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 this 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.

Standing out from the crowd?

The current rally has been a little unusual in that it is being driven by lower beta, higher yield, defensive-type stocks and sectors. In fact, this thematic has been so dominant that investors are beginning to wonder if this is the next crowded trade. In this report we use a novel measure of trade crowding to show evidence that this might be the case.

Introducing the DB Quant Dashboard

This month we introduce an easier way to understand the key drivers of markets around the world. For eight countries/regions we study the performance of a common set of investment styles. We find that even in today's globally integrated markets, the drivers of returns in countries are distinct, and a one-size-fits-all approach to investing is likely to be suboptimal.

A hint of bearishness

Notwithstanding the continuing rally, our VRP market timing indicator has a slightly bearish flavor for the second month in a row. The reading is not yet extreme, but it does suggest a degree of caution is warranted: investors are becoming a little complacent in their pricing of risk.

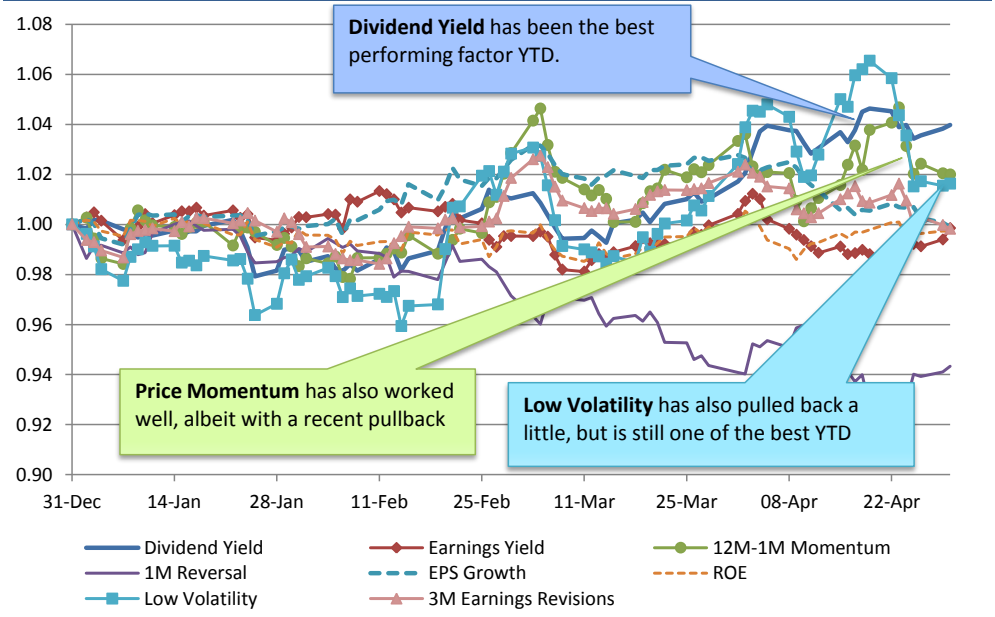
Deutsche Bank Securities Inc.

Quantifying markets

Scanning for crowded trades

One of the interesting features of the current market rally is that it has been driven by lower beta, lower volatility, defensive-type stocks and sectors. Indeed if we look at the cumulative performance of common styles in U.S. Large Caps (Figure 1), we see this quite clearly. Despite a pullback in the past two weeks, Dividend Yield, Low Volatility, and 12M Price Momentum have been leading the charge in 2013 (see the "DB Quant Dashboard" section below for factor performance in other markets).

Figure 1: Year-to-date factor performance in U.S. Large Caps (Russell 1000)



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

The strong performance of Dividend Yield and Low Volatility is not surprising. With Treasury yields near all-time lows, a natural rotation for asset allocators is to move out of bonds into higher yield equities. At the same time though, risk appetite is still colored by the turmoil of the post-crisis period, so there is still a strong preference towards extracting that yield from the lower-risk end of the stock universe. This so-called "great rotation" has been a popular theme in many of our recent client meetings.

In addition, the massive popularity of so-called low risk strategies (e.g. minimum variance, maximum diversification, etc.) has no doubt also played a role in driving the performance of the Low Volatility factor in particular.[1]

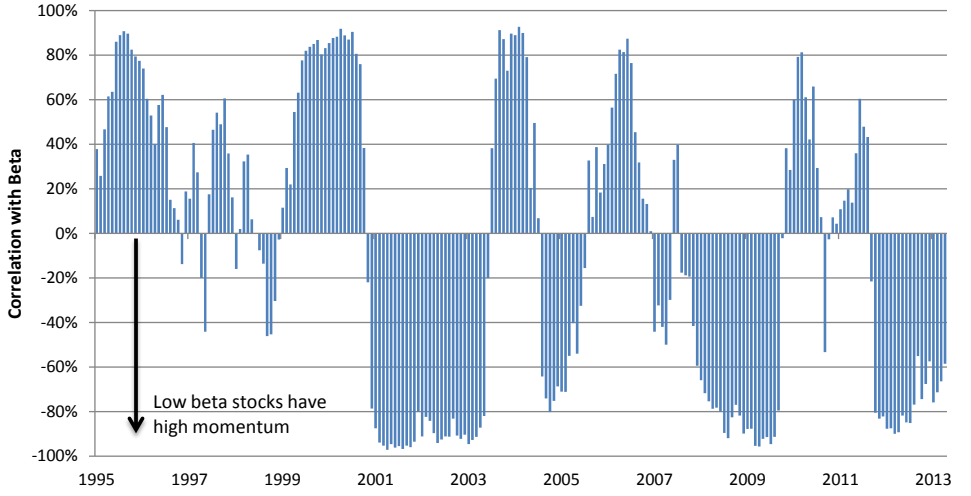
Momentum is a defensive trade in disguise

But what about 12M Price Momentum, which has been the third best factor this year in Figure 1? It turns out that momentum has been strongly aligned with low beta stocks for the past two years, as shown in Figure 2. The chart shows the cross-sectional

[1] For more details on inflows into low volatility strategies, particularly the ETFs, see a companion note from our Equity Derivatives Strategy team: Martin, Mercado, and Zhao, "SYNDEX: Access to Low Volatility Strategies", *Deutsche Bank Synthetic Equity & Index Strategy*, 3 May 2013.

correlation between momentum and beta at each point in time; when the bars are negative it means that *low* beta stocks have *high* momentum.[2] In other words, the strong performance of 12M Price Momentum is really just a reflection of the fact that investors have continued to push the low risk/high yield theme month after month. So at this stage playing a momentum strategy isn't really so different from playing the long defensives/short cyclical trade that has been dominating the market. One of the common mistakes we see is the assumption that momentum is automatically a factor for risk-on markets. That's certainly not the case right now.

Figure 2: Cross-sectional exposure of 12M Price Momentum to Beta



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

Three's a crowd?

Given the strong performance of the defensive yield trade, is there a chance this becomes the next crowded trade? Of course, measuring crowding is a tricky exercise, but in our past research we have suggested a few interesting ways we can use to estimate crowdedness in investment strategies. One technique is based on the so-called left tail dependence of stocks in a portfolio. The idea is that if investors start to trade a group of stocks as a basket (e.g. a basket of low volatility names, or a basket of high yield names) then these stocks will start to show higher co-movement compared to the market. This elevated co-movement will show up particularly when things go wrong, i.e. in the left tail. Therefore, by tracking the median left tail dependence of stocks in a portfolio, relative to the left tail dependence of the market, we can get a sense for crowding in a basket of stocks. For more technical details on this crowding metric – called Median Pairwise Tail Dependence, or MPTD – please see our paper "The Risk in Low Risk".[3]

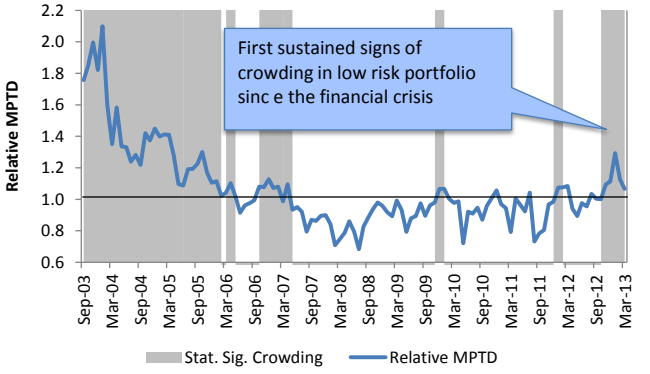
Figure 3 through Figure 8 shows the crowding over time for some of the topical factors right now: Low Volatility, Dividend Yield, Value, Momentum, Return on Equity, and Growth respectively. Both Dividend Yield and Low Volatility are showing some signs of crowding, albeit a little below recent highs (the gray shaded area shows when the crowding is statistically significant compared to the market). It turns out that Dividend Yield is more consistently crowded over time than other factors, perhaps not surprising

[2] Note when computing the cross-sectional correlation, we include the risk model in the computation to more accurately reflect the correlation structure of stocks, see: Alvarez et al., "Signal Processing: Reviving Momentum", *Deutsche Bank Quantitative Strategy*, 5 July 2011.

[3] Cahan et al., 2012, "Portfolios Under Construction: The Risk in Low Risk", *Deutsche Bank Quantitative Strategy*, 19 July 2012.

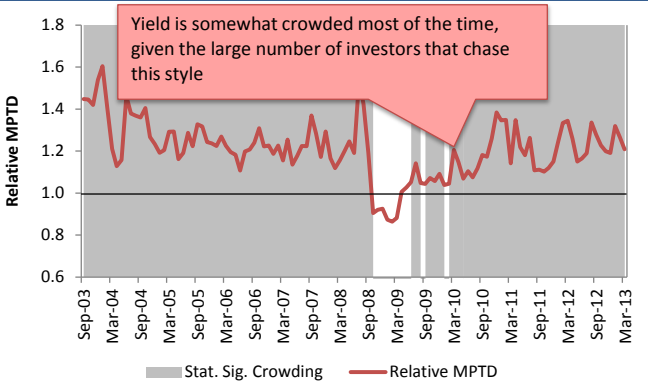
given that this is one of the most popular thematic baskets of all. We also see that Value (Figure 5) and 12M Price Momentum (Figure 6) are looking fairly un-crowded currently. The latter result is particularly interesting, because it does suggest that much of the herding in defensive strategies is being driven by investors playing those strategies specifically, rather than indirectly through momentum strategies. Return on Equity (Figure 7) has rarely been crowded, whereas Growth (Figure 8) has been sporadically showing a few signs of crowding post the subprime meltdown.

Figure 3: Crowding of Low Volatility (minimum variance) portfolio, Russell 1000 universe



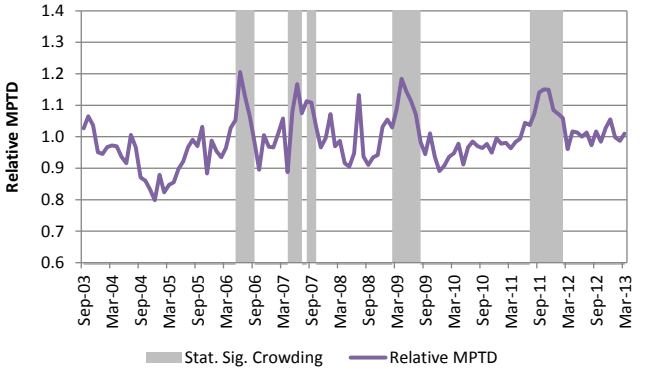
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 4: Crowding of Dividend Yield portfolio, Russell 1000 universe



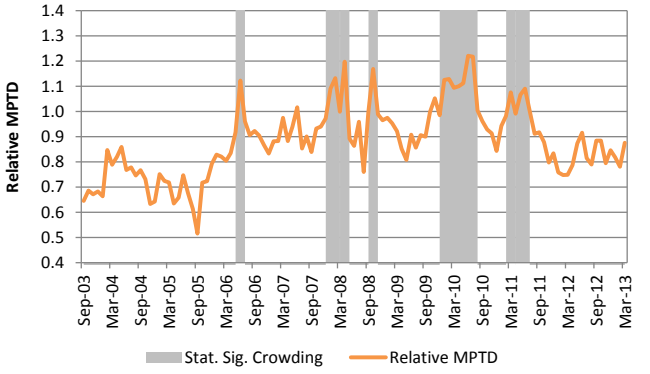
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 5: Crowding of Value portfolio (trailing earnings yield), Russell 1000 universe



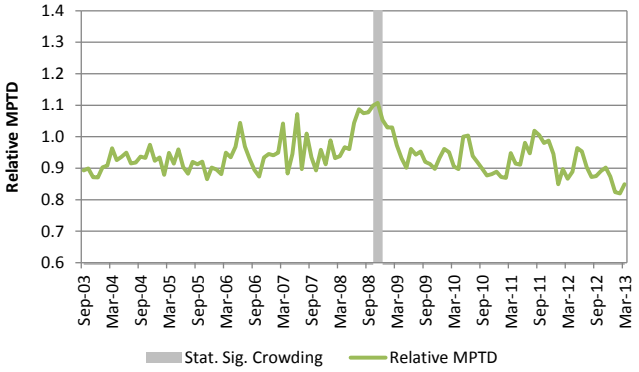
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 6: Crowding of 12M Price Momentum portfolio, Russell 1000 universe



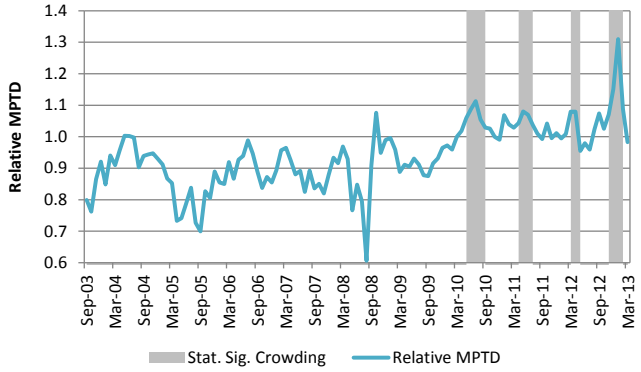
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Figure 7: Crowding of Return on Equity portfolio, Russell 1000 universe



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

Figure 8: Crowding of Growth portfolio, Russell 1000 universe

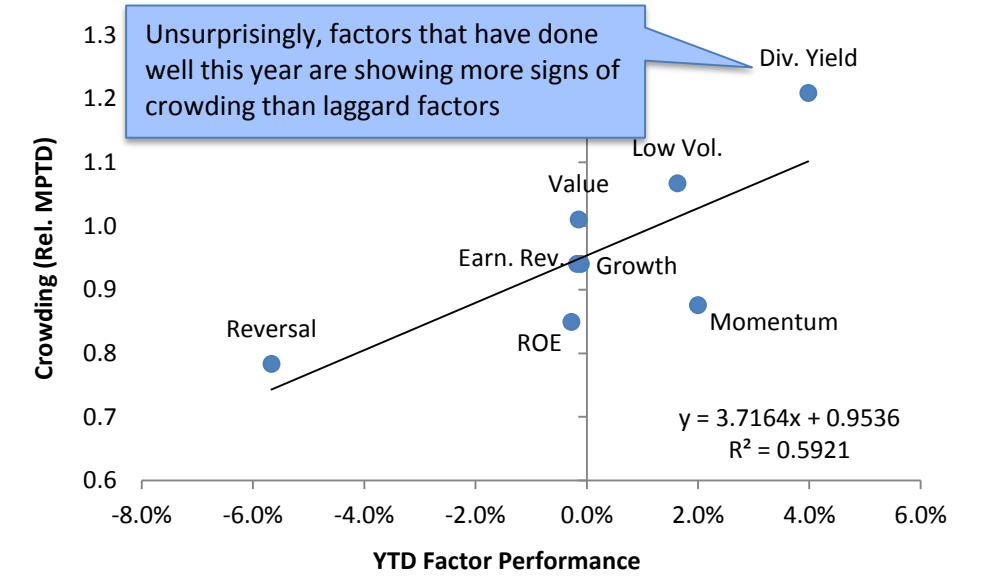


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Nothing drives popularity like good performance

In fact, if we plot the current crowding of different quant strategies against year-to-date performance, we see a fairly strong positive relationship (Figure 9). In other words, in 2013 there has been a solid link between past factor performance and the popularity of each strategy. For example, short-term reversal has been the single worst performing factor this year, and unsurprisingly it shows little crowding. On the other side of the coin, Dividend Yield has been the best performing factor year-to-date, and is also the one showing the most crowding right now.

Figure 9: Relationship between crowding and factor performance, Russell 1000



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

A word of caution

So what does this all mean? One very important point to keep in mind is that high crowding does *not* automatically mean a strategy will underperform. In fact, in the near term, crowding can actually be good for a strategy; as more investors enter a strategy it will continue to drive the stocks in the basket in the right direction. For example, as we saw above, Dividend Yield has been crowded over most of history, and yet is one of the best performing strategies in the long run.

However, our past research has shown that crowded strategies do tend to have higher left tail risk. In other words, the risk of a large, negative drawdown is elevated when a strategy is crowded. This is no surprise: when everyone runs for the exit in a crowded room, things tend to get ugly. Therefore, we prefer to use our crowding metrics as a useful risk management tool, for assessing the potential downside for a given strategy, should it fall out of favor.

Macro update

Turning our attention to the bigger picture, we also take the opportunity to update our favorite top-down market indicators.

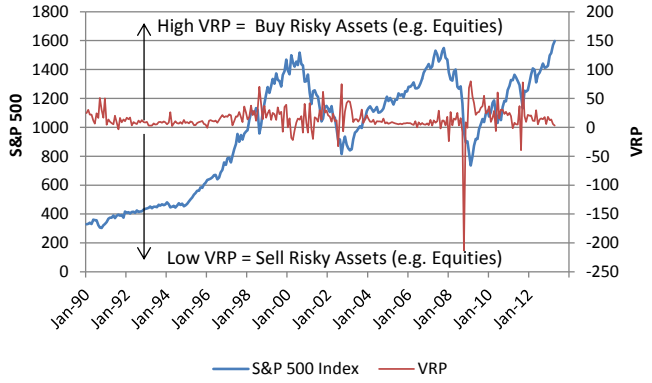
Variance Risk Premium

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.[4] 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.

Today our VRP indicator continues to have a bearish flavor, albeit not particularly strong by historical standards. The current reading is around half a standard deviation below the long-term average, whereas a strong signal would be a reading of around two standard deviations. Nonetheless, as the market continues to rally this does indicate that a little complacency is creeping in, in the sense that the risk investors are pricing in is starting to lag the actual realized risk in the market. We'll continue to watch this closely, because we do think it will be a useful tool for gauging when the current rally is coming to an end.

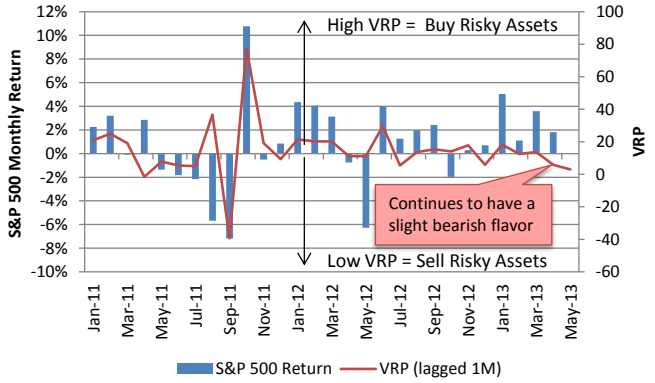
[4] For more details on the VRP, including our backtesting work, see: Luo et al., 2011, "Signal Processing: Quant Tactical Asset Allocation (QTAA)", *Deutsche Bank Quantitative Strategy*, 19 September 2011.

Figure 10: Variance Risk Premium (VRP)



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

Figure 11: Recent VRP (lagged) and market returns

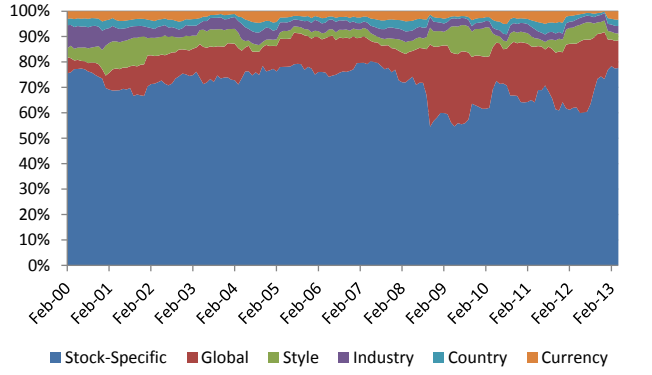


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

The opportunity set for investors

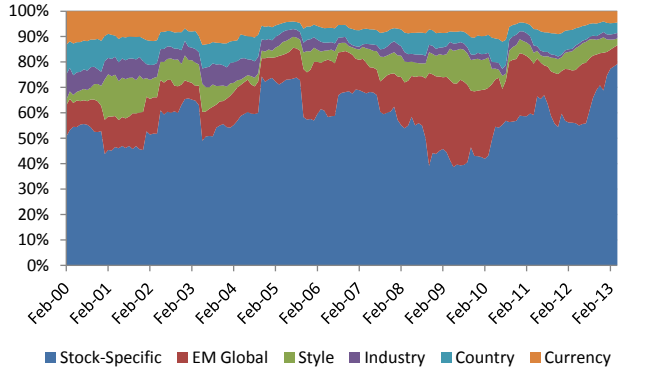
Another metric we keep a close eye on is the so-called "opportunity set" for investors. Think of this as the total alpha on the table. Our main interest is to understand what is driving that opportunity, because this can allow us to position our strategies to pick in the orchard with the juiciest fruit.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

Both charts actually tell a similar story. 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.

However, 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. This suggests that despite renewed concerns about a summer slowdown, there is still ample opportunity to trade stocks on their own merits. Or put another way, investors just aren't as concerned about big picture macro threats as they were in the past five years.[5]

[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.

The DB Quant Dashboard

Which styles have been working around the world?

This month we introduce the DB Quant Dashboard, 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.

The most interesting story this month – apart from the defensive-led rally that we've already discussed – is the bifurcation in factor performance between countries. In the U.S. we saw that 12M Price Momentum, Dividend Yield, and Low Volatility have been dominating (Figure 14 on page 10), but this is certainly not the case in Emerging Markets (Figure 21 on page 13) or Asia (Figure 19 on page 12). In those markets, 2013 has been all about following the trend: 12M Price Momentum and analyst Earnings Revisions have been by far the best performing factors.

In Japan, the surprise announcement in early April from the central bank had a massive impact on quant factor performance (Figure 18 on page 12). Prior to the announcement Japan was in-line with other developed markets: Dividend Yield, Low Volatility, and Momentum (i.e. the defensive yield trade) was dominating. However, the announcement triggered a sharp rotation into a more risk-seeking, high growth trade.

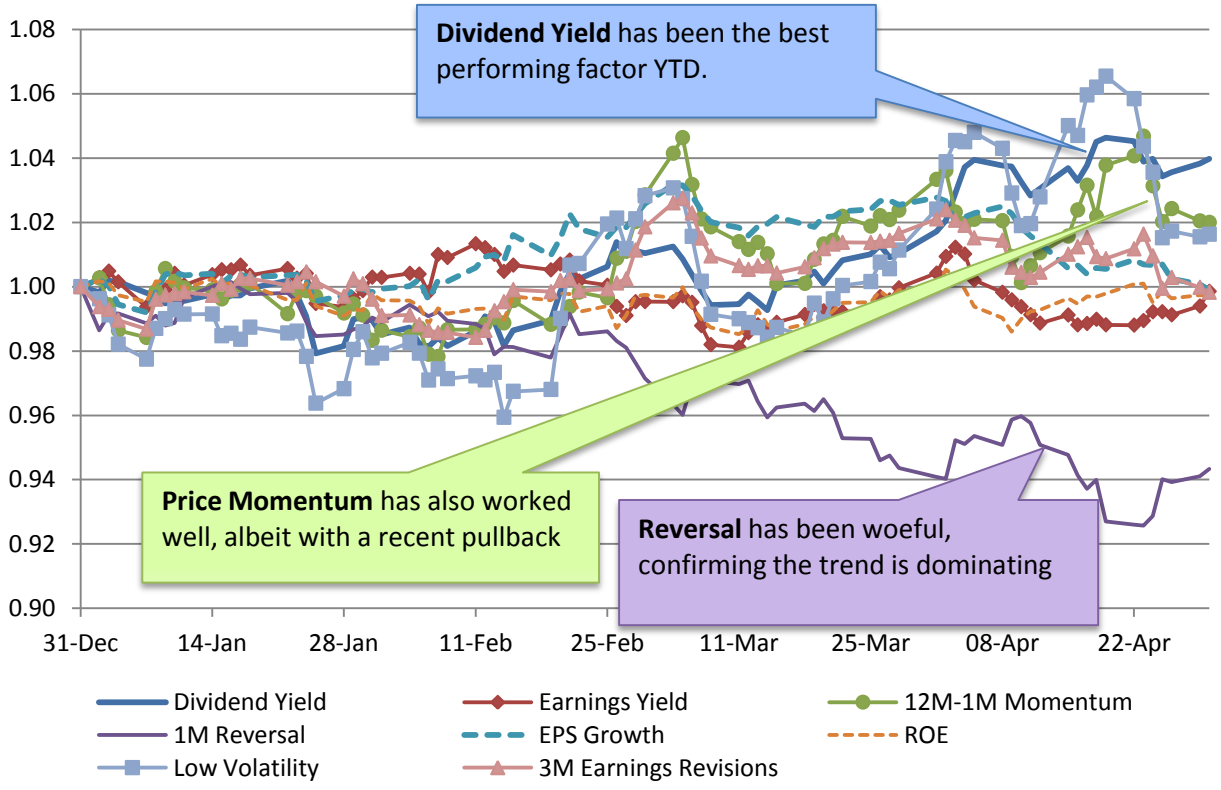
Europe is another interesting case study (Figure 17 on page 11). Up until early April, almost all the factors were working quite well, and like the other developed markets, Low Volatility was leading the pack. However, from the second week of April onwards, we observed a sharp reversal trade, with Low Volatility and Dividend Yield falling sharply, along with most the other factors (except Reversal of course).

Overall, the behavior of factors this year across the world reinforces something we are quite adamant about: markets and regions are very different, and there is no single set of factors that is suitable for all regions. This is why our global stock selection model – the N-LASR model – is designed to learn and adapt to the unique features of each market. One size does not fit all when it comes to quant models.

For more details see our website

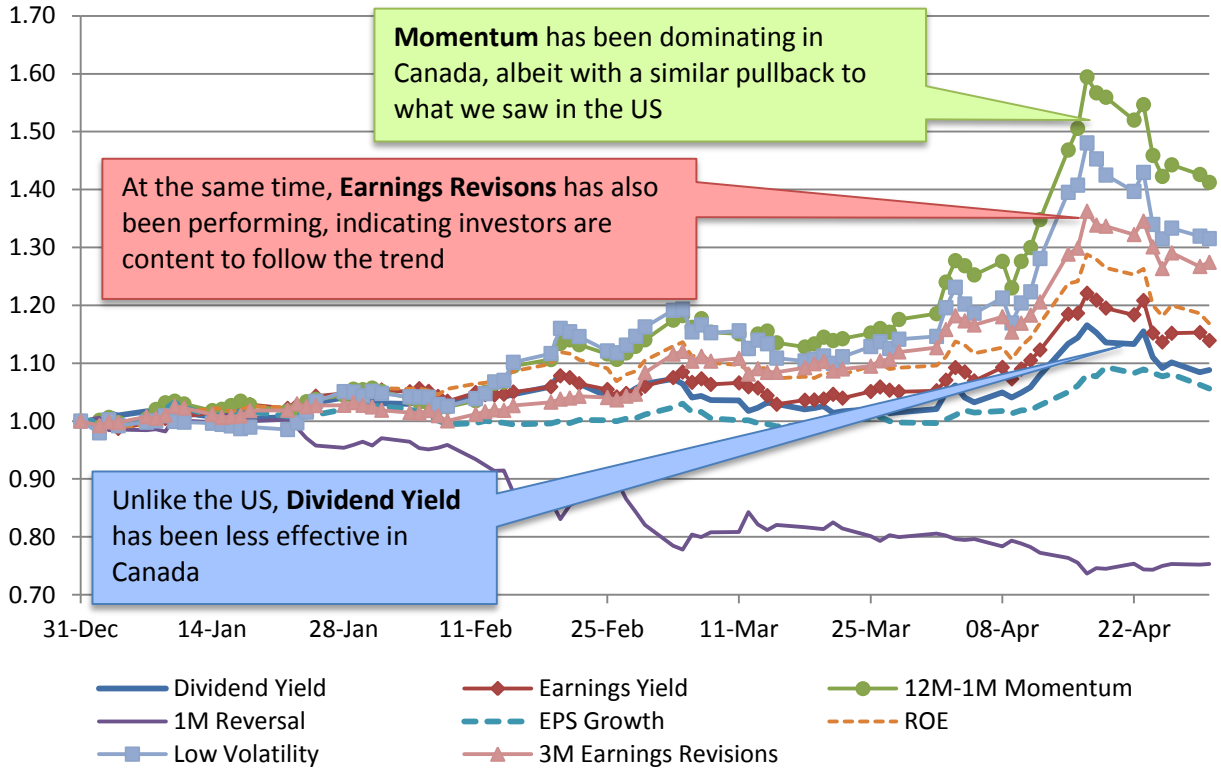
For the most recent daily factor performance, as well as factor performance delineated by different universes (e.g. large cap, small cap) and regions, please see our Global Quantitative Strategy website at https://eqindex.db.com/gqs/. Note that you need a username and password to log on to this website. 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)



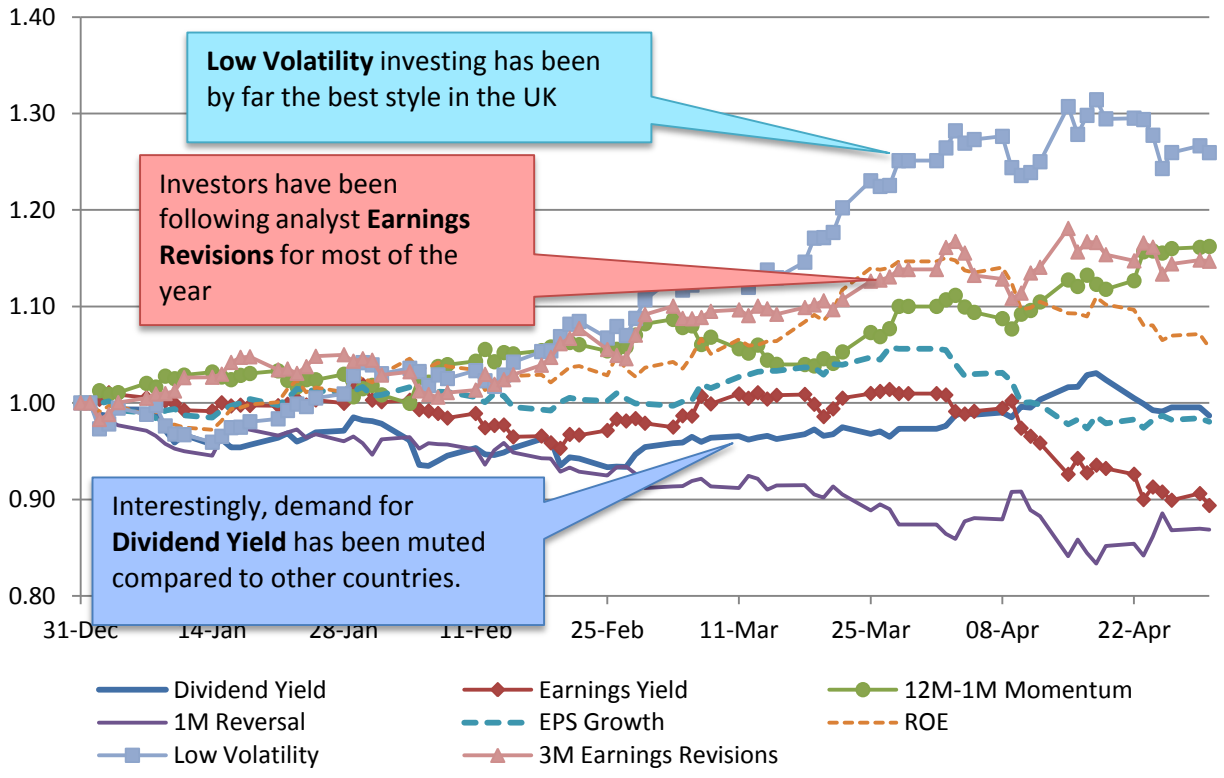
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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



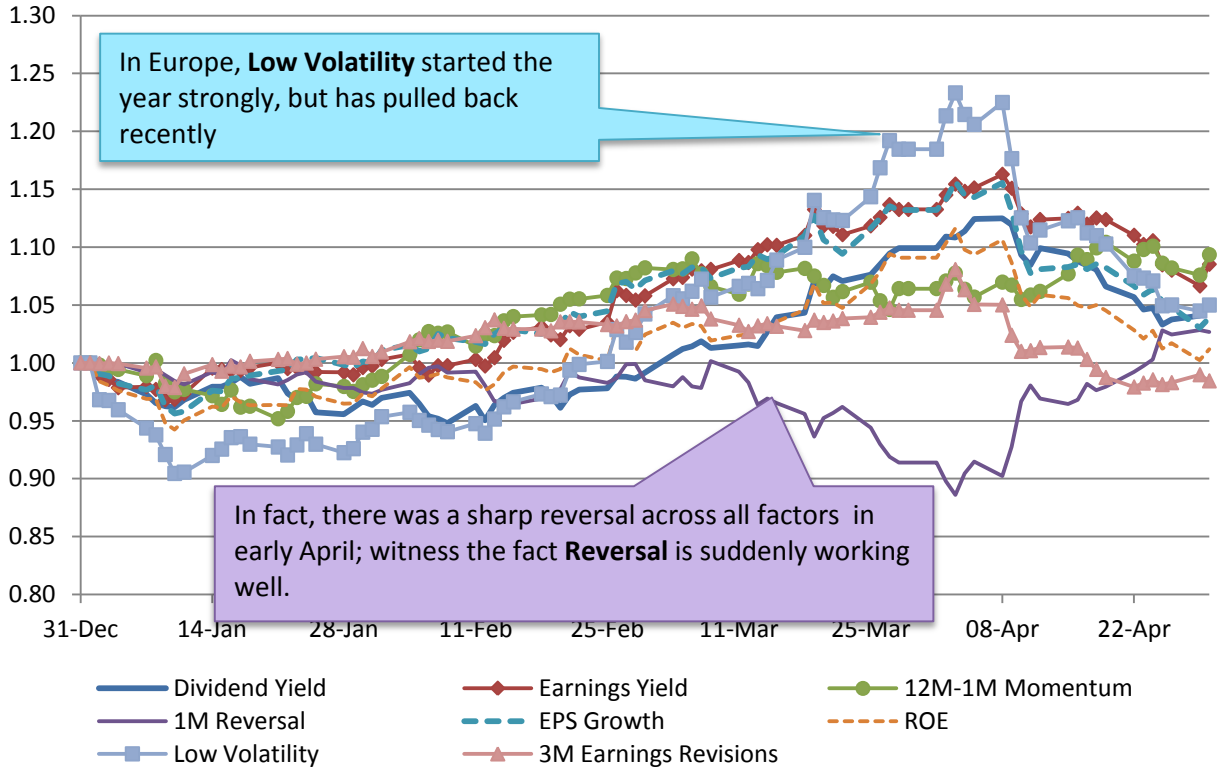
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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



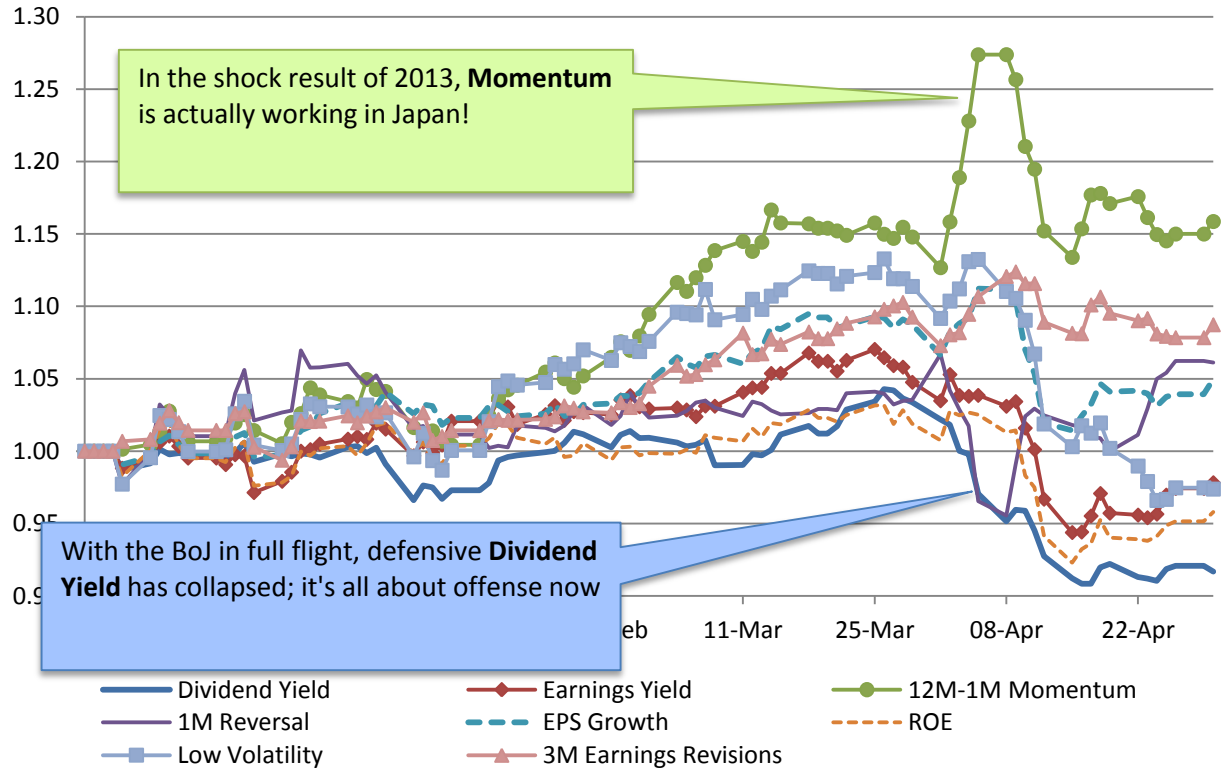
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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



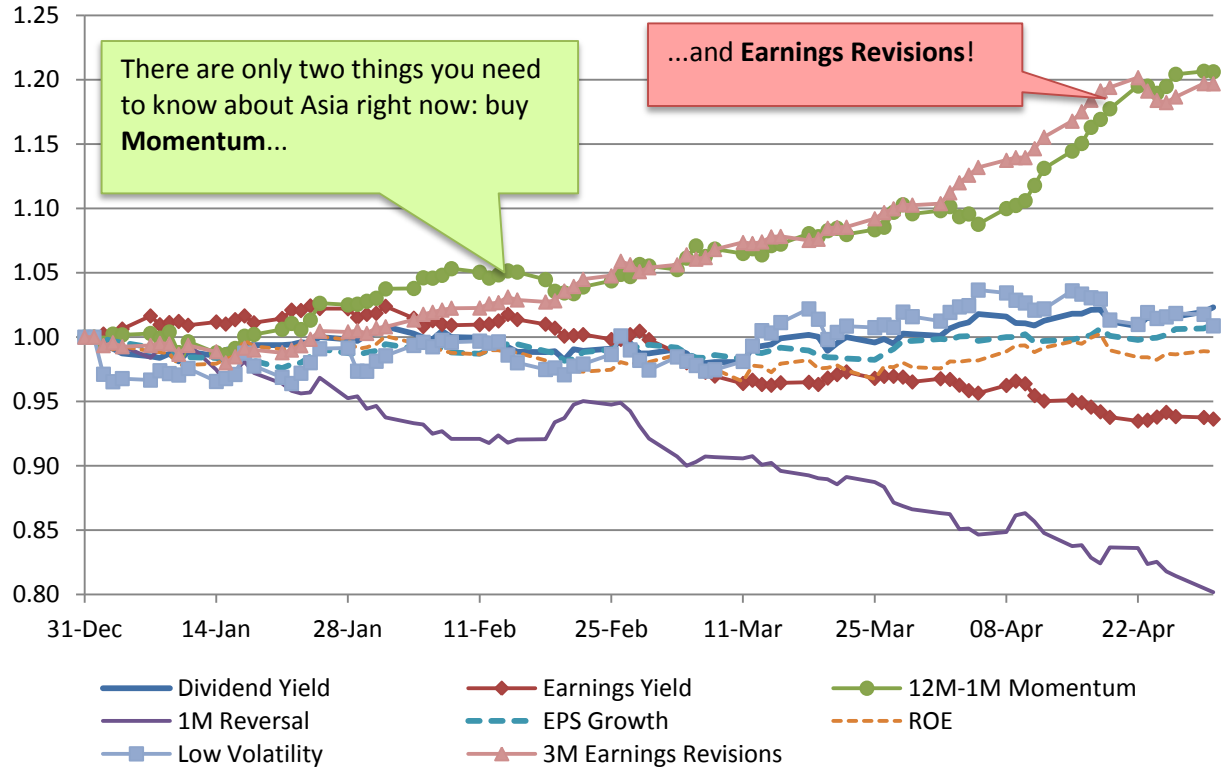
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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



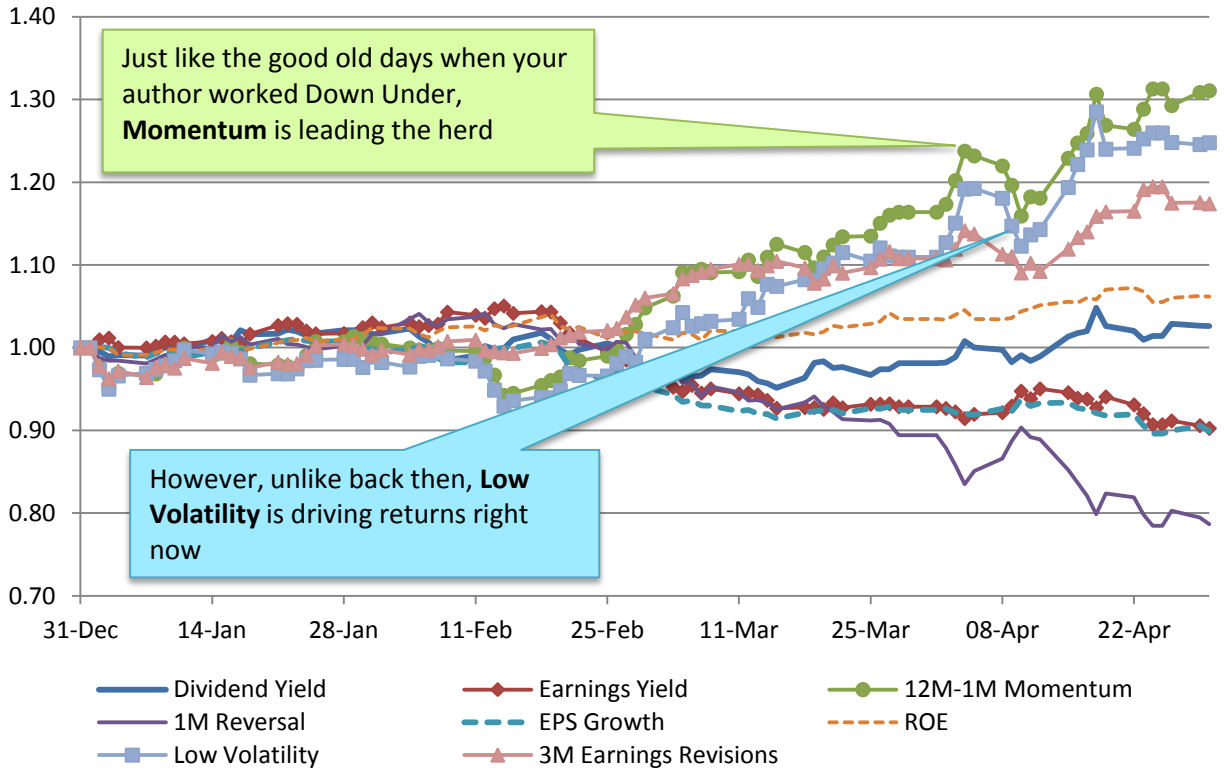
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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



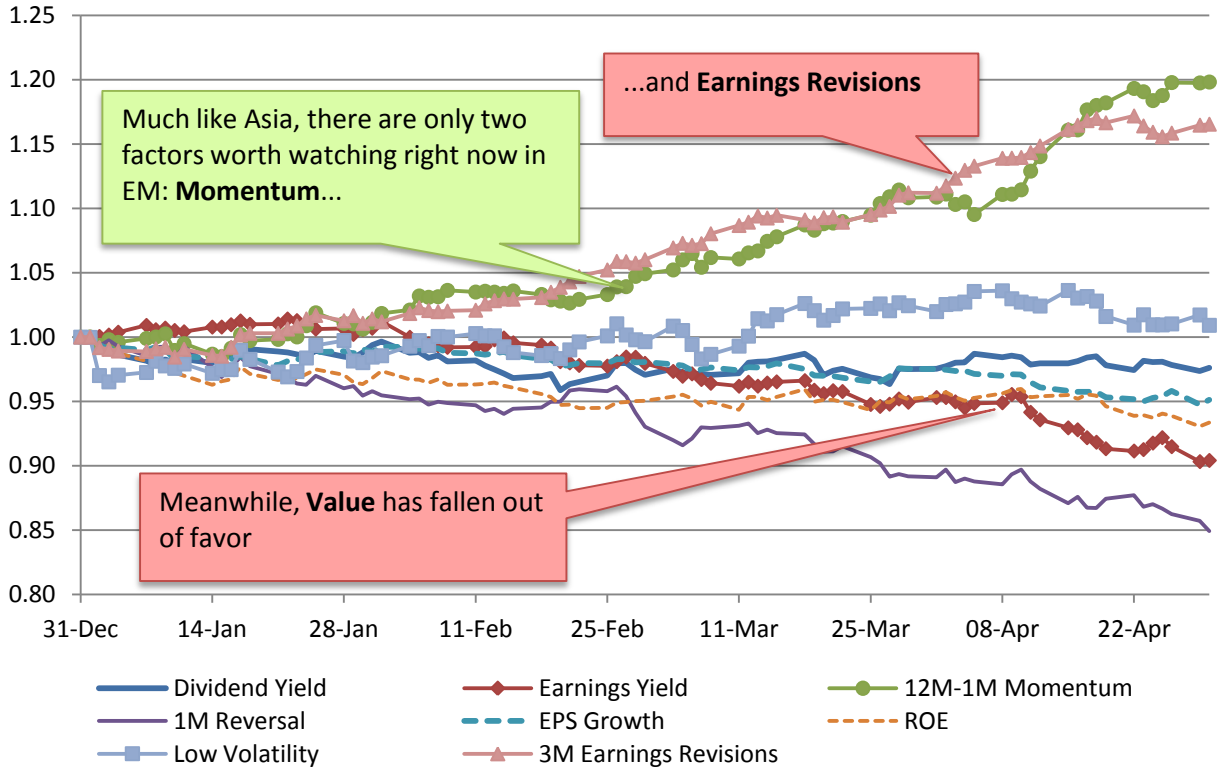
Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

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)
HBI	HANESBRANDS INC	410345102	Consumer Discretionary	19.3%
MN	MANNING & NAPIER INC	56382Q102	Financials	17.8%
ABC	AMERISOURCEBERGEN CORP	03073E105	Health Care	16.0%
ARB	ARBITRON INC	03875Q108	Consumer Discretionary	15.3%
CSH	CASH AMERICA INTL INC	14754D100	Financials	15.0%
TSN	TYSON FOODS INC -CL A	902494103	Consumer Staples	14.1%
PRXL	PAREXEL INTERNATIONAL CORP	699462107	Health Care	13.4%
HNZ	HEINZ (H J) CO	423074103	Consumer Staples	13.2%
CHRW	C H ROBINSON WORLDWIDE INC	12541W209	Industrials	9.4%
RRTS	ROADRUNNER TRANS SVCS HLDGS	76973Q105	Industrials	8.5%
TTEC	TELETECH HOLDINGS INC	879939106	Information Technology	7.7%
CSC	COMPUTER SCIENCES CORP	205363104	Information Technology	7.0%
CNP	CENTERPOINT ENERGY INC	15189T107	Utilities	5.8%
OTTR	OTTER TAIL CORP	689648103	Utilities	5.7%
WNR	WESTERN REFINING INC	959319104	Energy	5.5%
DK	DELEK US HOLDINGS INC	246647101	Energy	5.4%
HCOM	HAWAIIAN TELCOM HOLDCO INC	420031106	Telecommunication Services	4.4%
FTK	FLOTEK INDUSTRIES INC	343389102	Materials	2.7%
IDT	IDT CORP	448947507	Telecommunication Services	2.6%
WOR	WORTHINGTON INDUSTRIES	981811102	Materials	1.8%

BEST SELL IDEAS (SECTOR NEUTRAL)

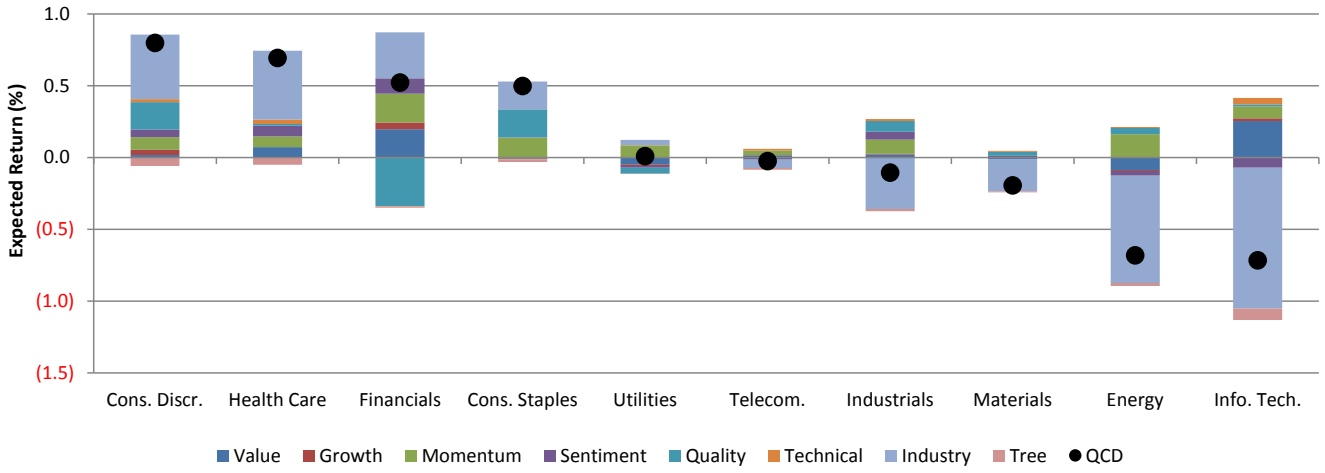
Ticker	Name	CUSIP	GICS Sector	QCD Score (lower is better short)
HNR	HARVEST NATURAL RESOURCES	41754V103	Energy	-35.8%
KIOR	KIOR INC	497217109	Energy	-33.5%
GTAT	GT ADVANCED TECHNOLOGIES INC	36191U106	Information Technology	-30.3%
AUMN	GOLDEN MINERALS CO	381119106	Materials	-30.1%
RBCN	RUBICON TECHNOLOGY INC	78112T107	Information Technology	-30.1%
MCP	MOLYCORP INC	608753109	Materials	-29.5%
ACFN	ACORN ENERGY INC	004848107	Industrials	-25.4%
SWSH	SWISHER HYGIENE INC	870808102	Industrials	-23.9%
NIHD	NII HOLDINGS INC	62913F201	Telecommunication Services	-23.8%
ZIOP	ZIOPHARM ONCOLOGY INC	98973P101	Health Care	-23.5%
ETRM	ENTEROMEDICS INC	29365M208	Health Care	-21.9%
IQNT	NEUTRAL TANDEM INC	64128B108	Telecommunication Services	-20.2%
MTG	MGIC INVESTMENT CORP/WI	552848103	Financials	-20.1%
STSI	STAR SCIENTIFIC INC	85517P101	Consumer Staples	-19.2%
CACB	CASCADE BANCORP	147154207	Financials	-18.5%
JCP	PENNEY (J C) CO	708160106	Consumer Discretionary	-17.4%
TSLA	TESLA MOTORS INC	88160R101	Consumer Discretionary	-16.3%
CDZI	CADIZ INC	127537207	Utilities	-15.9%
AT	ATLANTIC POWER CORP	04878Q863	Utilities	-14.8%
CQB	CHIQUITA BRANDS INTL INC	170032809	Consumer Staples	-12.8%

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

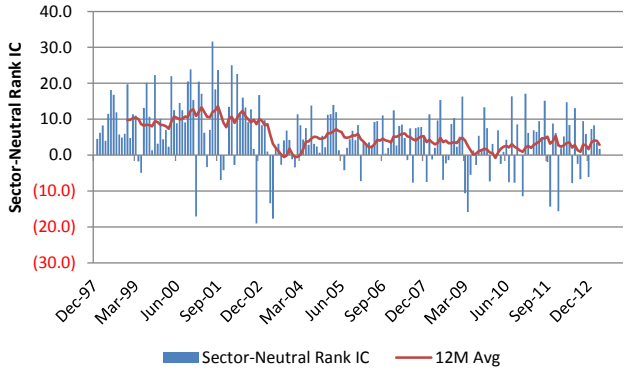


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Model performance

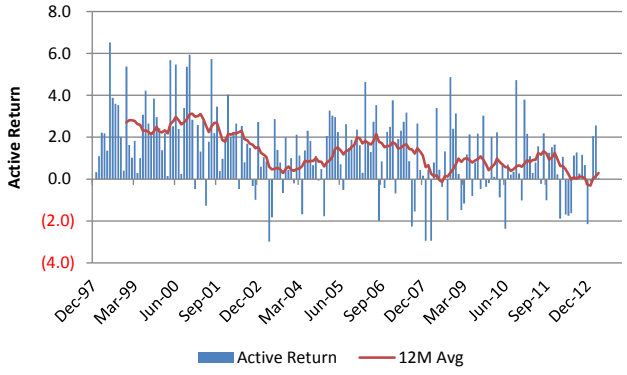
The QCD model has performed well since inception. Figure 24 shows the pure signal performance, measured as a monthly sector-neutral rank information coefficient (IC). Figure 25 shows the performance of an actual model portfolio, after costs, based on a realistically optimized market-neutral strategy.

Figure 24: Model performance, sector-neutral rank IC



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

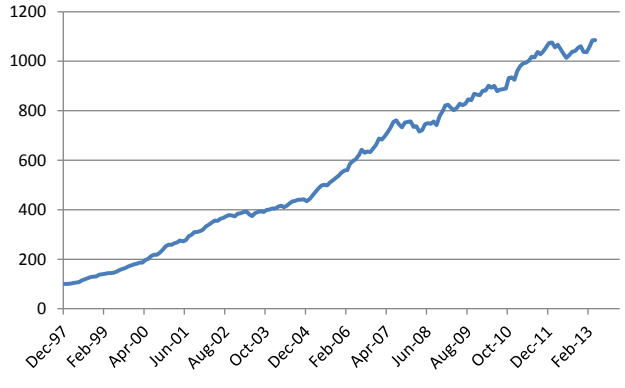
Figure 25: Model portfolio active return, after costs



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

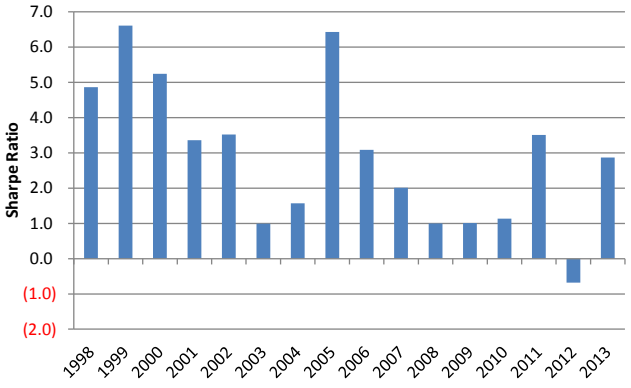
Figure 26 shows the cumulative performance of the optimized strategy, and Figure 27 shows the annualized Sharpe ratio (after costs) by calendar year.

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

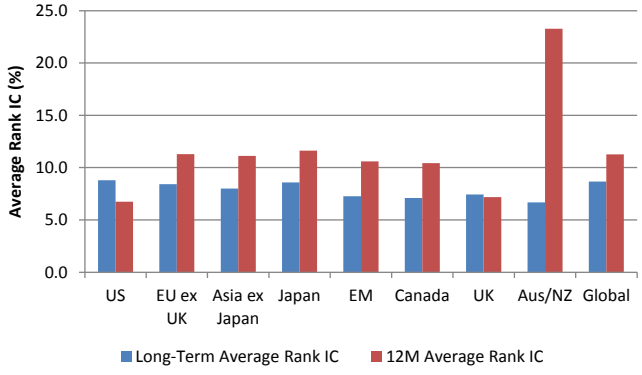
BEST BUY IDEAS					BEST SELL IDEAS				
Ticker	Name	SEDOL	County	N-LASR Score (higher is better long)	Ticker	Name	SEDOL	County	N-LASR Score (lower is better short)
SCR FP	SCOR SE	B1LB9P	France	2.39	MII SP	Mewah International Inc	B3RQ6Q	Singapore	-2.39
CNK	CINEMARK HOLDINGS INC	B1W7RQ0	USA	2.37	BO DC	Bang & Olufsen A/S	416129	Denmark	-2.20
GFC FP	Gecina	774246	France	2.33	3062 TT	CyberTAN Technology Inc	665191	Taiwan	-2.16
SREN VX	Swiss Re Reg	B545MG	Switzerland	2.33	CAO SP	China Aviation Oil Singapore Corp	B10SYQ	Singapore	-2.11
SKI AU	Spark Infrastructure Trust	B0T9JZ	Australia	2.31	TPIPL TB	TPI Polene PCL	686905	Thailand	-2.09
NDA SS	Nordea AB	538003	Sweden	2.30	GIFI	GULF ISLAND FABRICATION INC	2412636	USA	-2.06
SYD AU	Sydney Airport	B70DWB	Australia	2.24	2486 TT	I-Chiun Precision Industry	622478	Taiwan	-2.04
ENG SM	Enagas SpA	738307	Spain	2.22	PX PM	Philex Mining Corp	B1FHVG	Philippines	-2.03
BATS LN	British American Tobacco Plc	028758	UK	2.22	FN	FABRINET	B4JSZL8	USA	-2.03
TLS AU	Telstra Corp Ltd	608728	Australia	2.20	6358 JT	Sakai Hvy Industry	676948	Japan	-2.01
AAD AU	Ardent Leisure Ltd	611796	Australia	2.19	5449 JO	Osaka Steel Co Ltd	666209	Japan	-2.00
GIS	GENERAL MILLS INC	2367026	USA	2.16	RTRY SP	Rotary Engineering	675196	Singapore	-1.98
PMT	PENNYMAC MORTGAGE INVEST TR	B3V8JL7	USA	2.16	GMO	GENERAL MOLY INC	B01S2H3	USA	-1.96
REE SM	Red Electrica Corporacion SA	572377	Spain	2.16	ENZ	ENZO BIOCHEM INC	2318499	USA	-1.95
GBDC	GOLUB CAPITAL BDC INC	B60K6F8	USA	2.16	OMDC IB	Orissa Minerals Development Co Lt	B7Y0CM	India	-1.94
TDC DC	TDC A/S	569879	Denmark	2.15	3431 JT	Miyaji Engineering Group	668755	Japan	-1.94
T.	TELUS CORP	2381093	Canada	2.13	CIMBT TB	CIMB Thai Bank PCL	615811	Thailand	-1.94
BALN VX	Baloise Hldg Reg	712459	Switzerland	2.10	2328 TT	PAN International Industry	666996	Taiwan	-1.94
363 HK	Shanghai Industrial Holdings Ltd.	681001	China	2.09	2331 HK	Li Ning Co. Ltd.	B01JCK	China	-1.94
CCT SP	CapitaCommercial Trust	B011YD	Singapore	2.09	LCB PM	Lepanto Consolidated Mining B	651290	Philippines	-1.94

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

Model performance

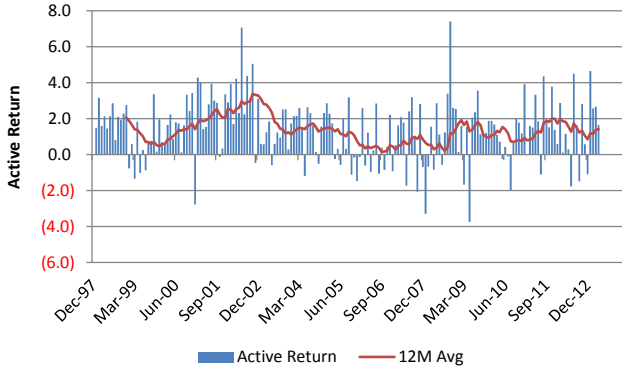
The N-LASR model has performed well since inception. Figure 29 shows the average pure signal performance, measured as a monthly rank information coefficient (IC), in different regions. Figure 30 shows the performance of a global model portfolio, after costs, based on a realistically optimized market-neutral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

Figure 29: Regional model performance, average rank IC



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

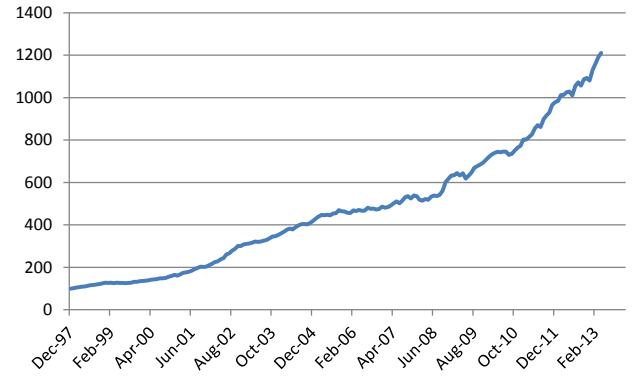
Figure 30: Global portfolio active return, after costs



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

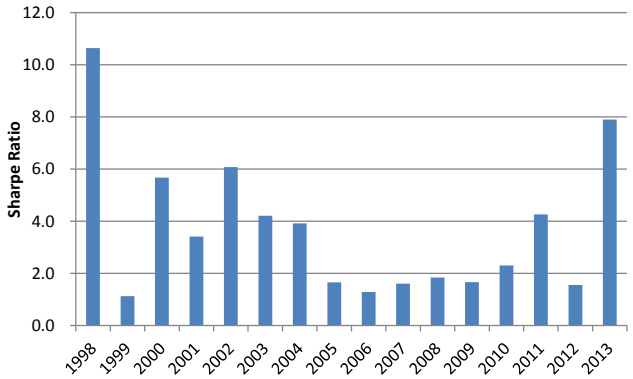
Figure 31 shows the cumulative performance of the optimized strategy, and Figure 32 shows the annualized Sharpe ratio (after costs) by calendar year.

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

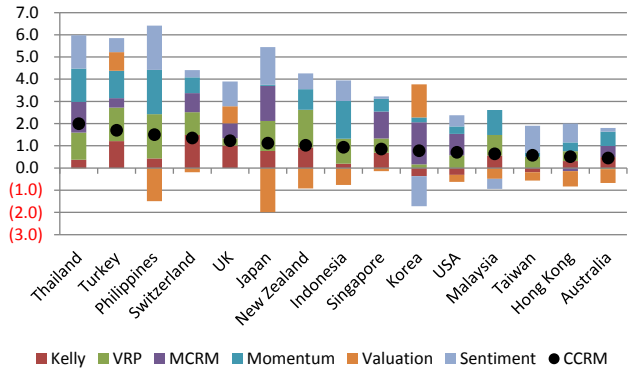
CCRM country rotation model

- 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

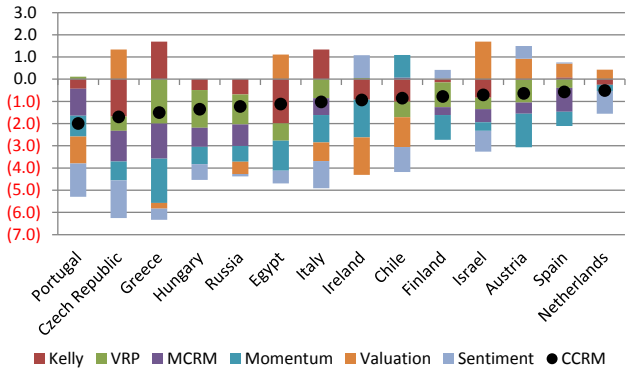
Figure 33 and Figure 34 show the top and bottom third of countries, as ranked currently by our CCRM model. The bars show what is driving these calls.

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

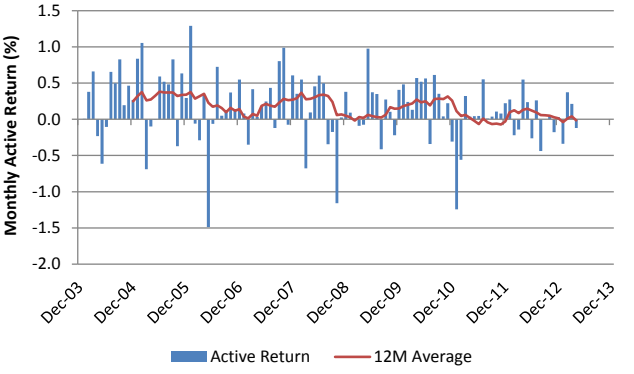


Source: Bloomberg Finance LLP, Compustat, IBES, MSCI, Russell, S&P, Thomson Reuters, Worldscope, Deutsche Bank

Model performance

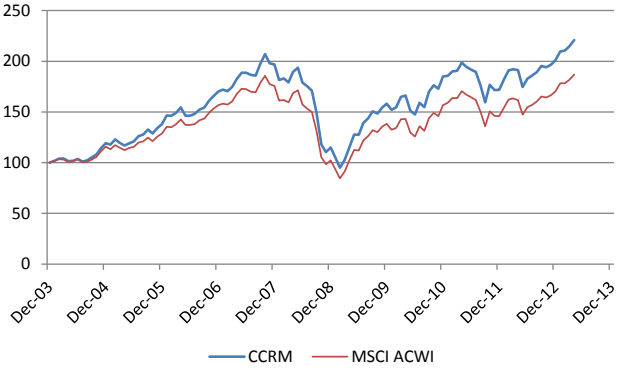
Figure 35 and Figure 36 show the performance of the model over time.

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

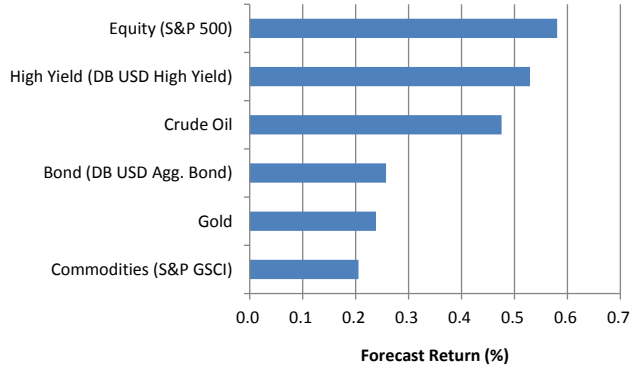
Quant Tactical Asset Allocation (QTAA) model

- 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

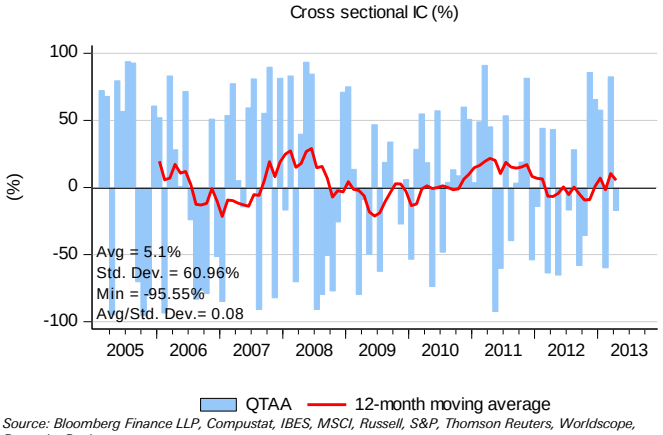
Figure 37 shows the current ranking of our six asset classes, ranked from best to worse in terms of month-ahead forecast returns. Figure 38 shows the monthly performance of the QTAA model over time.

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

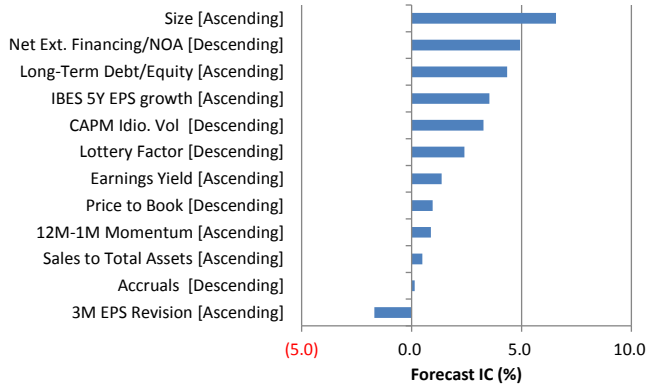
Style rotation model

- 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

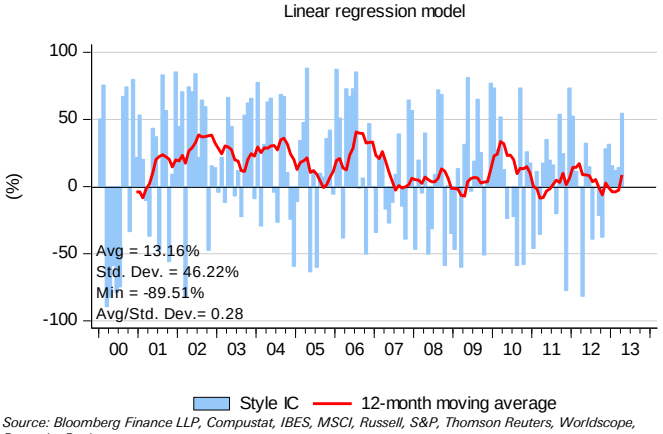
Figure 39 shows the current ranking of our 12 factors, ranked from best to worse in terms of month-ahead forecast performance. Figure 40 shows the monthly performance of the Style Rotation model over time.

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	2,921	12.66	4.05	3.00	3.02	14.41	0.21	42.59	(33.26)	0.00	304	2,872	55.26	99.24
2 Expected dividend yield	Ascending	2,921	12.80	4.16	3.40	3.28	14.94	0.22	44.46	(33.89)	0.00	304	2,872	54.61	99.31
3 Price-to-operating EPS, trailing 12M, Basic	Descending	2,335	4.05	2.21	1.19	2.79	10.42	0.27	30.82	(32.28)	0.00	228	2,355	59.65	95.20
4 Operating earnings yield, trailing 12M, Basic	Ascending	2,896	3.29	3.49	4.63	4.88	13.07	0.37	47.24	(33.30)	0.00	228	2,871	61.40	96.41
5 Earnings yield, forecast FY1 mean	Ascending	2,770	2.11	3.11	3.89	4.41	12.38	0.36	48.88	(34.61)	0.00	304	2,535	62.50	94.95
6 Earnings yield, forecast FY2 mean	Ascending	2,751	(2.27)	2.47	2.84	3.86	11.98	0.32	47.02	(34.31)	0.00	304	2,434	63.16	94.33
7 Earnings yield x IBES 5Y growth	Ascending	1,692	(6.05)	1.32	1.32	1.76	10.45	0.17	41.11	(26.63)	0.01	228	1,927	58.77	93.45
8 Sector-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,896	1.47	2.77	4.12	4.33	8.38	0.52	28.96	(14.90)	0.00	228	2,869	68.86	95.97
9 Hist-rel Operating earnings yield, trailing 12M, Basic	Ascending	2,118	1.79	(0.33)	1.95	1.69	6.95	0.24	20.73	(18.74)	0.01	134	2,013	62.69	96.85
10 Operating cash flow yield (income stmt def)	Ascending	2,921	3.87	3.34	3.51	4.12	10.90	0.38	47.14	(32.67)	0.00	304	2,872	64.47	96.01
11 Cash flow yield, FY1 mean	Ascending	1,605	(4.03)	1.20	0.44	2.72	17.65	0.15	66.06	(54.29)	0.01	274	749	58.03	95.74
12 Free cash flow yield	Ascending	2,844	4.89	4.09	3.27	4.91	7.93	0.62	31.93	(22.64)	0.00	267	2,506	75.28	94.63
13 Price-to-sales, trailing 12M	Descending	2,858	0.55	2.88	0.27	1.80	10.96	0.16	30.02	(41.46)	0.00	304	2,797	56.91	99.11
14 Price-to-book	Descending	2,831	(3.39)	1.64	(1.15)	0.84	10.69	0.08	26.28	(35.75)	0.17	304	2,762	49.34	97.64
15 EBITDA/EV	Ascending	2,877	2.11	1.99	3.09	4.18	9.73	0.43	39.32	(27.15)	0.00	304	2,818	67.76	95.53
16 Price-to-book adj for ROE, sector adj	Descending	2,685	(4.34)	1.20	(1.50)	0.44	8.75	0.05	22.50	(33.21)	0.38	304	2,430	49.01	95.59
2. Growth															
17 Hist 5Y operating EPS growth	Descending	2,843	4.81	2.05	3.49	1.08	8.74	0.12	30.58	(22.70)	0.07	216	2,730	52.78	97.25
18 Hist 5Y operating EPS acceleration	Ascending	2,843	(5.72)	1.60	0.68	0.85	6.71	0.13	25.31	(16.13)	0.07	216	2,730	54.17	94.73
19 IBES 5Y EPS growth	Ascending	2,435	1.98	(0.70)	2.30	0.89	8.13	0.11	21.65	(27.86)	0.06	304	2,296	53.95	98.29
20 IBES 5Y EPS growth/stability	Ascending	2,435	2.68	(0.42)	2.49	1.31	7.73	0.17	20.64	(19.20)	0.00	304	2,296	56.25	98.63
21 IBES LTG EPS mean	Descending	1,929	6.95	1.78	(0.65)	1.76	15.85	0.11	37.64	(52.38)	0.05	304	2,153	50.00	97.77
22 IBES FY2 mean DPS growth	Ascending	2,127	6.00	2.31	2.05	1.02	8.54	0.12	24.12	(21.96)	0.17	131	1,471	51.15	87.69
23 IBES FY1 mean EPS growth	Ascending	2,743	(3.39)	2.02	1.34	1.05	7.53	0.14	20.76	(24.42)	0.02	304	2,514	60.86	88.76
24 Year-over-year quarterly EPS growth	Ascending	2,901	(0.90)	3.63	3.20	2.56	7.07	0.36	23.85	(21.12)	0.00	228	2,875	66.67	81.58
25 IBES FY1 mean CFPS growth	Descending	1,460	9.26	(1.93)	(1.30)	0.48	11.21	0.04	38.08	(42.07)	0.51	231	513	50.65	92.71
26 IBES SUE, amortized	Ascending	2,550	(0.62)	(0.52)	2.07	0.76	6.52	0.12	20.62	(16.30)	0.07	243	1,068	53.50	73.81
3. Price Momentum and Reversal															
27 Total return, 1D	Descending	2,921	(5.96)	1.03	2.37	4.99	7.19	0.69	15.52	(33.75)	0.00	304	2,872	77.96	1.64
28 Total return, 21D (1M)	Descending	2,921	(3.84)	(0.27)	0.57	1.82	10.96	0.17	29.03	(43.69)	0.00	304	2,872	57.89	0.44
29 Maximum daily return in last 1M (lottery factor)	Descending	2,915	8.51	3.92	4.40	5.19	14.97	0.35	39.13	(56.07)	0.00	304	2,742	64.47	54.31
30 21D volatility of volume/price	Descending	2,921	4.84	2.47	2.50	0.28	6.57	0.04	24.16	(16.78)	0.46	304	2,862	51.64	56.47
31 Total return, 252D (12M)	Ascending	2,846	7.35	4.26	2.93	3.32	14.13	0.23	39.62	(57.00)	0.00	304	2,791	64.47	89.95
32 12M-1M total return	Ascending	2,846	6.57	4.46	3.42	4.16	13.23	0.31	37.65	(49.06)	0.00	304	2,791	65.46	88.43
33 Price-to-52 week high	Ascending	346	5.56	3.15	3.84	3.22	17.81	0.18	49.63	(62.50)	0.00	304	1,934	62.17	83.45
34 Total return, 1260D (60M)	Ascending	2,510	6.07	(0.74)	3.28	1.15	10.99	0.10	25.63	(35.41)	0.07	292	2,232	56.85	97.47
4. Sentiment															
35 IBES LTG Mean EPS Revision, 3M	Ascending	1,899	1.09	0.80	1.14	0.88	3.77	0.23	11.16	(12.06)	0.00	304	2,125	61.84	59.76
36 IBES FY1 Mean EPS Revision, 3M	Ascending	2,722	(2.30)	0.61	2.02	2.94	8.47	0.35	29.96	(33.00)	0.00	304	2,473	66.78	75.40
37 IBES FY1 EPS up/down ratio, 3M	Ascending	2,694	(0.86)	0.25	2.06	3.11	7.88	0.39	27.54	(24.41)	0.00	304	2,335	67.76	79.64
38 Expectation gap, short-term - long-term	Descending	2,189	2.85	2.13	2.31	1.24	5.18	0.24	9.60	(19.91)	0.00	304	2,123	58.22	91.12
39 IBES FY1 Mean CFPS Revision, 3M	Ascending	1,535	2.63	0.62	2.04	2.01	16.06	0.13	69.38	(75.04)	0.04	273	682	62.27	64.53
40 IBES FY1 Mean SAL Revision, 3M	Ascending	2,677	2.96	1.42	2.31	1.10	7.90	0.14	27.43	(24.32)	0.05	203	2,161	60.59	71.57
41 IBES FY1 Mean FFO Revision, 3M	Ascending	140	15.89	0.46	3.73	2.99	21.10	0.14	71.43	(80.00)	0.02	276	83	57.61	69.67
42 IBES FY1 Mean DPS Revision, 3M	Ascending	1,244	(0.95)	0.09	0.94	0.65	5.18	0.13	14.91	(17.55)	0.16	128	991	57.81	62.56
43 IBES FY1 Mean ROE Revision, 3M	Ascending	2,072	1.43	(0.93)	0.92	0.66	6.68	0.10	23.70	(22.19)	0.26	128	1,719	58.59	65.84
44 Recommendation, mean	Descending	2,773	(6.59)	1.06	2.01	0.78	7.57	0.10	21.85	(19.41)	0.12	233	2,675	56.22	94.37
45 Mean recommendation revision, 3M	Descending	2,759	(1.86)	0.74	0.30	1.25	4.10	0.30	19.86	(11.55)	0.00	230	2,661	62.61	59.90
46 Target price implied return	Descending	2,711	6.80	0.45	0.20	0.04	16.91	0.00	60.74	(39.59)	0.98	169	2,455	47.34	80.10
47 Mean target price revision, 3M	Ascending	2,697	(5.68)	0.28	1.46	2.40	12.77	0.19	30.14	(41.94)	0.02	166	2,441	63.86	74.97
5. Quality															
48 ROE, trailing 12M	Ascending	2,893	2.21	1.31	3.98	3.89	10.12	0.38	33.42	(29.52)	0.00	228	2,862	64.47	96.44
49 Return on invested capital (ROIC)	Ascending	2,887	0.01	0.53	4.38	4.20	10.29	0.41	33.02	(31.24)	0.00	228	2,854	68.42	98.20
50 Sales to total assets (asset turnover)	Ascending	2,895	(0.68)	(0.28)	1.63	1.56	8.67	0.18	22.78	(22.02)	0.00	304	2,812	55.92	99.45
51 Operating profit margin	Ascending	2,851	(4.14)	(2.84)	0.75	1.16	5.44	0.21	16.98	(14.17)	0.00	304	2,716	59.54	98.43
52 Current ratio	Descending	2,257	7.37	2.77	1.39	1.89	10.24	0.18	31.95	(38.66)	0.00	304	2,238	54.61	97.91
53 Long-term debt/equity	Ascending	2,812	10.61	4.84	2.18	0.87	9.62	0.09	35.65	(28.14)	0.11	304	2,746	49.01	98.51
54 Altman's z-score	Ascending	2,214	(1.06)	(1.60)	1.69	0.27	9.21	0.03	31.74	(30.44)	0.62	304	2,157	49.01	98.34
55 Merton's distance to default	Ascending	2,228	5.86	0.84	3.81	3.37	11.79	0.29	33.03	(41.45)	0.00	304	2,334	65.79	95.05
56 Ohlson default model	Descending	2,236	(3.91)	(1.34)	2.01	2.32	6.38	0.36	16.95	(18.63)	0.00	267	2,123	68.16	98.28
57 Accruals (Sloan 1996 def)	Descending	2,189	1.53	(0.00)	(0.32)	0.55	4.19	0.13	12.07	(15.48)	0.02	304	2,137	55.26	88.49
58 Firm-specific discretionary accruals	Descending	1,139	1.46	(0.41)	(0.14)	0.50	3.17	0.16	7.82	(10.87)	0.01	244	2,119	55.74	81.27
59 Hist 5Y operating EPS stability, coef of determination	Ascending	2,843	1.79	(0.32)	(0.18)	0.80	5.04	0.16	20.01	(12.27)	0.02	216	2,730	52.31	96.88
60 IBES 5Y EPS stability	Descending	2,435	4.90	0.90	1.64	1.19	8.64	0.14	25.00	(34.33)	0.02	304	2,296	54.28	98.96
61 IBES FY1 EPS dispersion	Descending	2,770	(1.75)	0.89	3.63	1.57	9.11	0.17	31.67	(25.17)	0.00	304	2,535	60.20	84.16
62 Payout on trailing operating EPS	Ascending	2,231	12.35	2.14	0.83	0.89	13.47	0.07	38.55	(30.91)	0.25	304	2,211	50.00	99.23
63 YoY change in # of shares outstanding	Descending	2,873	1.14	3.01	3.07	2.62	8.91	0.29	19.53	(46.21)	0.00	304	2,767	60.53	94.27
64 YoY change in debt outstanding	Descending	2,229	(1.70)	0.07	(0.81)	0.27	4.06	0.07	13.07	(10.40)	0.25	304	2,220	55.59	89.87
65 Net external financing/net operating assets	Ascending	2,908	5.94	3.15	2.64	2.51	8.47	0.30	44.61	(21.76)	0.00	304	2,834	61.51	94.67
66 Piotroski's F-score	Ascending	2,921	2.08	2.41	3.60	2.95	8.11	0.36	29.20	(27.83)	0.00	304	2,874	67.76	88.18
67 Mohanram's G-score	Ascending	542	6.29	(1.29)	2.13	2.69	10.62	0.25	35.27	(32.14)	0.00	216	382	57.41	95.45
6. Technicals															
68 # of days to cover short	Descending	2,921	7.16	2.48	2.91	2.27	7.28	0.31	33.80	(25.16)	0.00	304	2,011	58.88	91.35
69 CAPM beta, 5Y monthly	Descending	2,921	3.13	(0.86)	0.71	1.06	13.80	0.08	40.19	(42.70)	0.23	245	2,907	51.43	97.69
70 CAPM idosyncratic vol, 1Y daily	Descending	2,905	10.02	5.44	6.67	5.30	18.11	0.29	42.60	(60.80)	0.00	292	2,880	62.33	99.18
71 Realized vol, 1Y daily	Descending	2,871	12.68	5.07	6.29	5.14	18.73	0.27	42.69	(59.63)	0.00	304	2,791	61.51	99.16
72 Skewness, 1Y daily	Descending	2,871	5.95	(0.47)	0.97	1.27	5.35	0.24	13.93	(22.86)	0.00	304	2,791	57.57	89.75
73 Kurtosis, 1Y daily	Descending	2,871	0.32	0.99	1.87	1.46	5.45	0.27	15.28	(15.82)	0.00	304	2,791	62.50	91.49
74 Idiosyncratic vol surprise	Descending	2,904	(2.33)	2.05	1.85	2.88	8.03	0.36	22.66	(33.71)	0.00	291	2,861	67.01	87.80
75 Normalized abnormal volume	Ascending	2,921	2.49	3.56	3.34	2.31	6.37	0.36	23.10	(16.38)	0.00	304	2,865	66.12	64.20
76 Float turnover, 12M	Descending	2,735	(5.82)	(0.00)	(0.08)	0.24	10.73	0.02	23.53	(26.97)	0.70	293	2,784	48.46	99.77
77 Moving average crossover, 15W-36W	Ascending	2,861	(5.45)	0.05	0.24	2.20	13.25	0.17	46.29	(55.07)	0.00	304	2,524	59.87	90.75
78 Log float-adj capitalization	Ascending	2,921	12.04	3.97	4.78	3.58	10.96	0.33	29.53	(40.68)	0.00	304	2,868	61.84	99.40
79 # of month in the database	Ascending	2,921	1.15	1.57	1.48	2.21	8.83	0.25	35.61	(23.86)	0.00	304	2,872	57.57	99.99
80 DB composite options factor	Ascending	2,011	(1.75)	(0.28)	1.47	1.49	3.68	0.40	13.99	(13.88)	0.00	141	2,024	65.96	23.00

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.

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)

		Current	Average IC (%)			Since Inception									
Factor Name	Direction[1]	# of Stocks	Last M	12M Avg	3Y Avg	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	9,761	12.78	4.34	4.59	4.39	10.51	0.42	36.88	(23.89)	0.00	280	7,984	65.00	4.39
2 Dividend yield, FY1	Ascending	7,667	12.41	3.94	4.20	4.48	10.84	0.41	32.17	(22.90)	0.00	223	5,199	64.57	4.48
3 Dividend yield, FY2	Ascending	7,584	11.83	3.78	3.88	4.38	10.90	0.40	33.19	(24.39)	0.00	213	5,156	64.32	4.38
4 Price/Earnings	Descending	8,194	(2.63)	(0.21)	0.33	4.09	13.19	0.31	39.66	(50.73)	0.00	273	6,275	61.90	-4.09
5 Price-to-FY0 EPS	Descending	7,680	(1.81)	(0.68)	(0.90)	2.93	10.33	0.28	28.98	(37.08)	0.00	280	6,000	62.14	-2.93
6 Earnings yield, FY0	Ascending	8,789	1.45	1.87	1.80	4.04	9.23	0.44	31.67	(18.68)	0.00	280	6,979	65.00	4.04
7 Earnings yield, forecast FY1 mean	Ascending	8,188	2.67	2.58	2.59	4.79	10.92	0.44	35.35	(22.20)	0.00	280	6,432	64.29	4.79
8 Earnings yield, forecast FY2 mean	Ascending	8,124	(1.02)	1.10	1.04	4.39	11.91	0.37	37.31	(31.50)	0.00	280	6,256	62.86	4.39
9 Cash flow yield, FY0	Ascending	6,429	3.90	0.51	0.45	4.08	6.44	0.63	26.42	(11.80)	0.00	156	4,903	75.00	4.08
10 Cash flow yield, FY1 mean	Ascending	5,805	1.17	(0.94)	(1.10)	2.02	9.78	0.21	31.42	(32.01)	0.00	212	4,449	58.02	2.02
11 Price/Sales	Descending	9,262	3.16	(0.84)	(0.68)	1.46	9.62	0.15	26.48	(31.59)	0.01	280	7,464	55.71	-1.46
12 Price/Book	Descending	9,445	0.17	(1.01)	(1.69)	1.22	10.53	0.12	31.56	(37.54)	0.05	280	7,511	57.14	-1.22
13 Est Book-to-price, median	Ascending	7,171	1.07	(0.94)	(2.51)	1.24	9.94	0.12	30.37	(26.29)	0.11	164	5,358	53.05	1.24
14 EBITDA to EV	Ascending	7,244	(8.79)	3.14	4.80	3.89	10.82	0.36	36.69	(26.20)	0.00	280	4,633	62.50	3.89
15 Sales/EV	Ascending	9,230	4.24	(0.06)	0.75	1.93	7.92	0.24	24.81	(20.06)	0.00	280	7,430	60.71	1.93
2. Growth															
16 IBES 5Y EPS growth	Ascending	8,145	(2.63)	0.83	2.03	1.12	6.18	0.18	19.09	(21.86)	0.00	280	6,181	58.93	1.12
17 EPS Growth	Ascending	8,941	(2.69)	2.57	1.69	2.09	6.88	0.30	29.72	(28.97)	0.00	264	6,857	64.02	2.09
18 IBES LTG EPS mean	Descending	5,329	0.65	0.55	0.30	1.38	12.17	0.11	28.22	(40.36)	0.06	280	4,154	52.86	-1.38
19 IBES FY1 mean EPS growth	Ascending	7,763	1.01	1.22	0.53	0.42	6.07	0.07	14.44	(20.10)	0.24	280	6,343	55.00	0.42
20 IBES FY1 mean CFPS growth	Descending	4,775	4.90	1.22	0.75	1.74	4.23	0.41	7.47	(11.39)	0.00	156	3,874	65.38	-1.74
21 IBES FY2 mean DPS growth	Ascending	7,572	6.44	1.50	0.38	2.55	11.04	0.23	38.85	(31.49)	0.00	222	5,038	59.91	2.55
22 Asset growth	Descending	9,244	5.89	1.33	0.87	0.58	8.55	0.07	21.57	(27.36)	0.26	280	7,254	51.79	-0.58
3. Price Momentum and Reversal															
23 Total return, 1D	Descending	9,777	(3.03)	1.56	2.89	3.59	7.44	0.48	21.94	(41.58)	0.00	280	8,099	70.71	-3.59
24 Weekly Total Return	Descending	9,777	(4.35)	0.29	3.02	2.97	8.77	0.34	30.60	(33.64)	0.00	280	8,098	64.64	-2.97
25 Total return, 21D (1M)	Ascending	9,777	11.38	2.87	1.10	0.16	11.50	0.01	27.69	(44.07)	0.81	280	8,093	53.21	0.16
26 Total return, 252D (12M)	Ascending	9,602	19.98	9.32	5.92	4.48	14.58	0.31	41.64	(46.50)	0.00	280	7,900	66.79	4.48
27 12M-1M total return	Ascending	9,602	19.07	9.34	6.34	5.10	14.05	0.36	40.96	(42.52)	0.00	280	7,900	68.93	5.10
28 Total return, 1260D (60M)	Ascending	8,576	6.35	2.97	3.04	1.50	14.14	0.11	40.32	(44.84)	0.08	280	6,390	58.57	1.50
4. Sentiment															
29 IBES LTG Mean EPS Revision, 1M	Ascending	5,294	2.51	0.28	0.55	0.66	2.58	0.26	7.26	(8.59)	0.00	280	4,116	62.86	0.66
30 IBES LTG Mean EPS Revision, 3M	Ascending	5,271	3.18	0.91	0.84	0.86	3.35	0.26	11.05	(10.26)	0.00	280	4,060	61.43	0.86
31 IBES FY1 EPS up/down ratio, 1M	Ascending	5,790	6.55	3.22	3.57	3.69	5.43	0.68	17.76	(13.76)	0.00	280	4,328	76.79	3.69
32 IBES FY1 EPS up/down ratio, 3M	Ascending	7,388	7.14	4.47	4.13	3.68	5.80	0.63	17.92	(12.36)	0.00	280	5,806	75.36	3.68
33 IBES FY1 Mean EPS Revision, 1M	Ascending	8,009	4.28	2.93	2.77	2.90	5.07	0.57	16.50	(12.79)	0.00	280	6,284	72.50	2.90
34 IBES FY1 Mean EPS Revision, 3M	Ascending	7,957	7.13	4.64	4.11	3.41	6.64	0.51	19.37	(20.12)	0.00	280	6,193	73.57	3.41
35 IBES FY1 Mean CFPS Revision, 3M	Ascending	5,574	5.42	3.07	2.85	2.53	5.56	0.46	15.81	(23.83)	0.00	202	4,272	77.72	2.53
36 IBES FY1 Mean DPS Revision, 1M	Ascending	5,982	3.32	2.70	3.08	1.78	4.39	0.40	12.65	(16.63)	0.00	221	4,308	71.95	1.78
37 IBES FY1 Mean DPS Revision, 3M	Ascending	5,954	4.27	4.01	3.79	2.20	5.88	0.37	19.08	(24.51)	0.00	219	4,248	72.60	2.20
38 IBES FY1 Mean FFO Revision, 1M	Ascending	5,058	4.68	3.48	3.52	2.26	4.05	0.56	11.73	(8.89)	0.00	148	3,970	77.70	2.26
39 IBES FY1 Mean FFO Revision, 3M	Ascending	5,000	10.77	5.64	4.74	2.89	5.76	0.50	16.27	(14.53)	0.00	145	3,877	74.48	2.89
40 IBES FY1 Mean ROE Revision, 1M	Ascending	7,405	3.00	2.10	2.01	1.79	4.08	0.44	13.70	(10.51)	0.00	200	5,317	70.00	1.79
41 IBES FY1 Mean ROE Revision, 3M	Ascending	7,316	6.92	2.83	2.47	2.21	5.01	0.44	13.57	(13.58)	0.00	198	5,185	69.70	2.21
42 Target price implied return	Descending	8,309	13.91	2.85	1.79	0.96	14.72	0.07	55.58	(36.25)	0.41	164	6,234	53.05	-0.96
43 Recommendation, mean	Descending	8,512	(4.47)	1.93	2.30	1.76	6.86	0.26	17.41	(16.84)	0.00	233	7,171	65.24	-1.76
44 Mean recommendation revision, 3M	Descending	8,481	0.75	1.48	1.36	1.90	2.92	0.65	10.01	(10.13)	0.00	230	7,149	75.65	-1.90
5. Quality															
45 Return on Equity	Ascending	9,131	1.45	3.32	4.20	4.26	10.20	0.42	30.68	(34.69)	0.00	232	7,651	66.38	4.26
46 return on capital	Ascending	9,215	0.32	2.51	3.92	4.50	12.36	0.36	49.47	(34.02)	0.00	280	6,937	64.64	4.50
47 Return on Assets	Ascending	9,357	(8.23)	3.22	4.98	4.71	13.30	0.35	44.20	(30.31)	0.00	280	7,035	63.57	4.71
48 Asset Turnover	Ascending	9,369	(11.38)	0.98	2.70	2.48	16.26	0.15	44.64	(51.55)	0.01	280	7,526	57.86	2.48
49 Gross margin	Ascending	8,586	(0.08)	1.51	2.40	1.83	5.85	0.31	16.60	(13.45)	0.00	280	6,842	62.86	1.83
50 EBITDA margin	Ascending	9,371	(4.97)	3.07	3.71	3.96	13.83	0.29	42.97	(41.30)	0.00	280	7,545	59.29	3.96
51 Berry Ratio	Ascending	7,176	(1.48)	1.39	1.47	2.95	9.30	0.32	29.57	(20.79)	0.00	280	5,284	60.00	2.95
52 IBES FY1 EPS dispersion	Descending	8,188	3.33	2.94	3.77	0.43	9.51	0.05	32.68	(25.37)	0.45	280	6,432	50.71	-0.43
53 IBES 5Y EPS growth/stability	Ascending	8,145	(2.87)	1.12	2.41	1.45	6.01	0.24	18.66	(20.47)	0.00	280	6,180	58.57	1.45
54 YoY change in debt outstanding	Descending	7,755	1.26	(0.03)	(0.13)	0.23	3.92	0.06	11.51	(11.34)	0.32	280	6,269	53.21	-0.23
55 Current ratio	Descending	7,708	8.93	1.59	1.02	0.67	8.94	0.07	27.86	(27.01)	0.21	280	6,133	50.00	-0.67
56 Long-term debt/equity	Ascending	9,247	9.06	3.49	1.31	0.82	6.48	0.13	22.37	(18.17)	0.04	280	7,438	55.00	0.82
57 Merton's distance to default	Ascending	7,848	(2.87)	2.09	4.24	2.60	11.19	0.23	31.19	(31.18)	0.00	280	6,444	59.64	2.60
58 Capex to Dep	Descending	7,038	1.82	3.26	1.91	1.42	6.41	0.22	22.38	(19.93)	0.00	280	5,105	61.07	-1.42
6. Technicals															
59 Realized vol, 1Y daily	Descending	9,612	10.01	5.69	6.10	5.16	15.38	0.34	29.45	(44.64)	0.00	280	7,908	61.43	-5.16
60 Skewness, 1Y daily	Descending	9,612	0.48	0.68	1.99	1.63	5.34	0.31	15.03	(32.98)	0.00	280	7,908	63.93	-1.63
61 Moving average crossover, 15W-36W	Ascending	9,343	16.77	3.49	1.76	2.98	14.63	0.20	37.15	(45.46)	0.00	280	6,891	62.50	2.98
62 Normalized abnormal volume	Ascending	9,751	10.42	3.84	2.90	2.27	6.57	0.35	20.47	(14.71)	0.00	280	7,858	60.71	2.27

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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