Quantitative Monographs

Timing style rotations in China's domestic market

Equities

China
Quantitative

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Why do we consider style rotation?

Although style performance has been fairly consistent in the China A-share markets compared to developed markets such as the US and Hong Kong (link), we still observe constant rotation among the styles. Since 2016, for instance, Small-caps, one of the most consistent long-term outperformers, have started to lose ground to Large-caps. Whether this longest ever Large-cap rally will continue has become one of the most-asked questions among investors.

How do we do it?

We build the style rotation model by using machine learning techniques to explore the relationship between future style performance and economic conditions, market environment and style characteristics, etc. We tested three learning models, including Linear Regression, Logistic Regression and a Random Forest model. Our final model is a combination of the three.

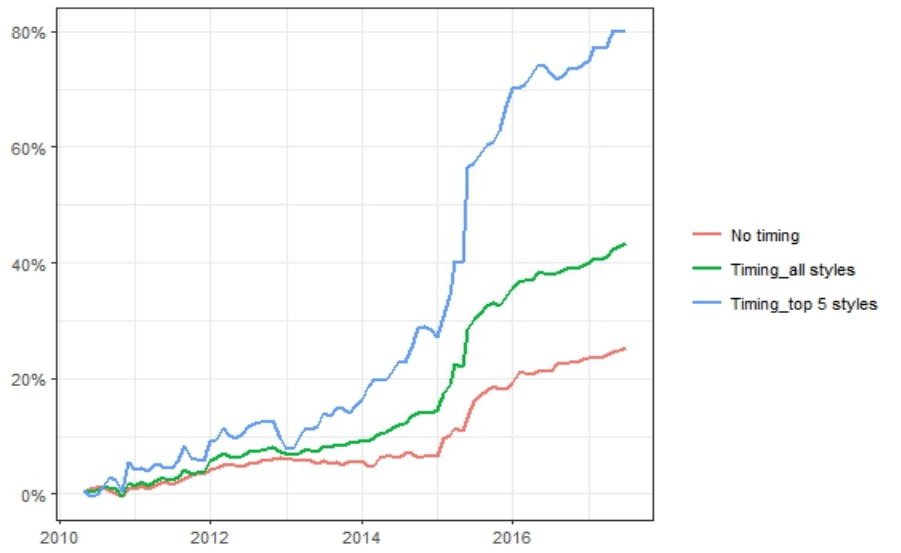
How did it perform?

Our timing model generates stronger performance and manages to react to the latest significant size rotation since 2016. Latest predictions suggest the continuation of outperformance in the Value and Low-Risk styles, as well as underperformance in Small-caps.

How do we invest based on the predictions?

There are various ways of investing on this idea, including trading on the potential winning style baskets, or stocks that are screened out based on these styles. We provide such screens in this report.

Figure 1: Performance of style timing



Source: FactSet, Wind, UBS Quantitative Research

Executive Summary

Style rotation has become more prevalent post the global financial crisis

Is it possible to time the style rotation? Shall we even be considering timing the style rotation? These have been long-debated questions in academia and the industry. However, one thing we know for sure is that style performance does rotate, and has been doing so even more so following the global financial crisis.

In China's domestic market (which is the focus of this report), even though style performance has been much more consistent compared to developed markets such as the US and Hong Kong, we have also observed style rotations. The most recent is a rotation in size. Since mid-2016, small caps have started to lose ground to large caps. Whether the rebound of large caps is a temporary phenomenon or a signal of a regime shift has become a main focus for many investors.

We combine the Linear Regression, Logistic Regression and Random Forest models to forecast style performance

In this report, we aim to build the style rotation model for China's domestic market, focusing on 19 different styles belonging to the following 6 categories: Value, Growth, Price Reversal, Quality, Size, and Risk.

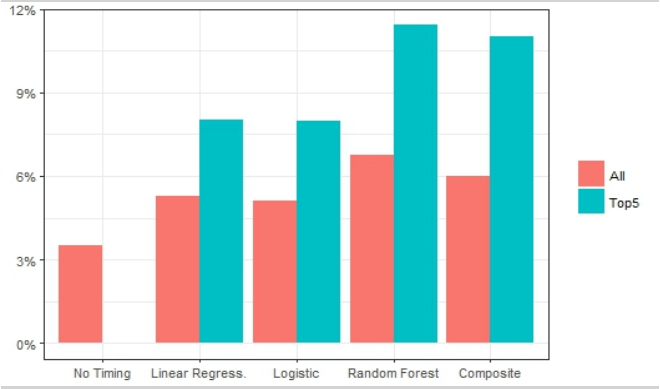
We use 3 models—Linear Regression, Logistic Regression and Random Forest models—to predict the styles' relative performance in the subsequent month (to predict the probability of outperforming in the case of logistic models), and adjust the style weighting accordingly. We then form the final composite model by combining the results from all three models based on the correlations between the Random Forest and regression models.

The composite model improves performance during the back-test period

The composite model generates strong performance on both an absolute and risk-adjusted basis. On top of this, it managed to switch out of small caps during the recent size rotation.

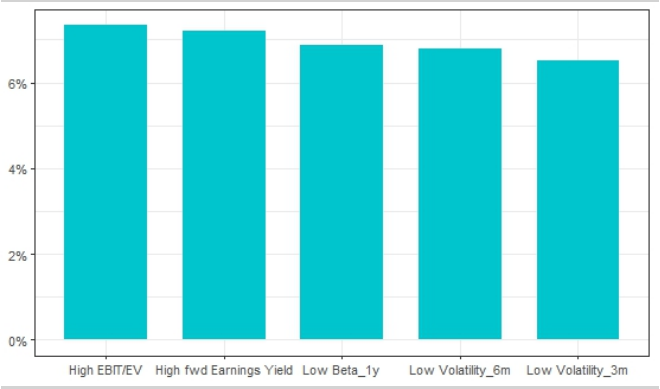
Based on training data from June 2002 to May 2017 as well as external factors as of end-June, we attempt to forecast style performance in July. The latest predictions suggest the Value and Low-Risk styles will continue to outperform in July 2017. According to our composite model, the top five performers will be: High EBIT/EV, High Forecast Earnings Yield, 12m Low Beta, and 6m and 3m Low Volatility. We also provide stock ideas based on the potential winning styles (Figure 25).

Figure 2: Model performance comparison



Source: FactSet, Wind, UBS Quantitative Research

Figure 3: Top picks for styles in July 2017



Source: FactSet, Wind, UBS Quantitative Research

Data

The universe of our back-test comprises all China A-shares. We aim to predict the rotation among 19 styles in 6 categories: Value, Growth, Price Reversal, Quality, Size, and Risk. Single-style portfolios are formed by assigning stocks into high, medium and low baskets, according to the respective styles' values such as Earnings Yield, ROE and Volatility. Please see Style definitions in the Appendix for a list of the 19 factors.

We use macro, market and style-specific factors for prediction

We use a wide range of external factors to train the models: 1) macro indices to explain the economic environment; 2) market data including performance, liquidity, volatility, and valuations; and 3) style-specific data, among which, style spreads are calculated as spreads between the most and least preferred baskets, adjusted by the market level, and style momentum is the performance of the style during previous months.

Figure 4: Macro indicators

Cluster	Type	Factors	Definition and Methodology
Economy	**Macro Factors**	Gross Domestic Product (GDP)	GDP growth ratio, quarterly, lag one quarter
		Industrial Production (IP)	Industrial production, monthly growth rate, lag one month
		Consumer Price Index (CPI)	Change in price level of consumer goods and services purchased by households, inflation
		Consumer Confidence Index	Index level of consumer confidence, lag one month
		USD/CNY	Foreign exchange rate between US dollar and RMB yuan
	Macro Factors - delta	MoM Chg in GDP	Month-over-month change in economic growth ratio, average duiring the quarter
		MoM Chg in IP	Month-over-month change in industrial production growth rate
		MoM Chg in CPI	Month-over-month change in inflation ratio
		MoM Chg in Consumer Confidence index	Month-over-month change in Consumer Confidence Index
		MoM Chg in USD / CNY	Month-over-month change in USD/CNY exchange rate

Source: Wind, UBS Quantitative Research

Rotate with the economic cycle

Style performance tends to rotate with the economic cycle. For example, in a low-growth environment, investors tend to prefer stocks in High-Quality and Low-Risk styles. However, in a growth environment, we would typically observe a rebound for stocks with low valuations at the beginning, followed by strong price momentum at the later stage. Therefore, we adopt a set of macro factors that are commonly used to monitor the economic cycle.

Figure 5: Market indicators

Cluster	Type	Factors	Definition and Methodology
Market	**Market Performance**	Past 1m Market Perf	China all A-share market performance during previous 1 month
		Past 3m Market Perf	China all A-share market performance during previous 3 months
		Past 6m Market Perf	China all A-share market performance during previous 6 months
		Past 12m Market Perf	China all A-share market performance during previous 12 months
		Market level	Shanghai Composite Price Index, month end
		20d Moving Avg (MA20)	Shanghai Composite Price Index, 20-day moving average
		Above MA20 dummy	Equals "1" if index level is above 20-day moving average; otherwise, "0".
	Market Liquidity	Amihud Liquidity Zscore	Standardised market liquidity index
		ADT_1m	Average daily turnover during previous 1 month
		ADT_3m	Average daily turnover during previous 3 months
		ADT_6m	Average daily turnover during previous 6 months
		ADT_12m	Average daily turnover during previous 12 months
		ADV_1m	Average daily value traded during previous 1 month
		ADV_3m	Average daily value traded during previous 3 months
		ADV_6m	Average daily value traded during previous 6 months
		ADV_12m	Average daily value traded during previous 12 months
		IPO# over the month	Total IPO number over the month
		MoM Change in IPO#	Change in IPO numbers, monthly
	Market Volatility	Market Realized Vol 1m	Historic return volatility, calculated from daily returns during previous month
		VIX	The CBOE Volatility Index
	Market Valuation	PE_whole market	Aggregated market valuation in all China A-shares
		PE_Shanghai	Aggregated market valuation in all China A-shares in Shanghai
		PE_Shenzhen	Aggregated market valuation in all China A-shares in Shenzhen
		MoM Chg in PE_all market	Month-over-month valuation change in China A-share
		MoM Chg in PE_Shanghai	Month-over-month valuation change in Shanghai
		MoM Chg in PE_Shenzhen	Month-over-month valuation change in Shenzhen

Source: Wind, Datastream, UBS Quantitative Research

Different style preferences in different market environments

We use market indicators such as past performance, technical indicators, volatility, and valuation to capture investor sentiment and market activity. Most style rotations happen when there is a switch in sentiment. When market volatility increases, investor preferences switch towards conservative choices such as Quality and Low-Risk stocks. In contrast, in an active trading and high liquidity environment, investor sentiment would normally be optimistic, thus leading to a golden period for the Small-cap and High-Growth styles.

Figure 6: Style-specific measures

Cluster	Type	Factors	Definition and Methodology
Style Specific	**Spreads* by style**	fwd Earnings Yield Spread	Forward 12-month Earnings Yield spread
		fwd Book Yield Spread	Forward 12-month Book/Price spread
		Sales Yield Spread	Trailing 12-month Sales Yield spread
		EBITÆV Spread	Trailing 12-month EBITÆV spread
		Size Spread	Market cap spread
		12m Vol Spread	Previous 12-month return volatility spread
		6m Vol Spread	Previous 6-month return volatility spread
		3m Vol Spread	Previous 3-month return volatility spread
		12m Beta Spread	12-month Beta spread
		3m Beta Spread	3-month Beta spread
		DEBTÆQ Spread	Debt to equity spread
		CAPDEP Spread	Capex/Depreciation spread
		ROIC Spread	ROIC spread
		fwd ROE Spread	Forward 12-month ROE spread
	Style Momentum	12m Style Momentum	Previous 12m style performance
		6m Style Momentum	Previous 6m style performance
		3m Style Momentum	Previous 3m style performance
		1m Style Momentum	Previous 1m style performance

* Spread is calculated as the difference between median EY (BY, Market-cap, etc.) in the top and bottom one-third of baskets, divided by the median EY (BY, Market-cap, etc.) of the overall A-share market.
Source: FactSet, Wind, UBS Quantitative Research

We capture the mean reversion on various measures

The effectiveness of using spreads to time performance is based on the mean reversion assumption, i.e. when the spread gets too wide, it tends to reverse. The most widely-used ones are valuation spreads. Here, we further extend the measure to various categories such as size, risk (measured by return volatility and beta), and quality spreads. In China's domestic market specifically, the mean reversion in size

and valuations has been well-documented in the past. Together with other categories, we are going to test their effectiveness in style timing.

Timing by long-term style momentum and short-term style reversal

Among a wide range of external signals, style momentum and reversal have proved to be the most useful factors in timing style rotations in the US. According to a study by our global quant team (Timing the US earnings yield style), the most useful signals are 12-month momentum and 3-month reversal. Therefore, we include previous style performance in both the Regression and Random Forest models.

In addition, we also use 11-month dummies to capture the potential calendar effect in both the Regression and Random Forest models.

The models

The base-line strategy is to buy and hold all 19 styles with equal weights, i.e. the no-timing version. The dynamic model is to predict the style's relative performance in the subsequent month and adjust its weighting accordingly.

We tested the following models:

(1) Linear Regression model

(2) Logistic model

(3) Random Forest model

Using a 180-month rolling period as the learning period, we predict the subsequent one-month long-only style performance, or the probability of outperformance, and adjust the weighting with model-predicted returns and probabilities. We feed the learning models with data since March 1995, and model the out-sample half from March 2010 to July 2017.

Linear Regression model

To start with, we use a Linear Regression model in which the independent variables are external factors such as macro, market and style-specific ones. At each month's end, the model predicts the style's relative performance in the subsequent month. We then weight the style based on the return predictions.

We consider a fairly large number of external factors. However, running a regression on all 53 independent variables at once will result in over-fitting the data. Therefore, we select only a subset of the factors, according to the below rules.

(1) Cluster external factors according to their pairwise correlations

(2) Choose only one factor from each cluster

The correlation threshold is set at 5%, which normally yields two to three different clusters. This ensures that we have a model without multi-co-linearity problems. Then we run all the possible models and choose the Linear Regression model with the best adjusted R-squared to predict style returns.

Logistic model

A Logistic Regression is similar to a Linear Regression, but instead of predicting performance, the Logistic model predicts the probability of a style outperforming the market in the subsequent month.

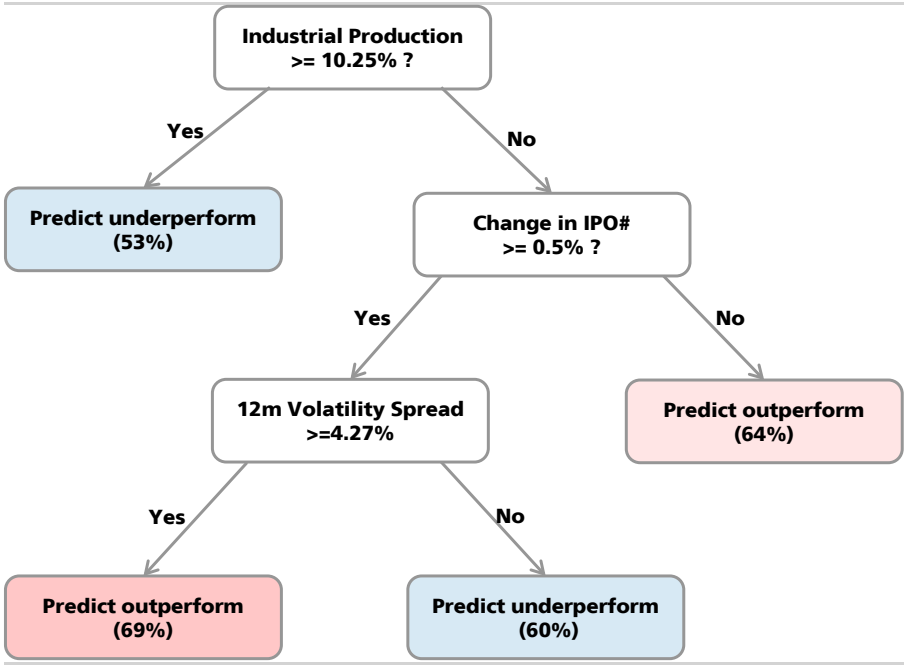
Subject to the same rules, we select a subset of independent variables. Among all the possible combinations, we choose the logistic model with the best Akaike Information Criterion (AIC).

Random Forest model

Random Forest is a model machine learning technique. This starting point is a decision tree. As shown in the following example, to grow a decision tree, we answer a series of yes and no questions until we reach a final node ("leaf"), which produces a predicted result with an associated probability.

The problem with a decision tree is that it will usually lead to a big, complicated tree and over-fit the data. The Random Forest model tends to avoid these problems.

Figure 7: Example of a decision tree



Source: UBS Quantitative Research

Random Forest is a bagging algorithm of multiple decision trees. At each month's end, it grows a large number of individual trees (nTree=1,000). For each tree, both the factors and the fraction of data in the learning period are randomly selected. The randomised process ensures independence, which is the key to the success of the algorithm. It then combines the predictions from each tree to form a consensus prediction. In our case, the model predicts the relative style performance in the subsequent month.

As the model copes well with multi-colinearity, we feed all factors into the model for training.

Model comparison

How did the models perform?

All three timing models improve the performance of a base-line no-timing strategy. We also look at the performance of a portfolio containing only the top 5 styles as suggested by the model. The base-line no-timing strategy in this case is a portfolio that contains 5 styles randomly selected each month.

Timing models generate better returns in both absolute and risk-adjusted terms

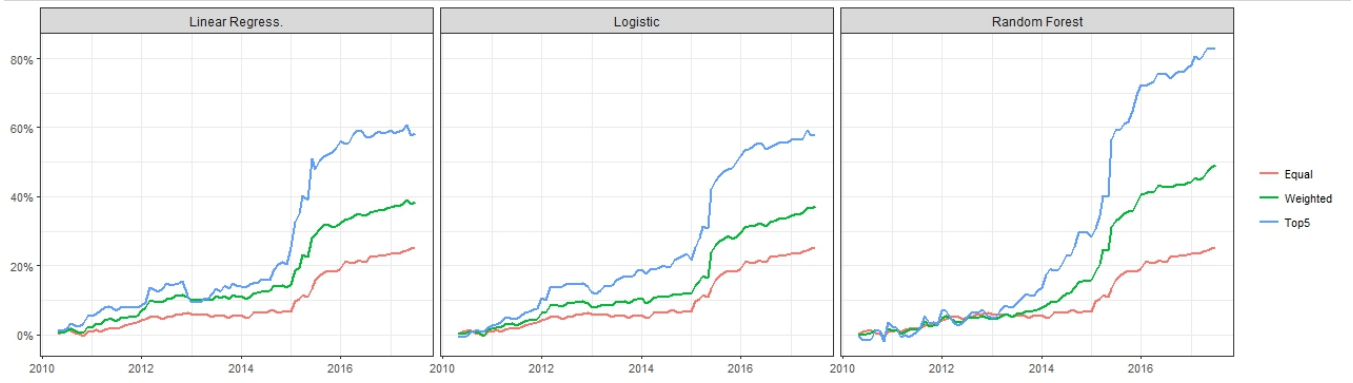
Figure 8: Predictability of individual models

		IC	Hit rate	Annualised rel. Return	Annualised rel. Return Volatility	Annualised Risk-adj. Return
All styles	No rotation	-	-	3.50%	2.35%	1.49
	Linear Regression	3.5%	57%	5.29%	3.44%	1.54
	Logistic Regression	5.6%	61%	5.12%	3.47%	1.47
	Random Forest	5.5%	61%	6.77%	4.09%	1.65
Top 5 Styles	Random 5 styles	-	-	3.10%	4.18%	0.74
	Linear Regression	-	57%	8.04%	6.98%	1.15
	Logistic Regression	-	62%	7.98%	5.42%	1.47
	Random Forest	-	59%	11.43%	8.30%	1.38

Note: Information coefficient (IC) refers to the rank correlation between timing signal and the subsequent month style returns; Hit rate is calculated as the percentage of months with monthly returns greater than the return of a no-timing portfolio. Backtesting performance is for the April 2010 to June 2017 period.
Source: FactSet, Wind, UBS Quantitative Research

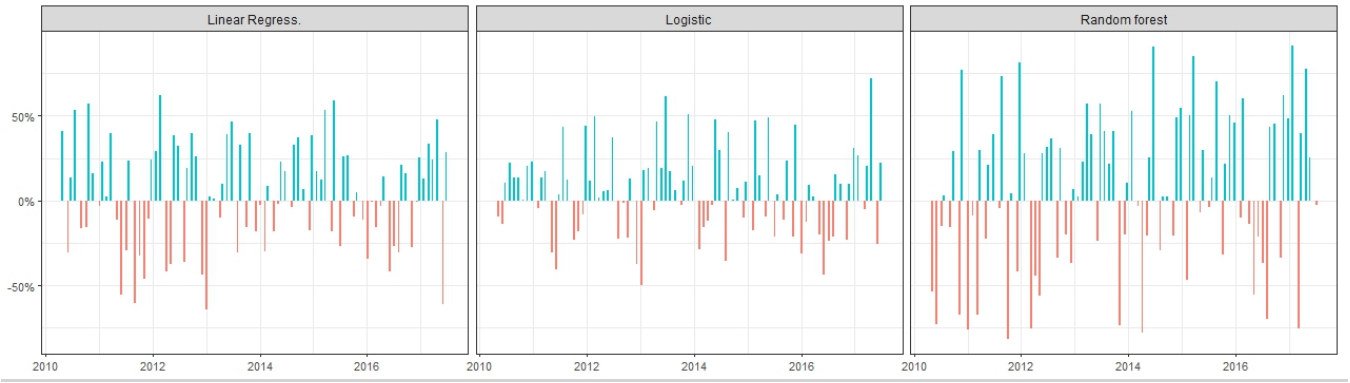
Looking back, the Linear and Logistic Regression models performed well during 2010-13, when the Random Forest model did not work. In the past two years, however, the regression models became less effective, while the Random Forest model yielded stronger performance.

Figure 9: Performance comparison of three timing models



Source: FactSet, Wind, UBS Quantitative Research

Figure 10: Information Coefficient (IC) of three timing models

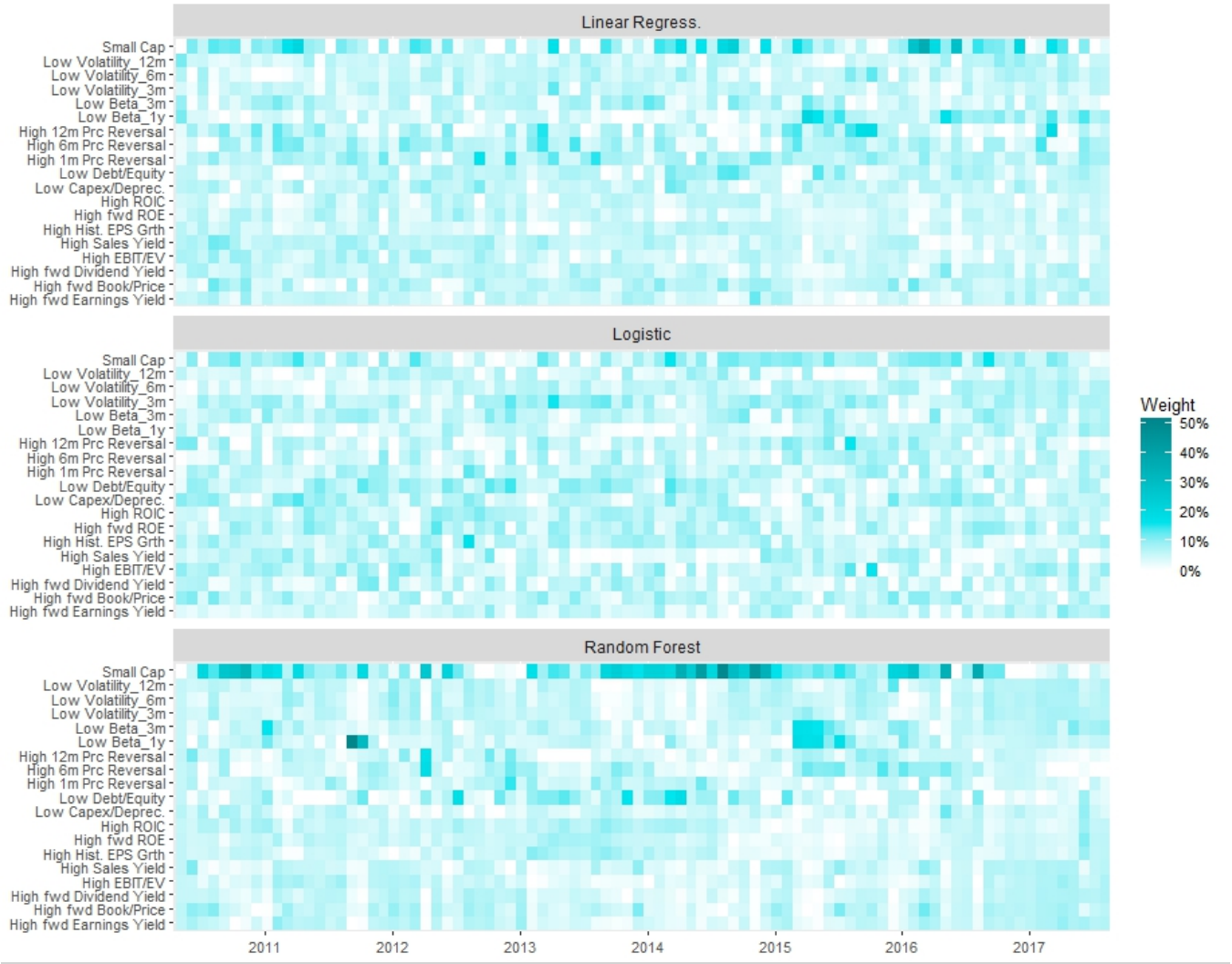


Note: Information coefficient (IC) is calculated as the rank correlation between the timing signal and actual subsequent month style returns.
Source: FactSet, Wind, UBS Quantitative Research

Which styles did the models pick?

Linear Regression and Logistic Regression produce less tilt towards certain styles, while the results from the Random Forest model diverge more from others.

Figure 11: Style weights



Source: FactSet, Wind, UBS Quantitative Research

More importantly, although the Random Forest model has been overweight on Small-caps and Reversal historically, it switched to the Value, Quality and Low-Risk styles since mid-2016, when Small-caps and Price Reversal stopped working. In contrast, regression models are slower in capturing the rotation.

The Random Forest model is the fastest to react on style rotation

As the Random Forest model does not assume any parametric relationships between the explanatory and dependent factors, we include the date as one of the explanatory factors. In doing this, we manage to capture the regime shift to some extent. On the other hand, we cannot include date in the regression model as we know for certain that the relationship between style performance and date are neither linear nor can be fitted by the Logistics model. It is not so surprising to see that Regression models do not perform well when historical patterns change.

A peek in the black box

The most common criticism for machine learning techniques is they are like a "black box". To shed light on how these models work, we output a detailed list of factors that are used in model predictions each month.

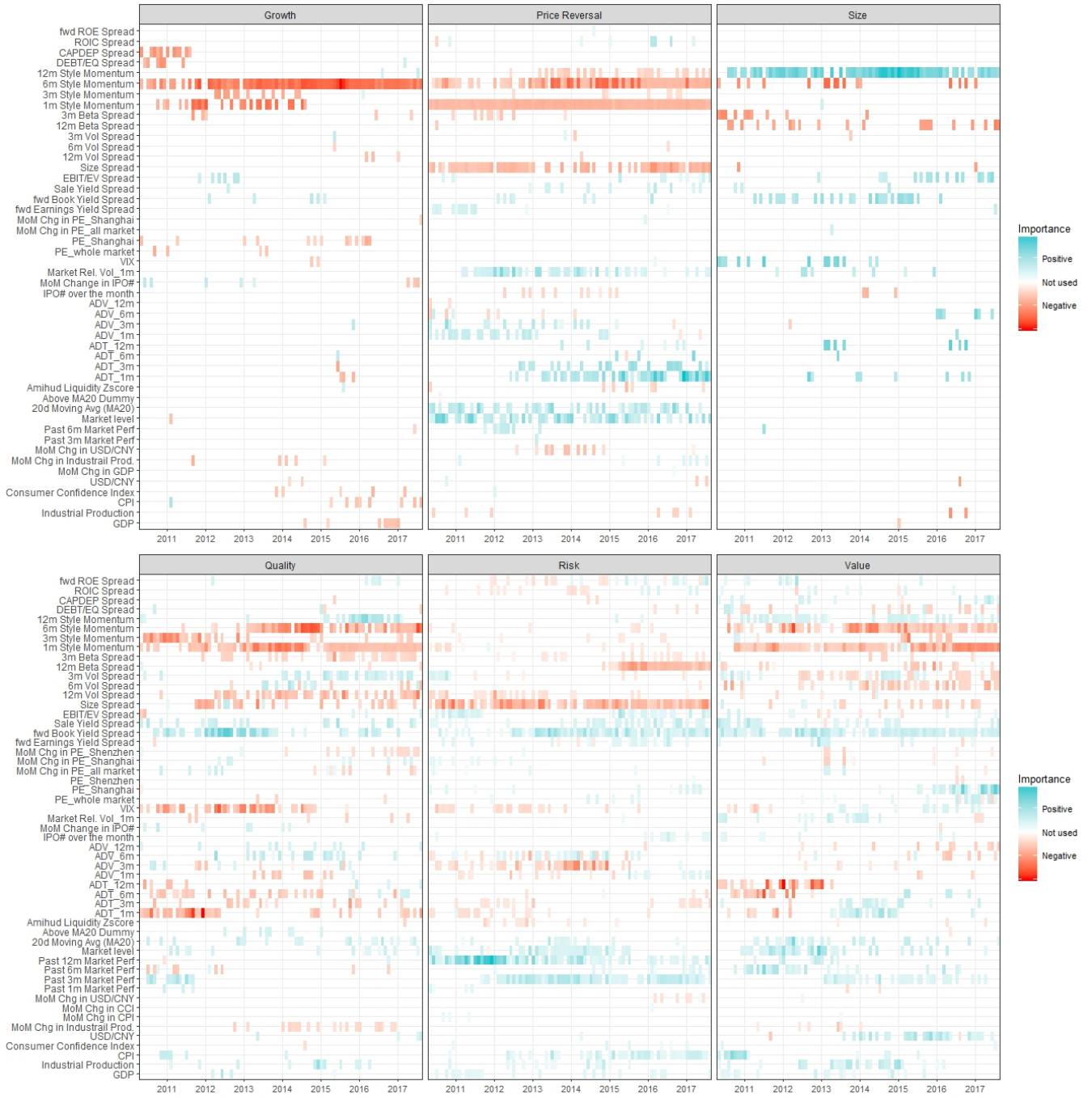
We use t-statistics to show the factor importance in a Linear Regression model (see Figure 12) and z-statistics for the Logistic Regression model (see Figure 13). The larger the magnitude, the more important the factor is. The sign for the statistics, as reflected by colours, indicates whether they are positively or negatively correlated (negative in red, positive in green).

Our results from Linear Regression show that styles in different categories tend to have different sensitivities to past performance. The small-cap premium used to be fairly persistent. Therefore, the 12-month style momentum has dominated the prediction of size performance. On the other hand, performance for Growth, Quality, Value and Price Reversal are negatively correlated with 1m, 3m and 6m past performance.

Style momentum/reversal are significantly correlated with subsequent style performance

For Price Reversal, apart from its past performance, it has also been sensitive to market liquidity, trading activities and size spreads in recent years. Risk styles are the only ones that are not sensitive to their past performance. Instead, they are correlated with risk and size spreads.

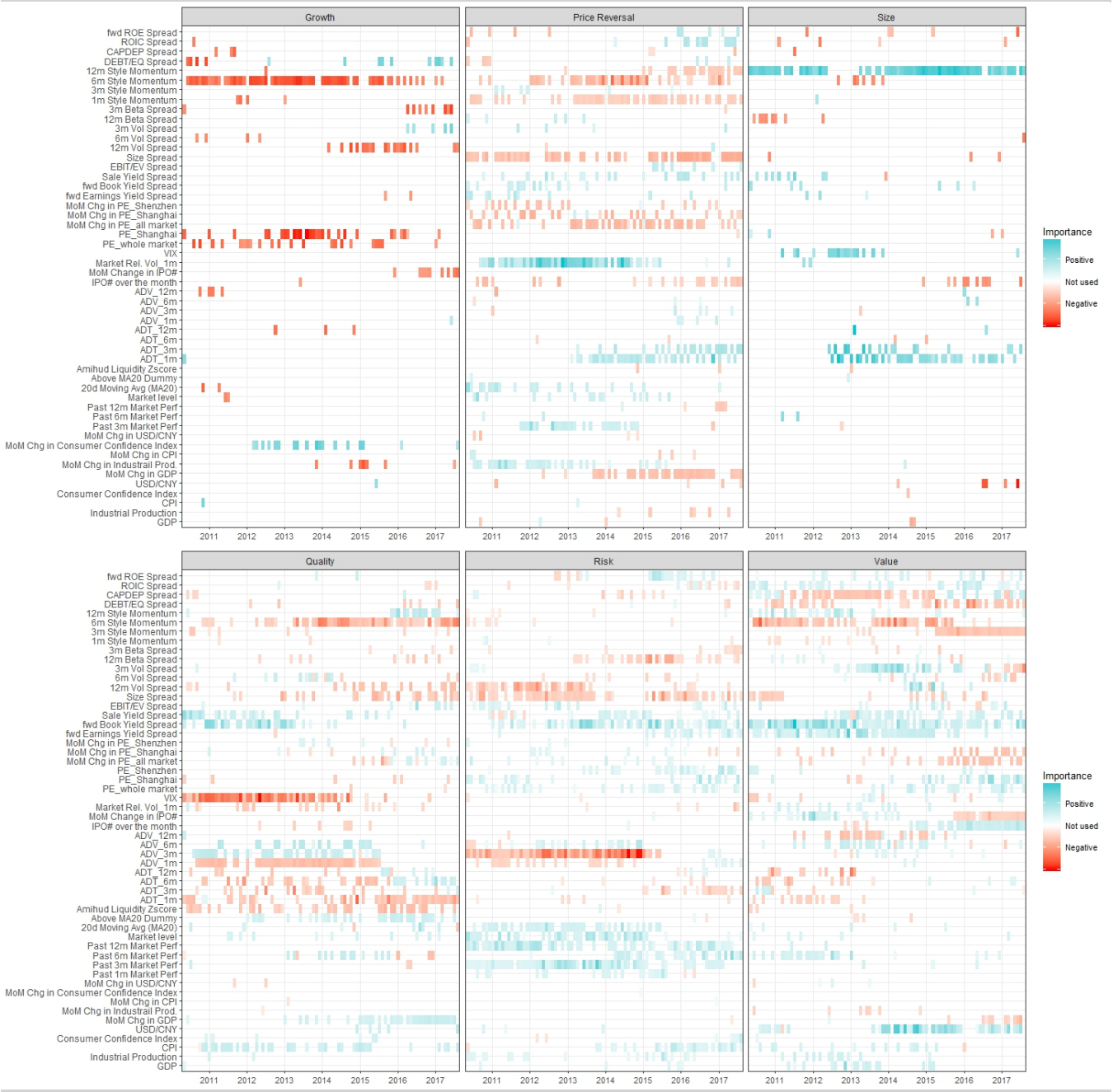
Figure 12: Factor importance in Linear Regressions



Source: FactSet, Wind, UBS Quantitative Research

The factors' importance in Logistic Regression models is largely similar to the ones in Linear Regression models. Styles' past performance is important in prediction across all the categories except Risk. Market factors are important in the prediction of Price Reversal, Risk and Value.

Figure 13: Factor importance in Logistic Regressions

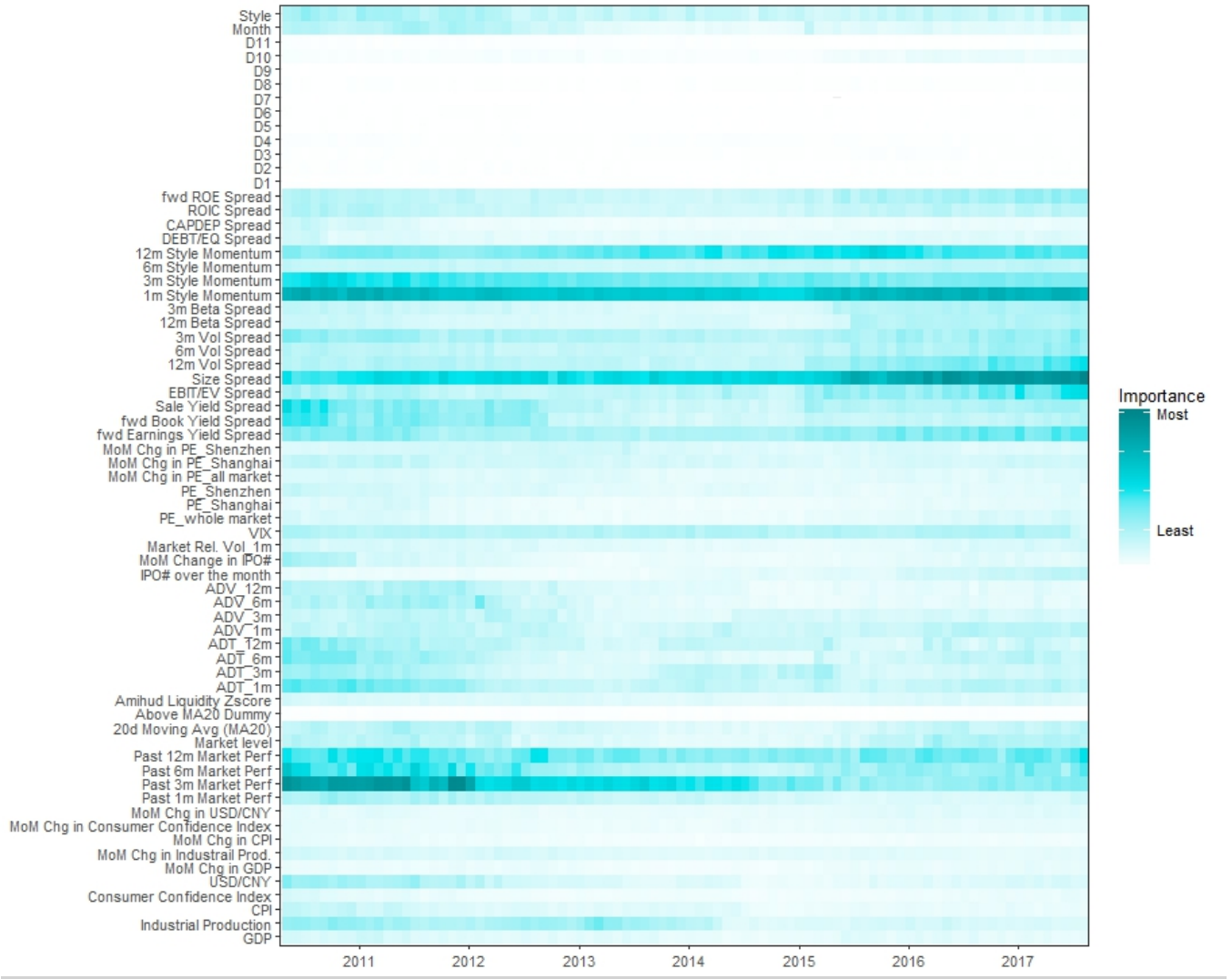


Source: FactSet, Wind, UBS Quantitative Research

The measure of factor importance in the Random Forest model is different from the regression models. The algorithm produces factor importance, calculating it as the incremental decrease in Mean Squared Error (MSE) with the factor included. With this measure, we can only tell how important each factor is, without knowing what exactly is the relationship between the factor and the predictions.

Size spread and styles' past performance are among the most important factors throughout the history. Macro and market factors used to have some importance around 2011 and 2012. However, the impact has declined over the past few years.

Figure 14: Factor importance in Random Forest model



Source: FactSet, Wind, UBS Quantitative Research

Style momentum

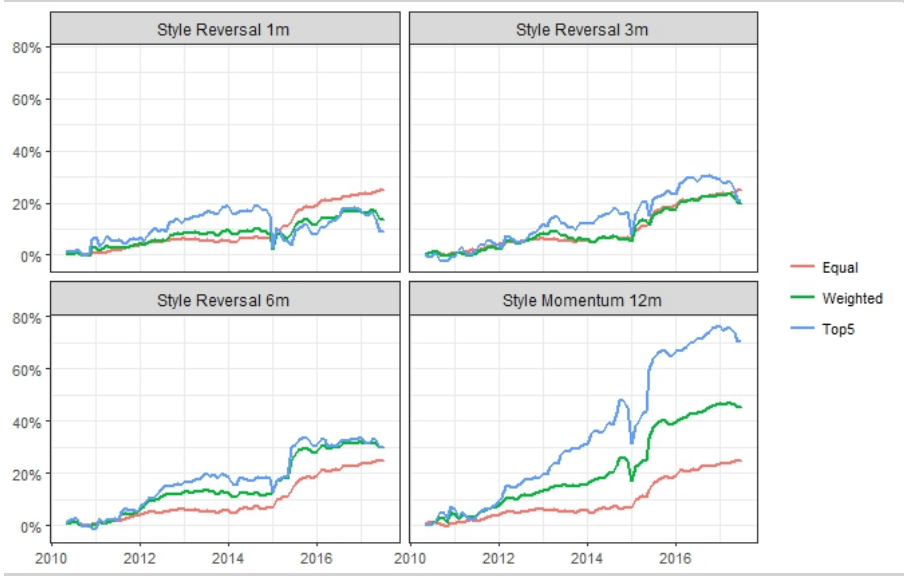
The back-test results show a strong correlation between 12-month style momentum, 1m, 3m, and 6m reversals and subsequent style performance. Therefore, in the following section, we test the strategy of only using these momentum and reversal factors to time the style performance.

12-month style momentum produces strong, but volatile excess returns. Slow in detecting size rotations

The base-line is still the equal-weight style portfolio. We then adjust the weighting according to the previous 12-month performance, as in the style momentum model. For style reversal models, weightings are based on -1 times the performance during the previous 1, 3, and 6 months.

The only strategy that outperformed in the back-test period is the one based on the 12m style momentum. However, the volatility of performance is high—hence, in the risk-adjusted base, performance was worse than that for the base-line portfolio.

Figure 15: Performance of style momentum and reversals



Source: FactSet, UBS Quantitative Research

What is more, it is slow in detecting rotations. The main draw-down of the momentum model happened at end-2014 and in the past few months, as it failed to predict the two major rotations of Small-caps. In December 2014, significant outperformance for the Financials sector resulted in a rebound for Large-caps. This was due to a strong expectation for more liquidity and greater trading in the approaching "bull" market. The second one started in mid-2016 due to fundamental changes in market regulations and the investment environment. Style momentum captured neither of these two rotations, and until recently, it put the highest weight on Small-caps.

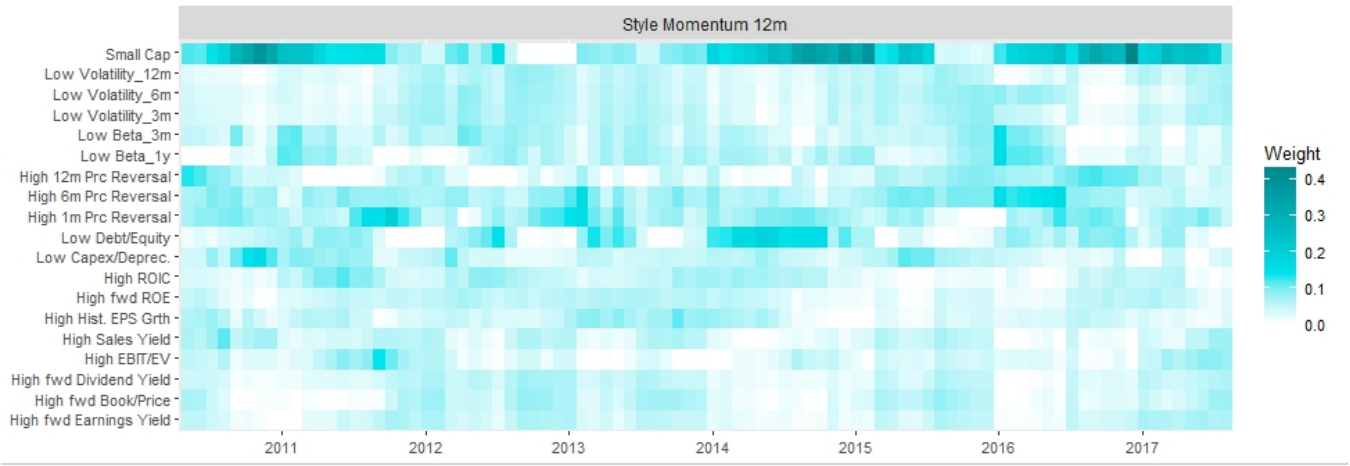
Figure 16: Performance comparison between style momentum models

		IC	Hit rate	Annualised rel. Return	Annualised rel. Return Volatility	Annualised Risk-adj. Return
All styles	No rotation	-	-	3.50%	2.35%	1.49
	Linear Regression	3.5%	57%	5.29%	3.44%	1.54
	Logistic Regression	5.6%	61%	5.12%	3.47%	1.47
	Random Forest	5.5%	61%	6.77%	4.09%	1.65
	1m Style Reversal	0.4%	49%	1.98%	4.40%	0.45
	3m Style Reversal	0.7%	49%	2.82%	3.84%	0.73
	6m Style Reversal	3.3%	54%	4.19%	3.93%	1.07
	12m Style Momentum	9.4%	61%	6.28%	5.77%	1.09
Top 5 Styles	Random 5 styles	-	-	3.10%	4.18%	0.74
	Linear Regression	-	57%	8.04%	6.98%	1.15
	Logistic Regression	-	62%	7.98%	5.42%	1.47
	Random Forest	-	59%	11.43%	8.30%	1.38
	1m Style Reversal	-	55%	1.29%	8.04%	0.16
	3m Style Reversal	-	54%	2.90%	7.31%	0.40
	6m Style Reversal	-	57%	4.14%	6.62%	0.62
	12m Style Momentum	-	59%	9.73%	9.96%	0.98

Source: FactSet, Wind, UBS Quantitative Research

In conclusion, momentum performance has historically been mainly driven by the long-term Small-cap premium instead of its timing capacity. Therefore, we need to take macro, market and style-specific factors into consideration in timing models.

Figure 17: Style weights in 12-month style momentum model



Source: FactSet, UBS Quantitative Research

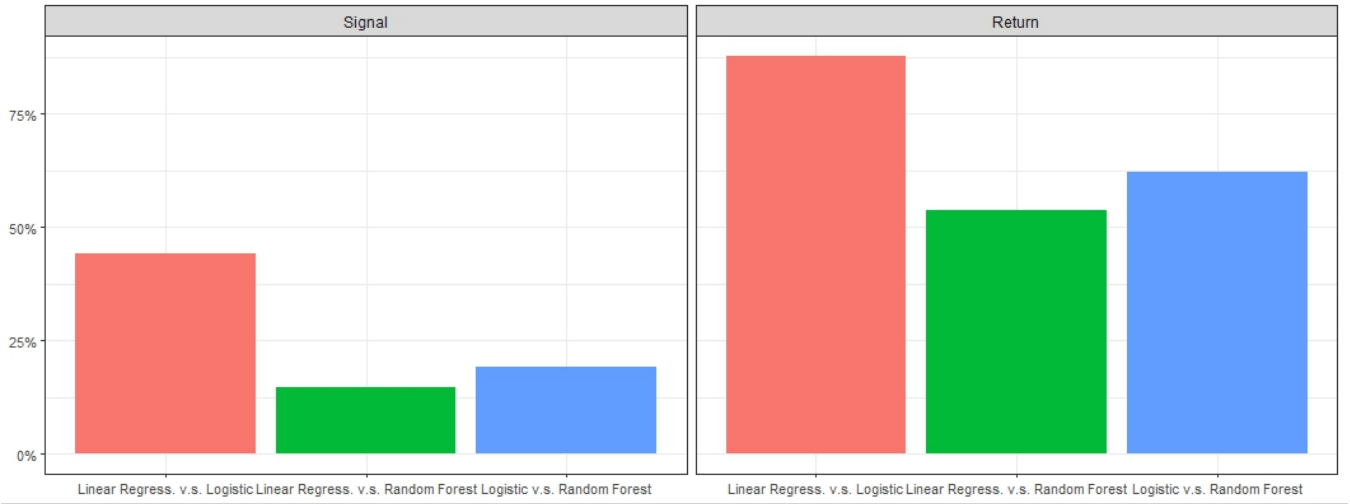
Model stacking

Model stacking has become a common technique in machine learning. Instead of relying on one single best model, people now tend to combine different models to reduce the bias.

As shown in Figure 18, there is a high correlation between the Linear Regression and Logistic Regression models, in terms of both the timing signals and strategy returns. On the other hand, the Random Forest model has a relatively low correlation with both regression models. Therefore, we combine three models as follows.

0.25*Linear Regression + 0.25*Logistic Regression + 0.5*Random Forest

Figure 18: Correlation between different models



Note: Correlation is calculated between actual style returns vs. signals, and actual returns vs. signal-weighted returns.
Source: FactSet, Wind, UBS Quantitative Research

In the all-style composite model, return volatility decreased as different models smoothed each other out. The composite timing model produces the highest risk-adjusted return among all the models.

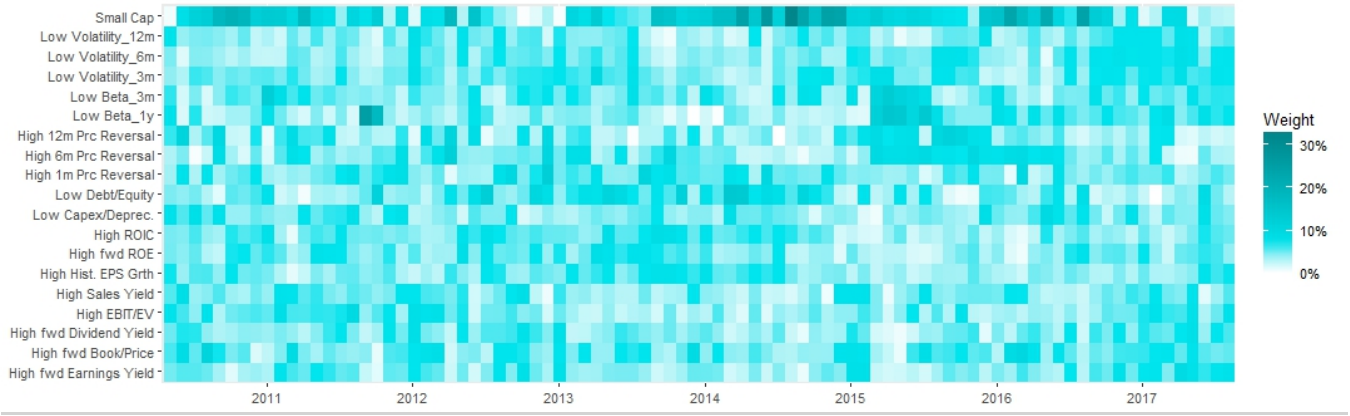
Figure 19: Performance of the composite model

		IC	Hit rate	Annualised rel. Return	Annualised rel. Return Volatility	Annualised Risk-adj. Return
All styles	No rotation	-	-	3.50%	2.35%	1.49
	Linear Regression	3.5%	57%	5.29%	3.44%	1.54
	Logistic Regression	5.6%	61%	5.12%	3.47%	1.47
	Random Forest	5.5%	61%	6.77%	4.09%	1.65
	Composite	**6.2%**	**61%**	**5.99%**	**3.48%**	**1.72**
Top 5 Styles	Random 5 styles	-	-	3.10%	4.18%	0.74
	Linear Regression	-	57%	8.04%	6.98%	1.15
	Logistic Regression	-	62%	7.98%	5.42%	1.47
	Random Forest	-	59%	11.43%	8.30%	1.38
	Composite	**-**	**61%**	**11.03%**	**7.99%**	**1.38**

Note: Backtesting performance is for the April 2010 to July 2017 period.
Source: FactSet, Wind, UBS Quantitative Research

Style weights for the composite model combine the advantages of the regression and Random Forest models. It had been overweight on Small-Caps before 2016 and switched to Low-Risk and High-Value styles afterwards.

Figure 20: Style weights of the composite model



Source: FactSet, Wind, UBS Quantitative Research

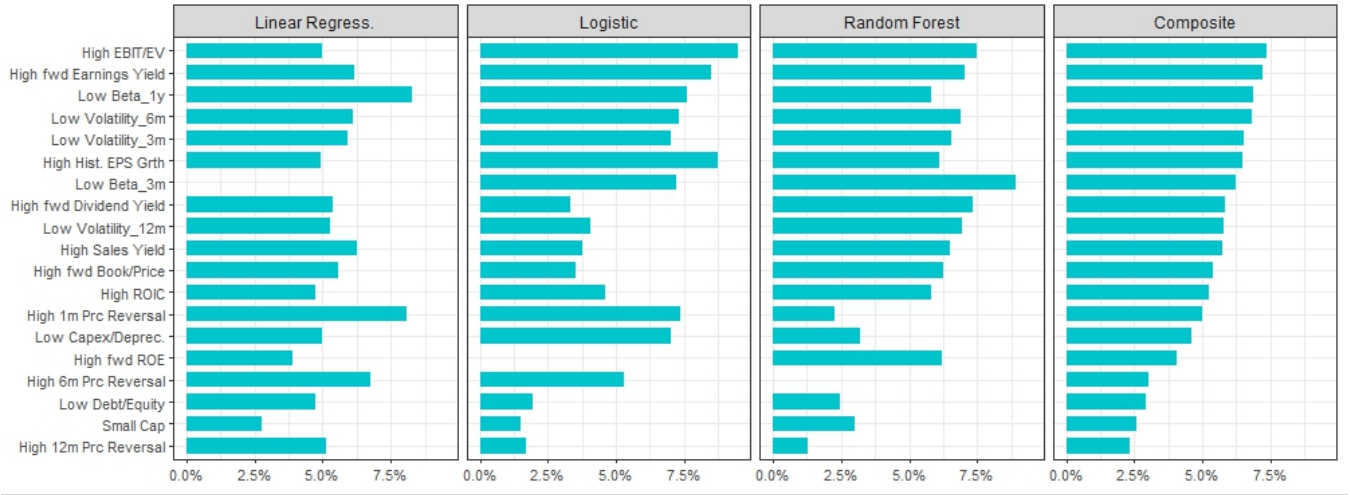
Latest results

We train the models with data from June 2002 to end-May 2017, and use end-June 2017 data to forecast the style rotation in July 2017.

Predicted style weights

The composite model puts the highest weights on Value and Low-risk factors, while it least prefers Small-caps and price reversals.

Figure 21: Style weights that the models suggested for July 2017

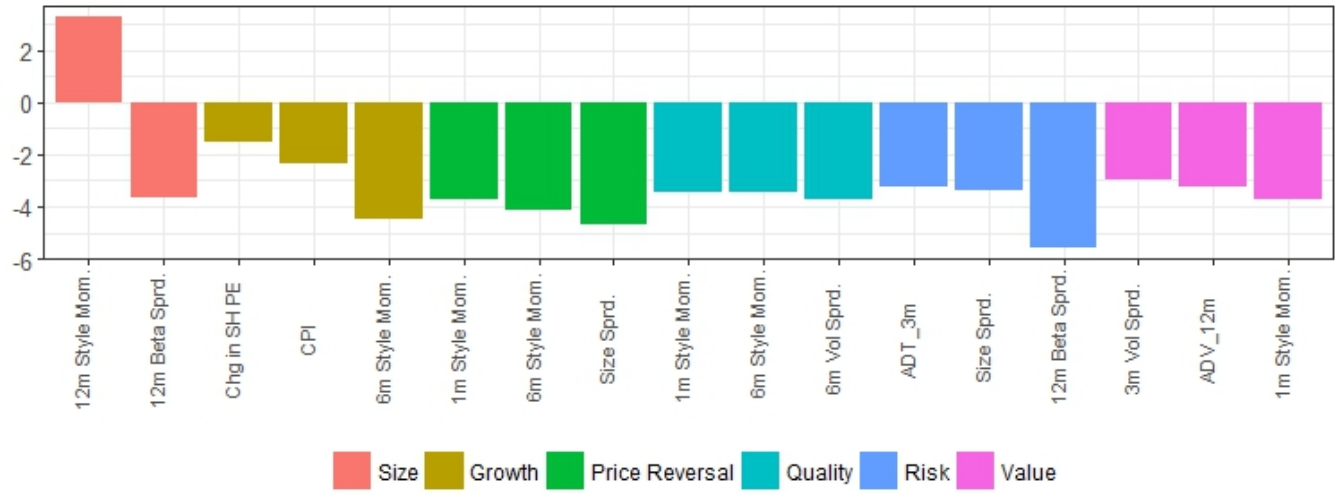


Source: FactSet, Wind, UBS Quantitative Research

Factor importance

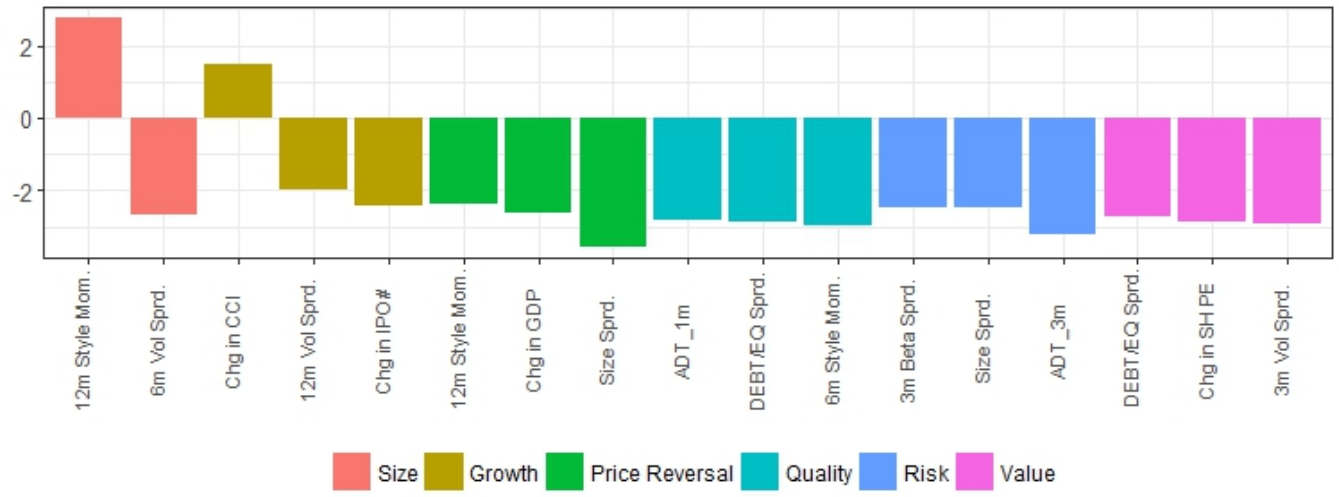
In the latest month, although different, all three models are still relying heavily on size spreads, style momentum/reversals and value spreads. Performance for growth styles are also highly correlated with market-level factors such as CPI, changes in the Consumer Confidence Index and changes in IPO numbers.

Figure 22: Factor importance for the Linear Regression model



Source: FactSet, Wind, UBS Quantitative Research

Figure 23: Factor importance for the Logistic model



Source: FactSet, Wind, UBS Quantitative Research

Figure 24: Top 10 factors in Random Forest, predicting July 2017

Source: FactSet, Wind, UBS Quantitative Research

Stock implications

We can also use this to pick stocks. We first calculate the percentile rank for each of these 19 factors. We then calculate the composite scores as the weighted average of the individual percentile rank using the predicted style weights. The back-test shows a monthly rebalanced portfolio of 20 stocks, with the highest composite score outperformance of the broad market by 20% per annum during our back-test period. The table below shows the latest top picks from the model.

Figure 25: Top 20 picks from the style timing model

Ticker	Company Name	Sector	Market Cap (Rmb m)	EBIT /EV	Forecast Earnings Yield	12m Beta	6m Volatility	3m Volatility	Rank
600688	Sinopec Shanghai Petrochemical Company Limited	Energy	48,286	13%	--	0.82	14%	13%	1
600023	Zhejiang Zheneng Electric Power Co.,Ltd.	Utilities	74,260	9%	8%	0.66	14%	14%	2
300196	Jiangsu Changhai Composite Materials Co., Ltd	Industrials	6,314	4%	6%	0.95	20%	21%	3
000650	Renhe Pharmacy Co.,Ltd	Health Care	7,405	8%	11%	1.17	16%	17%	4
002003	Zhejiang Weixing Industrial Development Co., Ltd.	Cons Disc	6,093	5%	7%	1.01	14%	13%	5
002563	Zhejiang Semir Garment Co., Ltd.	Cons Disc	22,844	8%	8%	1.04	19%	16%	6
600398	Heilan Home Co.,Ltd	Cons Disc	42,636	11%	9%	1.10	19%	23%	7
601006	Daqin Railway Co., Ltd.	Industrials	124,732	12%	9%	0.59	17%	18%	8
300360	Hangzhou Sunrise Technology Co., Ltd.	Industrials	5,458	5%	8%	1.14	23%	23%	9
600637	Shanghai Oriental Pearl Media Co., Ltd.	Cons Disc	57,246	4%	6%	0.90	15%	19%	10
600064	Nanjing Gaoke Company Limited	Real Estate	11,664	3%	12%	0.92	16%	15%	11
002100	Tecon Biology Co.Ltd	Cons Stpls	7,736	3%	7%	0.86	16%	18%	12
600894	Guangzhou Guangri Stock Co., Ltd.	Industrials	10,182	4%	7%	0.82	19%	23%	13
600027	Huadian Power International Corporation Limited	Utilities	39,344	12%	--	0.66	17%	21%	14
600352	Zhejiang Longsheng Group Co.,Ltd	Materials	31,004	5%	9%	0.85	15%	14%	15
300498	Guangdong Wen's Foodstuffs Group Co.,Ltd	Cons Stpls	122,365	5%	8%	0.91	16%	19%	16
600299	Bluestar Adisseo Company	Health Care	32,639	14%	6%	0.76	18%	18%	17
000876	New Hope Liuhe Co.,Ltd	Cons Stpls	34,656	2%	9%	0.70	11%	11%	18
002588	Stanley Group Co.,Ltd	Materials	8,899	6%	8%	0.99	20%	23%	19
600835	Shanghai Mechanical & Electrical Industry Co.,Ltd.	Industrials	17,050	21%	--	0.88	16%	19%	20

Source: FactSet, Wind, UBS Quantitative Research

Appendix

Description of styles

We attempt to predict the rotation among 19 styles in 6 categories, including Value, Growth, Price Reversal, Quality, Size, and Risk. Style portfolios are formed by assigning stocks in the universe into three baskets—high, medium and low—according to the respective styles such as market capitalisation, book-to-price ratio, and dividend yield.

Style performance is based on a long-only strategy, calculated as the difference between the most preferred basket and the whole universe. The universe is all listed China A-shares. Portfolio returns are free-float market capitalisation-weighted and rebalanced on a monthly basis. We calculated style performance in the direction that we thought was the most intuitive. For example, investors typically prefer cheaper stocks, i.e. High Book / Price, and less volatile stocks, i.e. Low Volatility.

Figure 26: Style definitions

Type	Style	Definition
Value	High Book / Price	The inverse of the 12m forward P/BV multiple
	High Dividend Yield	The 12m forward dividend yield
	High Earnings Yield	The inverse of the 12m forward PE multiple
	High EBIT / EV	EBIT / EV
	High Sales Yield	Sales / EV
Growth	High Historical EPS Growth	The average EPS growth in the trailing 5 years
Price Reversal	Low Past 1m Performance	The month's local price return, for the 'current' month-end
	Low Past 6m Performance	The -6m to 'current' local price return, for the 'current' month-end
	Low Past 12m Performance	The -12m to 'current' local price return, for the 'current' month-end
Quality	High ROE	The 12m forward Earnings Yield / Book to Price
	High ROIC	EBIT / Invested Capital
	Low Capex / Depreciation	Capital Expenditure / Depreciation
	Low Debt / EV	Net debt / EV
Size	Small Market Cap	The month-end free-float market cap
Risk	Low Volatility 3M	Volatility of daily total returns on trading days over the past 3 months
	Low Volatility 6M	Volatility of daily total returns on trading days over the past 6 months
	Low Volatility 12M	Volatility of daily total returns on trading days over the past 12 months
	Low Beta 3M	Average Beta over the past 3 months
	Low Beta 1Y	Average Beta over the past 12 months

Source: UBS Quantitative Research

Style weights with timing

We start with an equal-weight no-timing portfolio of all styles, and with model predictions, we adjust the weights among them. Style weights with timing are based on predicted returns and probabilities in the subsequent month.

At the month's end t, Linear Regression predicts style returns in the next month, $\hat{R}_{t+1,s}^{Linear}$, where s stands for the 19 styles, $s = s_1, s_2, \dots s_{19}$. We then put larger weights on the styles with higher returns, based on a set of standardised predictions:

$$\widehat{wgt}_{t+1,s}^{Linear} = \left[\hat{R}_{t+1,s}^{Linear} - \min\left(\hat{R}_{t+1,s}^{Linear}\right)\right] / \sum\left[\hat{R}_{t+1,s}^{Linear} - \min\left(\hat{R}_{t+1,s}^{Linear}\right)\right]$$

Similarly, Random Forest produces predicted returns, $\hat{R}_{t+1,s}^{RF}$, while Logistic Regression outputs the probability of outperformance, $\hat{P}_{t+1,s}^{Logistic}$. In the back-test, the subsequent month's performance with timing is calculated as:

$$Return_{t+1}^{Linear} = \sum Return_{t+1,s} \times \widehat{wgt}_{t+1,s}^{Linear}$$

$$Return_{t+1}^{Logistic} = \sum Return_{t+1,s} \times \widehat{wgt}_{t+1,s}^{Logistic}$$

$$Return_{t+1}^{RandomForest} = \sum Return_{t+1,s} \times \widehat{wgt}_{t+1,s}^{RF}$$

Based on the diversification between the Random Forest and regression models, we combine the adjusted weights in a composite model as follows.

$$Weight_{t+1,s}^{Composite} = 0.25 \times \widehat{wgt}_{t+1,s}^{Linear} + 0.25 \times \widehat{wgt}_{t+1,s}^{Logistic} + 0.5 \times \widehat{wgt}_{t+1,s}^{RF}$$

$$Return_{t+1}^{Composite} = \sum Return_{t+1,s} \times Weight_{t+1,s}^{Composite}$$

Valuation Method and Risk Statement

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

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Buy	FSR is > 6% above the MRA.	45%	28%
Neutral	FSR is between -6% and 6% of the MRA.	38%	27%
Sell	FSR is > 6% below the MRA.	17%	11%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

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