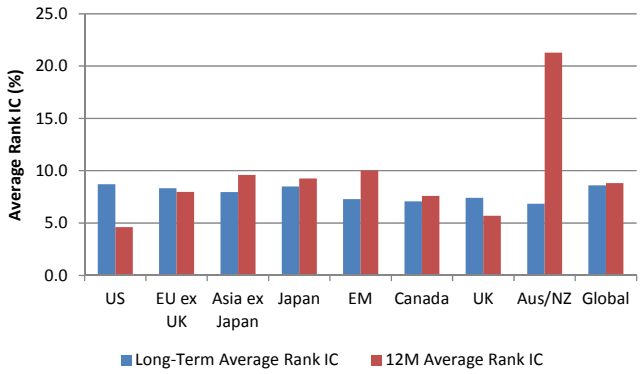
Ticker	Name	SEDOL	County	N-LASR Score (lower is better short)
5727 JT	Toho Titanium Co	689462	Japan	-2.52
MACK	MERRIMACK PHARMACEUTICALS	B72XX62	USA	-2.47
IDIX	IDENIX PHARMACEUTICALS INC	2877536	USA	-2.40
3406 TT	Genius Electronic Optical	B059SR	Taiwan	-2.35
UAMY	U S ANTIMONY CORP	2910668	USA	-2.34
LANCI IB	Lanco Infratech Ltd	B1BQS3	India	-2.32
BKIA SM	Bankia SA	B9FLK4	Spain	-2.31
SBS GY	Stratec Biomedical AG	457918	Germany	-2.30
ARCHER NO	Archer Ltd	B2850B	Norway	-2.29
MHR	MAGNUM HUNTER RESOURCES COF	2850979	USA	-2.28
IVG GY	IVG Immobilien AG	574037	Germany	-2.26
2158 JT	Ubic Inc	B1Y4DN	Japan	-2.25
DML AU	Discovery Metals Ltd	671178	Australia	-2.24
KNMG MK	KNM Group Bhd	B02JY4	Malaysia	-2.23
TNK	TEEKAY TANKERS LTD	B29VHY0	USA	-2.22
DNDN	DENDREON CORP	2602545	USA	-2.21
GNK	GENCO SHIPPING & TRADING	B0DPJS2	USA	-2.21
LCB PM	Lepanto Consolidated Mining B	651290	Philippines	-2.20
HRTP3 BS	HRT Participacoes em Petroleo S.A.	B4LW4N	Brazil	-2.20
ATRS	ANTARES PHARMA INC	2383163	USA	-2.19

Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Model performance

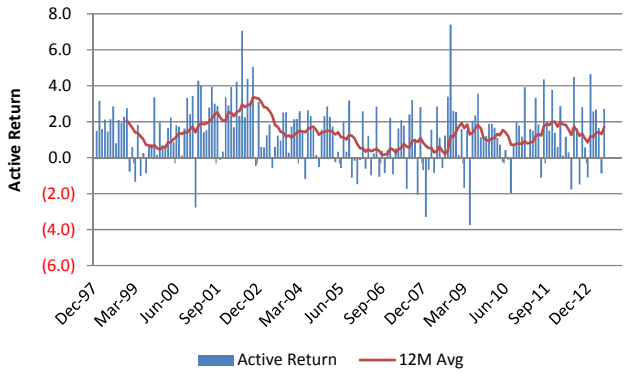
The N-LASR model has performed well since inception. Figure 29 shows the average pure signal performance, measured as a monthly rank information coefficient (IC), in different regions. Figure 30 shows the performance of a global model portfolio, after costs, based on a realistically optimized market-neutral strategy.

Figure 29: Regional model performance, average rank IC



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

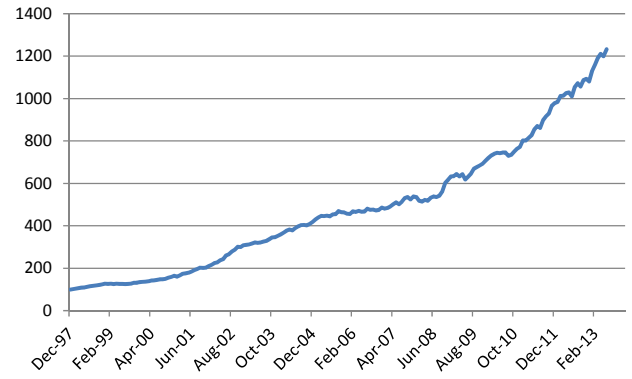
Figure 30: Global portfolio active return, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

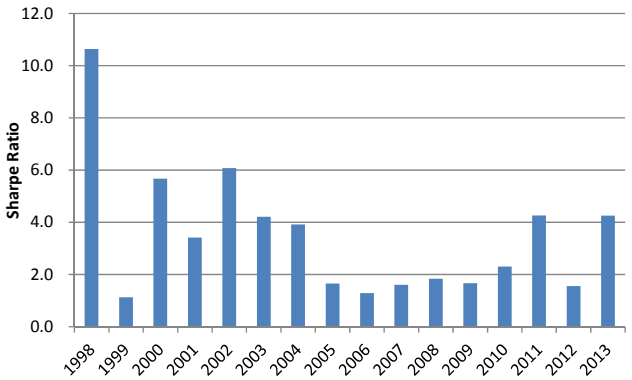
Figure 31 shows the cumulative performance of the optimized strategy, and Figure 32 shows the annualized Sharpe ratio (after costs) by calendar year.

Figure 31: Global portfolio cumulative, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 32: Annualized Sharpe ratio, after costs



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Top-down country rotation

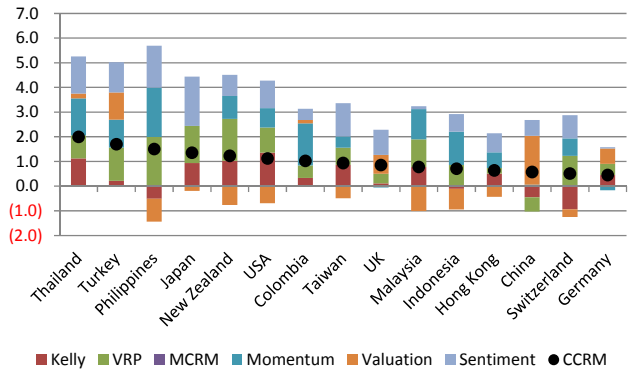
CCRM country rotation model

- Our Composite Country Rotation Model (CCRM) uses three sets of inputs to dynamically rotate between countries in the MSCI All Country World Index.
- The inputs include top-down macro signals (e.g. VRP, Kelly's Tail Risk), aggregate bottom-up fundamental signals (e.g. country-level valuation and momentum), and lead-lag signals based on economic trade linkages.
- For complete details on the model, please see Luo et al., "Signal Processing: New Insights in Country Rotation", 9 February 2012.

Current recommendations

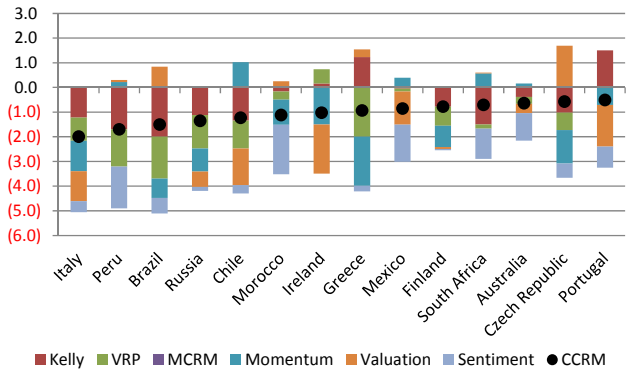
Figure 33 and Figure 34 show the top and bottom third of countries, as ranked currently by our CCRM model. The bars show what is driving these calls.

Figure 33: Top tercile countries



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 34: Bottom tercile countries

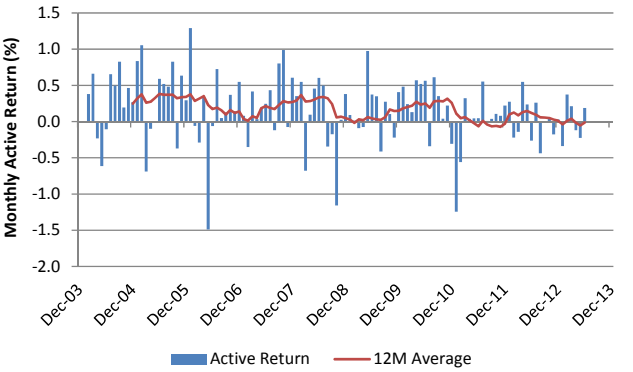


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Model performance

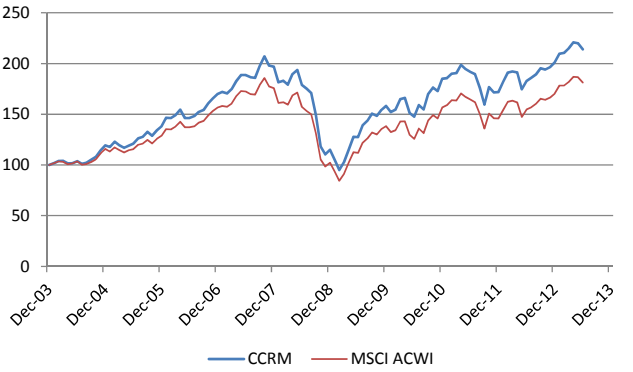
Figure 35 and Figure 36 show the performance of the model over time.

Figure 35: Monthly returns



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 36: Cumulative performance



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Top-down asset allocation

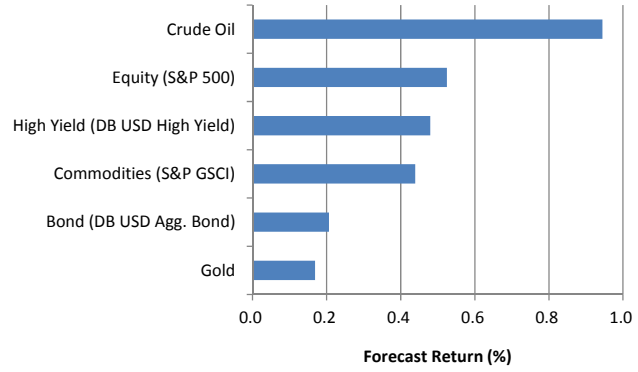
Quant Tactical Asset Allocation (QTAA) model

- Our Quantitative Tactical Asset Allocation (QTAA) model uses a model-of-models methodology to rotate between six asset classes.
- The model uses a wide range of fundamental and market-based factors as inputs, and dynamically selects a subset of those factors to use at each point in time.
- For complete details on the model, please see Luo et al., "Signal Processing: Quant Tactical Asset Allocation", 19 September 2011.

Current recommendations and performance

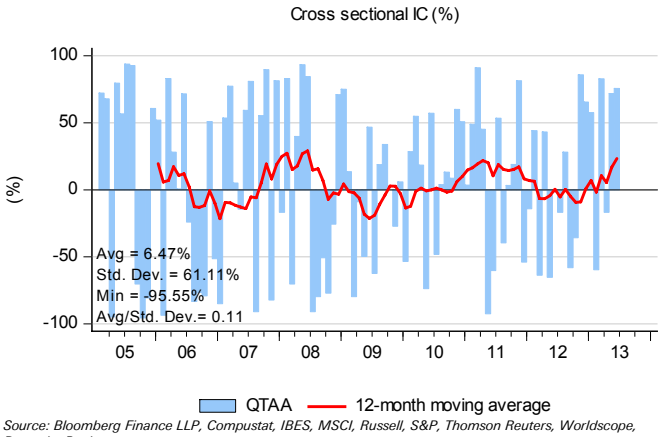
Figure 37 shows the current ranking of our six asset classes, ranked from best to worse in terms of month-ahead forecast returns. Figure 38 shows the monthly performance of the QTAA model over time.

Figure 37: Current QTAA forecasts



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 38: Performance of QTAA model



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Top-down style rotation

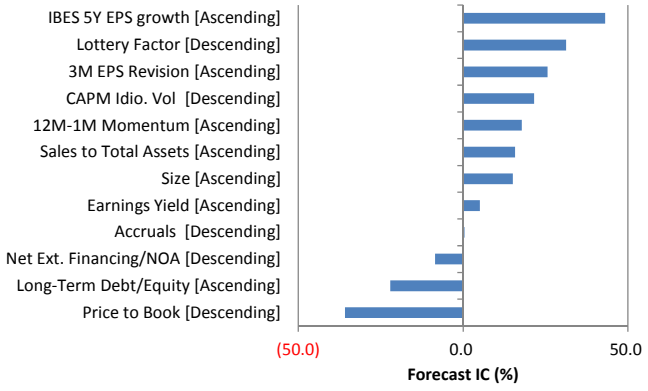
Style rotation model

- Our Style Rotation model dynamically rotates between 12 "typical" quant factors.
- The model uses market-based and macroeconomic inputs to predict month-ahead factor returns using a backwards stepwise linear regression model.
- For complete details on the model, please see Luo et al., "Signal Processing: Style Rotation", 7 September 2010.

Current recommendations and performance

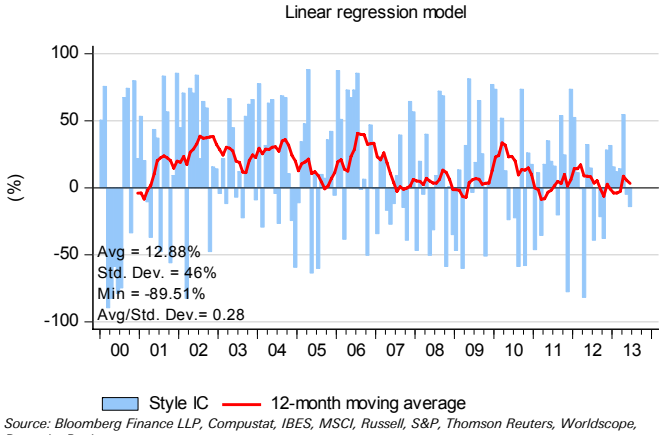
Figure 39 shows the current ranking of our 12 factors, ranked from best to worse in terms of month-ahead forecast performance. Figure 40 shows the monthly performance of the Style Rotation model over time.

Figure 39: Current style rotation forecasts



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 40: Performance of style rotation model



Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Appendix: Factor performance

Figure 41: US factor performance, measured as rank IC (Russell 3000 universe)

Factor Name	Direction[1]	Current # of Stocks	Average IC (%) Last M	12M Avg	3Y Avg	Since Inception Avg	Std Dev	Avg / Std Dev	Max	Min	p-value[2]	# of Months	Avg # of Stocks	Hit Rate (%)	Serial Corr (%)[3]
1. Value															
1 Dividend yield, trailing 12M	Ascending	2,948	0.29	0.86	2.17	2.94	14.42	0.20	42.59	(33.26)	0.00	306	2,872	55.23	99.24
2 Expected dividend yield	Ascending	2,948	0.89	0.87	2.48	3.19	14.95	0.21	44.46	(33.89)	0.00	306	2,872	54.58	99.31
3 Price-to-operating EPS, trailing 12M, Basic	Descending	2,338	5.62	3.63	1.41	2.83	10.38	0.27	30.82	(32.28)	0.00	230	2,354	60.00	95.21
4 Operating earnings yield, trailing 12M, Basic	Ascending	2,928	6.07	3.78	4.20	4.88	13.01	0.38	47.24	(33.30)	0.00	230	2,872	61.74	96.43
5 Earnings yield, forecast FY1 mean	Ascending	2,790	5.24	4.32	3.75	4.43	12.34	0.36	48.88	(34.61)	0.00	306	2,537	62.75	94.97
6 Earnings yield, forecast FY2 mean	Ascending	2,773	1.18	4.27	2.93	3.88	11.95	0.32	47.02	(34.31)	0.00	306	2,436	63.40	94.35
7 Earnings yield x IBES 5Y growth	Ascending	1,758	(5.48)	3.65	1.57	1.81	10.49	0.17	41.11	(26.63)	0.01	230	1,926	58.70	93.46
8 Sector-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,928	5.62	3.34	3.80	4.34	8.35	0.52	28.96	(14.90)	0.00	230	2,870	69.13	95.99
9 Hist-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,110	(1.27)	0.54	1.58	1.68	6.90	0.24	20.73	(18.74)	0.01	136	2,014	62.50	96.86
10 Operating cash flow yield (income stmt def)	Ascending	2,948	2.54	3.83	3.24	4.11	10.87	0.38	47.14	(32.67)	0.00	306	2,872	64.71	96.02
11 Cash flow yield, FY1 mean	Ascending	1,630	0.38	3.00	0.84	2.75	17.60	0.16	66.06	(54.29)	0.01	276	756	58.33	95.74
12 Free cash flow yield	Ascending	2,869	9.44	4.55	3.42	4.93	7.91	0.62	31.93	(22.64)	0.00	269	2,509	75.46	94.63
13 Price-to-sales, trailing 12M	Descending	2,894	(0.77)	4.66	0.89	1.84	10.96	0.17	30.02	(41.46)	0.00	306	2,797	56.86	99.11
14 Price-to-book	Descending	2,855	5.66	2.04	(0.69)	0.85	10.66	0.08	26.28	(35.75)	0.16	306	2,762	49.35	97.64
15 EBITDA/EV	Ascending	2,910	2.53	2.79	2.85	4.17	9.69	0.43	39.32	(27.15)	0.00	306	2,818	67.97	95.54
16 Price-to-book adj for ROE, sector adj	Descending	2,672	5.01	2.55	(0.79)	0.47	8.74	0.05	22.50	(33.21)	0.34	306	2,432	49.35	95.60
2. Growth															
17 Hist 5Y operating EPS growth	Descending	2,873	(3.16)	1.47	2.87	1.06	8.70	0.12	30.58	(22.70)	0.07	218	2,731	52.75	97.25
18 Hist 5Y operating EPS acceleration	Ascending	2,873	2.73	1.99	0.34	0.84	6.68	0.13	25.31	(16.13)	0.07	218	2,731	54.13	94.73
19 IBES 5Y EPS growth	Ascending	2,453	(0.15)	(0.61)	2.11	0.89	8.10	0.11	21.65	(27.86)	0.06	306	2,297	53.92	98.28
20 IBES 5Y EPS growth/stability	Ascending	2,453	2.94	(0.30)	2.33	1.32	7.70	0.17	20.64	(19.20)	0.00	306	2,297	56.54	98.62
21 IBES LTG EPS mean	Descending	2,017	(0.23)	(0.55)	(1.05)	1.69	15.84	0.11	37.64	(52.38)	0.06	306	2,152	49.67	97.76
22 IBES FY2 mean DPS growth	Ascending	2,157	2.88	0.14	1.59	0.93	8.56	0.11	24.12	(21.96)	0.21	133	1,482	51.13	87.75
23 IBES FY1 mean EPS growth	Ascending	2,765	3.30	2.26	1.65	1.07	7.51	0.14	20.76	(24.42)	0.01	306	2,516	61.11	88.78
24 Year-over-year quarterly EPS growth	Ascending	2,937	4.96	3.04	3.02	2.55	7.05	0.36	23.85	(21.12)	0.00	230	2,876	66.52	81.54
25 IBES FY1 mean CFPS growth	Descending	1,483	(1.76)	(3.44)	(1.44)	0.43	11.18	0.04	38.08	(42.07)	0.56	233	521	50.21	92.72
26 IBES SUE, amortized	Ascending	2,617	5.59	0.36	1.96	0.79	6.50	0.12	20.62	(16.30)	0.06	245	1,081	53.88	73.85
3. Price Momentum and Reversal															
27 Total return, 1D	Descending	2,948	(1.83)	1.57	2.64	4.98	7.18	0.69	15.52	(33.75)	0.00	306	2,873	77.78	1.65
28 Total return, 21D (1M)	Descending	2,947	(1.78)	1.33	0.61	1.84	10.93	0.17	29.03	(43.69)	0.00	306	2,872	57.84	0.42
29 Maximum daily return in last 1M (lottery factor)	Descending	2,941	2.76	1.09	3.55	5.12	14.96	0.34	39.13	(56.07)	0.00	306	2,744	64.38	54.28
30 21D volatility of volume/price	Descending	2,947	(10.83)	1.17	2.07	0.23	6.58	0.04	24.16	(16.78)	0.54	306	2,862	51.31	56.43
31 Total return, 252D (12M)	Ascending	2,878	1.20	1.05	2.57	3.26	14.11	0.23	39.62	(57.00)	0.00	306	2,791	64.38	89.94
32 12M-1M total return	Ascending	2,878	(0.04)	1.42	3.02	4.10	13.22	0.31	37.65	(49.06)	0.00	306	2,791	65.03	88.43
33 Price-to-52 week high	Ascending	2,878	10.59	0.22	3.19	3.17	17.80	0.18	49.63	(62.50)	0.00	306	1,940	62.09	83.35
34 Total return, 1260D (60M)	Ascending	2,517	2.54	(2.16)	2.60	1.13	10.96	0.10	25.63	(35.41)	0.08	294	2,234	56.80	97.47
4. Sentiment															
35 IBES LTG Mean EPS Revision, 3M	Ascending	1,985	0.77	0.30	1.08	0.88	3.76	0.23	11.16	(12.06)	0.00	306	2,124	61.76	59.75
36 IBES FY1 Mean EPS Revision, 3M	Ascending	2,748	6.72	0.61	1.87	2.93	8.46	0.35	29.96	(33.00)	0.00	306	2,475	66.67	75.37
37 IBES FY1 EPS up/down ratio, 3M	Ascending	2,742	6.40	0.32	1.85	3.09	7.87	0.39	27.54	(24.41)	0.00	306	2,337	67.65	79.59
38 Expectation gap, short-term - long-term	Descending	2,185	(1.84)	1.59	1.90	1.22	5.16	0.24	9.60	(19.91)	0.00	306	2,124	57.84	91.13
39 IBES FY1 Mean CFPS Revision, 3M	Ascending	1,559	8.30	1.19	2.09	2.03	16.01	0.13	69.38	(75.04)	0.04	275	688	62.55	64.49
40 IBES FY1 Mean SAL Revision, 3M	Ascending	2,707	5.01	1.31	2.23	1.10	7.87	0.14	27.43	(24.32)	0.05	205	2,166	60.49	71.57
41 IBES FY1 Mean FFO Revision, 3M	Ascending	138	5.19	(1.57)	2.68	2.90	21.09	0.14	71.43	(80.00)	0.02	278	83	57.55	69.61
42 IBES FY1 Mean DPS Revision, 3M	Ascending	1,250	(3.50)	0.62	0.96	0.66	5.18	0.13	14.91	(17.55)	0.15	130	995	57.69	62.58
43 IBES FY1 Mean ROE Revision, 3M	Ascending	2,115	4.36	(0.89)	0.80	0.66	6.65	0.10	23.70	(22.19)	0.26	130	1,725	58.46	65.84
44 Recommendation, mean	Descending	2,796	2.59	2.27	2.10	0.81	7.54	0.11	21.85	(19.41)	0.10	235	2,676	56.60	94.38
45 Mean recommendation revision, 3M	Descending	2,785	0.23	0.77	0.39	1.24	4.09	0.30	19.86	(11.55)	0.00	232	2,662	62.93	59.93
46 Target price implied return	Ascending	2,738	(4.09)	2.58	0.36	0.05	16.88	0.00	60.74	(39.59)	0.97	171	2,458	52.63	80.06
47 Mean target price revision, 3M	Ascending	2,726	8.26	0.94	1.47	2.41	12.70	0.19	30.14	(41.94)	0.02	168	2,444	63.69	74.97
5. Quality															
48 ROE, trailing 12M	Ascending	2,925	(2.01)	1.13	3.38	3.86	10.08	0.38	33.42	(29.52)	0.00	230	2,863	64.35	96.45
49 Return on invested capital (ROIC)	Ascending	2,918	1.09	0.79	3.83	4.19	10.24	0.41	33.02	(31.24)	0.00	230	2,855	68.70	98.21
50 Sales to total assets (asset turnover)	Ascending	2,930	(3.15)	1.51	1.82	1.60	8.70	0.18	22.78	(22.02)	0.00	306	2,813	55.88	99.45
51 Operating profit margin	Ascending	2,889	14.58	(1.72)	0.75	1.19	5.48	0.22	16.98	(14.17)	0.00	306	2,717	59.48	98.43
52 Current ratio	Descending	2,283	4.24	2.08	1.20	1.87	10.21	0.18	31.95	(38.66)	0.00	306	2,238	54.58	97.91
53 Long-term debt/equity	Ascending	2,843	(6.62)	3.05	1.79	0.81	9.62	0.08	35.65	(28.14)	0.14	306	2,747	48.69	98.51
54 Altman's z-score	Ascending	2,267	3.25	(1.17)	1.49	0.30	9.19	0.03	31.74	(30.44)	0.57	306	2,158	49.35	98.34
55 Merton's distance to default	Ascending	2,450	8.08	(1.11)	3.03	3.34	11.79	0.28	33.03	(41.45)	0.00	306	2,335	65.69	95.05
56 Ohlson default model	Descending	2,259	0.17	(1.18)	1.74	2.31	6.36	0.36	16.95	(18.63)	0.00	269	2,124	68.40	98.28
57 Accruals (Sloan 1996 def)	Descending	2,212	3.27	0.24	(0.17)	0.56	4.18	0.13	12.07	(15.48)	0.02	306	2,138	55.56	88.50
58 Firm-specific discretionary accruals	Descending	2,182	3.19	(0.14)	(0.10)	0.51	3.16	0.16	7.82	(10.87)	0.01	246	2,119	56.10	80.66
59 Hist 5Y operating EPS stability, coef of determination	Ascending	2,873	3.54	0.38	0.06	0.83	5.03	0.17	20.01	(12.27)	0.02	218	2,731	52.75	96.88
60 IBES 5Y EPS stability	Descending	2,453	7.20	0.28	1.37	1.20	8.62	0.14	25.00	(34.33)	0.02	306	2,297	54.25	98.96
61 IBES FY1 EPS dispersion	Descending	2,790	(2.88)	(0.14)	3.14	1.57	9.10	0.17	31.67	(25.17)	0.00	306	2,537	60.13	84.18
62 Payout on trailing operating EPS	Ascending	2,235	(0.99)	(1.51)	0.09	0.80	13.51	0.06	38.55	(30.91)	0.30	306	2,211	49.67	99.23
63 YoY change in # of shares outstanding	Descending	2,895	0.11	2.74	2.90	2.62	8.89	0.29	19.53	(46.21)	0.00	306	2,768	60.78	94.28
64 YoY change in debt outstanding	Descending	2,263	4.32	0.28	(0.52)	0.28	4.06	0.07	13.07	(10.40)	0.22	306	2,220	55.88	89.87
65 Net external financing/net operating assets	Ascending	2,938	(4.70)	2.44	2.30	2.48	8.45	0.29	44.61	(21.76)	0.00	306	2,835	61.44	94.68
66 Piotroski's F-score	Ascending	2,948	4.43	2.46	3.09	2.94	8.09	0.36	29.20	(27.83)	0.00	306	2,875	67.65	88.20
67 Mohanram's G-score	Ascending	549	(1.06)	(2.26)	1.64	2.65	10.58	0.25	35.27	(32.14)	0.00	218	384	56.88	95.46
6. Technicals															
68 # of days to cover short	Descending	2,937	(6.41)	1.47	2.56	2.20	7.30	0.30	33.80	(25.16)	0.00	306	2,017	58.50	91.37
69 CAPM beta, 5Y monthly	Descending	2,945	7.48	(2.28)	0.20	1.03	13.78	0.07	40.19	(42.70)	0.24	247	2,908	51.42	97.70
70 CAPM idosyncratic vol, 1Y daily	Descending	2,946	4.16	1.73	5.39	5.21	18.12	0.29	42.60	(60.80)	0.00	294	2,880	62.24	99.18
71 Realized vol, 1Y daily	Descending	2,878	7.63	1.00	4.94	5.06	18.75	0.27	42.69	(59.63)	0.00	306	2,791	61.44	99.16
72 Skewness, 1Y daily	Descending	2,878	(1.22)	(0.43)	0.87	1.25	5.34	0.23	13.93	(22.86)	0.00	306	2,791	57.19	89.75
73 Kurtosis, 1Y daily	Descending	2,878	(0.32)	0.33	1.49	1.41	5.49	0.26	15.28	(15.82)	0.00	306	2,791	62.09	91.51
74 Idiosyncratic vol surprise	Descending	2,896	3.22	0.87	1.88	2.87	8.00	0.36	22.66	(33.71)	0.00	293	2,861	66.89	87.81
75 Normalized abnormal volume	Ascending	2,945	(6.89)	2.20	2.96	2.26	6.38	0.35	23.10	(16.38)	0.00	306	2,866	65.69	64.20
76 Float turnover, 12M	Descending	2,881	16.40	(0.30)	0.02	0.27	10.75	0.02	23.53	(26.97)	0.67	295	2,784	48.47	99.77
77 Moving average crossover, 15W-36W	Ascending	2,890	5.39	0.97	0.31	2.21	13.21	0.17	46.29	(55.07)	0.00	306	2,527	60.13	90.76
78 Log float-adj capitalization	Ascending	2,947	(12.41)	1.65	3.90	3.48	10.99	0.32	29.53	(40.68)	0.00	306	2,869	61.44	99.40
79 # of month in the database	Ascending	2,948	(5.00)	0.59	1.33	2.18	8.81	0.25	35.61	(23.86)	0.00	306	2,872	57.19	99.99
80 DB composite options factor	Ascending	2,040	(2.88)	(0.32)	1.30	1.45	3.68	0.39	13.99	(13.88)	0.00	143	2,025	65.73	23.13

Note:

1 Direction indicates how the factor scores are sorted. Ascending order means higher factors scores are likely to be associated with higher subsequent stock returns, and vice versa for descending order.

2 P-value indicates the statistical significance of the factor's performance. A smaller p-value suggests that is it more likely the factor's performance is different from zero.

3 This is the autocorrelation of the factor scores over time. Higher serial correlation indicates lower portfolio turnover based on the factor.

Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 42: Global factor performance, measured as rank IC (S&P BMI World universe)

Factor Name	Direction[1]	Current # of Stocks	Average IC (%) Last M	12M Avg	3Y Avg	Since Inception Avg	Std Dev	Avg / Std Dev	Max	Min	p-value[2]	# of Months	Avg # of Stocks	Hit Rate (%)	Serial Corr (%)[3]
1. Value															
1 Dividend yield, trailing 12M	Ascending	9,714	1.75	2.26	3.85	4.31	10.54	0.41	36.88	(23.89)	0.00	282	7,997	64.89	98.00
2 Dividend yield, FY1	Ascending	7,591	(1.38)	1.79	3.49	4.37	10.88	0.40	32.17	(22.90)	0.00	225	5,221	64.00	98.17
3 Dividend yield, FY2	Ascending	7,494	(4.15)	1.71	3.22	4.26	10.93	0.39	33.19	(24.39)	0.00	215	5,178	63.72	98.16
4 Price/Earnings	Descending	7,909	(6.53)	0.17	0.25	4.04	13.16	0.31	39.66	(50.73)	0.00	275	6,286	61.82	96.31
5 Price-to-FY0 EPS	Descending	7,800	(8.75)	(0.08)	(0.80)	2.89	10.32	0.28	28.98	(37.08)	0.00	282	6,013	62.06	96.37
6 Earnings yield, FY0	Ascending	8,973	(1.92)	1.90	1.57	4.01	9.21	0.44	31.67	(18.68)	0.00	282	6,993	64.54	96.28
7 Earnings yield, forecast FY1 mean	Ascending	8,173	(6.60)	2.28	2.22	4.73	10.90	0.43	35.35	(22.20)	0.00	282	6,444	63.83	95.66
8 Earnings yield, forecast FY2 mean	Ascending	8,049	(12.75)	1.32	0.92	4.33	11.91	0.36	37.31	(31.50)	0.00	282	6,269	62.77	95.70
9 Cash flow yield, FY0	Ascending	6,830	3.62	1.11	0.66	4.06	6.40	0.63	26.42	(11.80)	0.00	158	4,927	75.32	97.08
10 Cash flow yield, FY1 mean	Ascending	5,805	(6.01)	0.01	(0.98)	2.00	9.76	0.21	31.42	(32.01)	0.00	214	4,462	57.94	96.00
11 Price/Sales	Descending	9,070	(1.29)	0.34	(0.42)	1.46	9.59	0.15	26.48	(31.59)	0.01	282	7,475	55.67	99.23
12 Price/Book	Descending	9,216	(7.51)	(1.23)	(1.72)	1.17	10.52	0.11	31.56	(37.54)	0.06	282	7,522	56.74	98.33
13 Est Book-to-price, median	Ascending	7,138	(9.63)	(1.03)	(2.50)	1.14	9.92	0.12	30.37	(26.29)	0.14	166	5,380	52.41	98.06
14 EBITDA to EV	Ascending	7,114	21.87	4.76	5.09	3.99	10.85	0.37	36.69	(26.20)	0.00	282	4,650	62.77	95.61
15 Sales/EV	Ascending	9,070	7.65	1.09	1.02	1.96	7.90	0.25	24.81	(20.06)	0.00	282	7,441	60.99	98.98
2. Growth															
16 IBES 5Y EPS growth	Ascending	8,240	1.30	0.34	1.88	1.12	6.15	0.18	19.09	(21.86)	0.00	282	6,196	59.22	98.05
17 EPS Growth	Ascending	8,600	7.83	2.46	1.37	2.09	6.87	0.30	29.72	(28.97)	0.00	266	6,869	63.91	88.45
18 IBES LTG EPS mean	Descending	5,215	0.97	(0.54)	0.12	1.33	12.15	0.11	28.22	(40.36)	0.07	282	4,161	52.84	96.76
19 IBES FY1 mean EPS growth	Ascending	7,943	(5.58)	0.68	0.53	0.41	6.06	0.07	14.44	(20.10)	0.25	282	6,354	54.96	88.47
20 IBES FY1 mean CFPS growth	Descending	5,143	5.45	1.09	0.89	1.74	4.23	0.41	7.47	(11.39)	0.00	158	3,890	65.19	91.70
21 IBES FY2 mean DPS growth	Ascending	7,489	(10.60)	0.72	0.25	2.47	11.03	0.22	38.85	(31.49)	0.00	224	5,060	59.38	88.02
22 Asset growth	Descending	9,025	7.97	2.10	1.44	0.63	8.54	0.07	21.57	(27.36)	0.22	282	7,265	52.13	93.67
3. Price Momentum and Reversal															
23 Total return, 1D	Descending	9,739	2.49	1.54	2.88	3.58	7.42	0.48	21.94	(41.58)	0.00	282	8,110	70.92	2.07
24 Weekly Total Return	Descending	9,738	6.27	0.58	3.30	2.97	8.74	0.34	30.60	(33.64)	0.00	282	8,109	64.54	1.40
25 Total return, 21D (1M)	Ascending	9,737	2.55	1.10	0.71	0.13	11.48	0.01	27.69	(44.07)	0.85	282	8,104	53.19	4.17
26 Total return, 252D (12M)	Ascending	9,606	11.87	6.91	5.77	4.45	14.57	0.31	41.64	(46.50)	0.00	282	7,912	66.67	90.64
27 12M-1M total return	Ascending	9,606	11.18	7.09	6.21	5.07	14.03	0.36	40.96	(42.52)	0.00	282	7,912	68.79	88.71
28 Total return, 1260D (60M)	Ascending	8,579	7.07	1.17	2.76	1.48	14.11	0.11	40.32	(44.84)	0.08	282	6,405	58.51	97.80
4. Sentiment															
29 IBES LTG Mean EPS Revision, 1M	Ascending	5,199	(0.90)	0.50	0.59	0.66	2.58	0.26	7.26	(8.59)	0.00	282	4,123	62.77	0.54
30 IBES LTG Mean EPS Revision, 3M	Ascending	5,160	0.93	0.99	0.93	0.87	3.34	0.26	11.05	(10.26)	0.00	282	4,067	61.70	60.11
31 IBES FY1 EPS up/down ratio, 1M	Ascending	6,477	12.86	3.47	3.64	3.71	5.44	0.68	17.76	(13.76)	0.00	282	4,341	76.60	34.75
32 IBES FY1 EPS up/down ratio, 3M	Ascending	7,597	12.48	4.56	4.10	3.69	5.81	0.63	17.92	(12.36)	0.00	282	5,818	75.18	78.48
33 IBES FY1 Mean EPS Revision, 1M	Ascending	8,004	10.03	3.07	2.91	2.91	5.08	0.57	16.50	(12.79)	0.00	282	6,296	72.34	24.16
34 IBES FY1 Mean EPS Revision, 3M	Ascending	7,904	11.38	4.32	4.09	3.42	6.64	0.51	19.37	(20.12)	0.00	282	6,205	73.40	74.15
35 IBES FY1 Mean CFPS Revision, 3M	Ascending	5,525	9.31	3.07	2.86	2.55	5.55	0.46	15.81	(23.83)	0.00	204	4,285	77.45	63.93
36 IBES FY1 Mean DPS Revision, 1M	Ascending	6,002	6.09	2.50	3.02	1.78	4.39	0.41	12.65	(16.63)	0.00	223	4,323	71.75	10.98
37 IBES FY1 Mean DPS Revision, 3M	Ascending	5,929	9.57	3.72	3.89	2.22	5.88	0.38	19.08	(24.51)	0.00	221	4,264	72.40	65.62
38 IBES FY1 Mean FFO Revision, 1M	Ascending	7,241	9.42	3.81	3.63	2.29	4.07	0.56	11.73	(8.89)	0.00	150	4,013	77.33	13.51
39 IBES FY1 Mean FFO Revision, 3M	Ascending	7,063	10.77	5.40	4.77	2.92	5.76	0.51	16.27	(14.53)	0.00	147	3,920	74.15	67.71
40 IBES FY1 Mean ROE Revision, 1M	Ascending	8,005	6.97	2.20	2.07	1.79	4.08	0.44	13.70	(10.51)	0.00	202	5,343	69.80	14.27
41 IBES FY1 Mean ROE Revision, 3M	Ascending	7,886	6.77	2.68	2.46	2.21	5.00	0.44	13.57	(13.58)	0.00	200	5,212	69.50	68.41
42 Target price implied return	Descending	8,258	13.58	1.32	1.53	0.95	14.70	0.06	55.58	(36.25)	0.41	166	6,258	53.01	82.31
43 Recommendation, mean	Descending	8,434	(2.36)	2.20	2.28	1.77	6.85	0.26	17.41	(16.84)	0.00	235	7,181	65.11	94.45
44 Mean recommendation revision, 3M	Descending	8,411	(1.67)	0.89	1.35	1.87	2.93	0.64	10.01	(10.13)	0.00	232	7,160	75.00	60.09
5. Quality															
45 Return on Equity	Ascending	8,944	2.31	2.82	3.77	4.24	10.16	0.42	30.68	(34.69)	0.00	234	7,660	66.67	97.10
46 return on capital	Ascending	8,828	1.95	2.05	3.48	4.47	12.32	0.36	49.47	(34.02)	0.00	282	6,948	64.89	97.95
47 Return on Assets	Ascending	9,156	18.36	4.25	5.10	4.79	13.29	0.36	44.20	(30.31)	0.00	282	7,049	63.83	98.15
48 Asset Turnover	Ascending	9,165	27.49	3.96	3.58	2.66	16.34	0.16	44.64	(51.55)	0.01	282	7,536	58.16	99.84
49 Gross margin	Ascending	8,391	11.07	2.04	2.39	1.87	5.86	0.32	16.60	(13.45)	0.00	282	6,852	63.12	98.88
50 EBITDA margin	Ascending	9,135	18.37	4.12	3.86	4.05	13.82	0.29	42.97	(41.30)	0.00	282	7,555	59.57	96.82
51 Berry Ratio	Ascending	6,865	(9.70)	0.41	1.04	2.88	9.31	0.31	29.57	(20.79)	0.00	282	5,294	59.57	97.69
52 IBES FY1 EPS dispersion	Descending	8,173	24.20	2.65	3.71	0.51	9.59	0.05	32.68	(25.37)	0.38	282	6,444	50.71	87.89
53 IBES 5Y EPS growth/stability	Ascending	8,240	2.30	0.71	2.25	1.46	5.99	0.24	18.66	(20.47)	0.00	282	6,195	58.87	98.29
54 YoY change in debt outstanding	Descending	7,584	5.44	0.45	0.10	0.26	3.92	0.07	11.51	(11.34)	0.28	282	6,277	53.55	91.49
55 Current ratio	Descending	7,543	(4.06)	0.69	0.74	0.62	8.92	0.07	27.86	(27.01)	0.24	282	6,142	49.65	98.50
56 Long-term debt/equity	Ascending	9,056	(4.34)	3.22	1.27	0.79	6.47	0.12	22.37	(18.17)	0.04	282	7,449	54.61	98.88
57 Merton's distance to default	Ascending	7,950	15.95	1.63	4.07	2.65	11.17	0.24	31.19	(31.18)	0.00	282	6,453	59.93	93.26
58 Capex to Dep	Descending	6,862	18.21	4.49	2.46	1.51	6.49	0.23	22.38	(19.93)	0.00	282	5,116	61.35	96.90
6. Technicals															
59 Realized vol, 1Y daily	Descending	9,606	20.17	4.30	5.51	5.16	15.38	0.34	29.45	(44.64)	0.00	282	7,920	61.35	98.97
60 Skewness, 1Y daily	Descending	9,606	9.31	1.46	2.19	1.66	5.34	0.31	15.03	(32.98)	0.00	282	7,920	64.18	90.01
61 Moving average crossover, 15W-36W	Ascending	9,329	19.05	4.30	1.89	3.01	14.62	0.21	37.15	(45.46)	0.00	282	6,909	62.41	91.36
62 Normalized abnormal volume	Ascending	9,723	7.85	3.36	2.73	2.26	6.57	0.34	20.47	(14.71)	0.00	282	7,871	60.64	66.24

Note:

1 Direction indicates how the factor scores are sorted. Ascending order means higher factors scores are likely to be associated with higher subsequent stock returns, and vice versa for descending order.

2 P-value indicates the statistical significance of the factor's performance. A smaller p-value suggests that is it more likely the factor's performance is different from zero.

3 This is the autocorrelation of the factor scores over time. Higher serial correlation indicates lower portfolio turnover based on the factor.

Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Appendix 1

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Additional information available upon request

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