

Quantitative Monographs

Can we trade on news sentiment in China?

Part III: Quant Factors

Eroding factor performance

Market efficiency continues to increase globally and quant factors' information coefficients are diminishing. As a consequence, performance has been eroding—making it even more challenging for regular quant factors to generate significant returns. This trend is also noticeable in China, albeit to a lesser extent. Challenging performance should push the industry to revisit its factor definitions and, through the use of better data, build smarter factors.

Flow aware factors

This report accelerates factor innovation using a sentiment factor derived from the *DataYes News Sentiment Dataset*. We derive a set of augmented factors in the broad China market. In the first section we investigate the impact of universe selections in the Chinese market. We show the sector and liquidity biases introduced by the universe definition. We then study the performance of our news sentiment factor and demonstrate that absolute performance increases as we capture more stocks and more market cap until we reach 1,000 stocks (ranked on market cap). Then, as we increase the size of the universe further, the performance of the factor starts to decrease and performance is lowest for our largest universe.

Augmented factors performance

We compare the performance and impact of creating augmented factors following two methodologies: (a) we study the intersection of regular quant factors with our news sentiment factor, and (b) we study the performance of composite factors. ROIC, 1-month Momentum, and Historical EPS Growth respective annualised returns increase from 15%, 1.1% and 2.9% to 28.8%, 12.5%, and 19.8%. Across all quant factor definitions, there is more performance improvement to be found at the intersection with news sentiment compared to a composite factor construction. We also demonstrate that the benefits of using the news sentiment signal are stronger in the Top-1,000 universe, but decrease as we include more stocks, and become minor in the extended China universe.

Augment institutional factor strategies in the larger China universe

We revisit previous strategies that investigated the performance of the Northbound Stock Connect factor and the China onshore mutual fund factor at the intersection with news sentiment. We show that significant performance can be achieved by increasing the universe of interest. Strategy 1 and Strategy 2 delivered the best annualised returns, 32.5% and 26.4%, in the Top-500 universe. Extending to all China stocks only mildly decreased the overall performance. All strategies had strong performance in all universes, yet the best risk-adjusted returns were obtained in the Top-1,000 universe, where Strategy 1 and Strategy 2 had Sharpe ratios of 2.38 and 2.63. We then discuss the three strategies that investigated China onshore mutual fund factors at the intersection with news sentiment. Strategy 1 annualised returns reached 27.5% in the Top-1,000 universe, for a Sharpe ratio of 1.78.

Equities

China

Quantitative

Fabrice Schloegel, PhD

Analyst

fabrice.schloegel@ubs.com
+852-2971 6118

Lynce Wang

Associate

S1460120080001
lynce.wang@ubssecurities.com
+86-21-3866 8638

Paul Winter

Analyst

paul-j.winter@ubs.com
+61-2-9324 2080

Oliver Antrobus, CFA

Analyst

oliver.antrobus@ubs.com
+61-3-9242 6467

Michael Gray

Analyst

michael-f.gray@ubs.com
+1-212-713 1313

Andreas Schroeder, CFA

Analyst

andreas.schroeder@ubs.com
+44-20-7568 4432

Cathy Fang, PhD

Analyst

S1460518100001
cathy.fang@ubssecurities.com
+86-213-866 8891

Aaron Guo, CFA

Analyst

aaron.guo@ubs.com
+852-2971 7705

Executive Summary

Quant factor performance has been eroding globally in recent history. If it is true that quant factors have delivered better returns in China, China is not immune to the erosion in performance. For instance, see any of our weekly publications [What's happening to Quant?](#), [Asia Style Guide](#), and [China A-share Style Guide](#). In our previous two reports investigating news sentiment in China ([Quantitative Monographs "Can we trade on news sentiment in China?"](#) and ["Can we trade on news sentiment in China? Part II: onshore mutual fund"](#)) we studied the *DataYes News Sentiment Dataset*⁽¹⁾ and created new monthly and quarterly news sentiment factors. We also demonstrated that news sentiment is positively correlated to the retail flow. In this note we extend our previous work and look to create a set of smarter quant factors by incorporating the news sentiment signal. As 80% of Chinese daily trading activity is driven by retail trading, we believe that by augmenting regular quant factors using news sentiment, we effectively incorporate the effects of the retail flow into our factors.

In previous notes we demonstrated that we can improve quant factors using institutional data globally, see ["The Rise of Active Management: How to use fundamental insights"](#) and in China, see [Quantitative Monographs "Who is the smart money in China?"](#). In this research note, we propose two definitions of augmented factors across three universes in the Chinese market.

- First, we study regular quant factors at the intersection of news sentiment by conditioning terciles of quant score on terciles of news sentiment. This creates a set of factors that each month trade on average one ninth of the universe for the long and short legs instead of one third for the original quant factors. We find that this improves all quant factor definitions studied. The best improvements are found for ROIC, Historical EPS growth, and 1-month Momentum.
- Second, we define our factors more loosely and create baskets that rank the average score of a quant factor and news sentiment. The resulting long and short legs of these factors contain the same number of stocks as the original quant factors. We find improvement across most quant factors. Yet, we show that the gains in performance are less pronounced compared to the factors that deal with the intersection with news sentiment.

Finally, we first revisit the performance of the two strategies proposed in [Part I](#) and the three strategies discussed in [Part II](#) of our series on news sentiment. Strategy 1 and Strategy 2 investigate the intersection of our news sentiment factor with our Northbound factor (see [this report](#) for the original factor definition) that tracks the institutional flow holdings of hedge funds that invest in China through Northbound Stock Connect. We report on the performance of each strategies in the three universes of interest and show that:

- Strategies 1 and 2 had larger absolute returns of 32.5% and 26.4%, respectively, in the smaller universe of Top 500 stocks (ranked on market cap). The absolute returns decreased as the universe was increased in size and captured more names. Yet for Strategy 1, the performance was similar for the Top 1,000 universe and the China All universe, at 29.4% and 29.5%, respectively. The Sharpe ratio was higher in the China All universe for Strategy 1 at 2.4 (but very comparable to the 2.38 obtained in the Top 1,000 universe). For Strategy 2, the best Sharpe ratio of 2.63 was obtained in the Top 1,000 universe. Maximum drawdown also tended to decrease as the universe increased in size.

The three strategies that look at the holdings of alpha-generating Chinese onshore mutual funds (see [our previous report](#)) at the intersection with news sentiment are investigated in the three larger universes of interest. We find that the best performance was generally achieved in the Top 1,000 universe and returns and Sharpe ratio could be as high as 27.5% and 1.78 for Strategy 1, although results were strong in all universes.

We create a set of smarter quant factors

Strong institutional holdings X News sentiment strategies performance in the broader Chinese universe

1. The DataYes News Sentiment Dataset is based on a deep-neural network specifically trained for the Chinese language that processes over 45,000 daily news items and sentiment scores them.

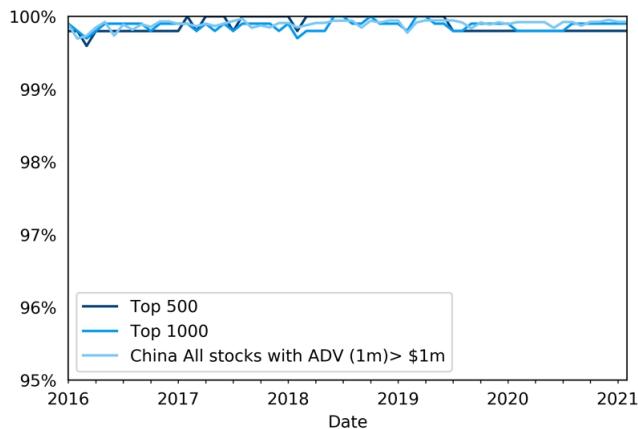
Can we trade on news sentiment?

In this section, we report on the characteristics of several universes that we chose for our study. The base universe is made of all Chinese stocks filtered to keep only the stocks that trade more than US\$1m per day on average. We then select two subsets of that universe. For these subset universes, stocks are ranked on market cap and we select the top 500 market capitalisations for one universe, and the top 1,000 market capitalisations for the other. The results are presented for all three universes in either the following section of this report or the Appendix.

Figure 1 shows the number of stocks under coverage by the *DataYes News Sentiment Dataset*. Since January 2016, at least 99.6% of all stocks in our universe are covered in the dataset. In terms of market cap capture, Figure 2 shows that in January 2016, the data covered 97.9% of the top 500 market cap and 98.5% of our larger China universe. By February 2021, the data covered more than 99.9% of all universes under consideration in this study.

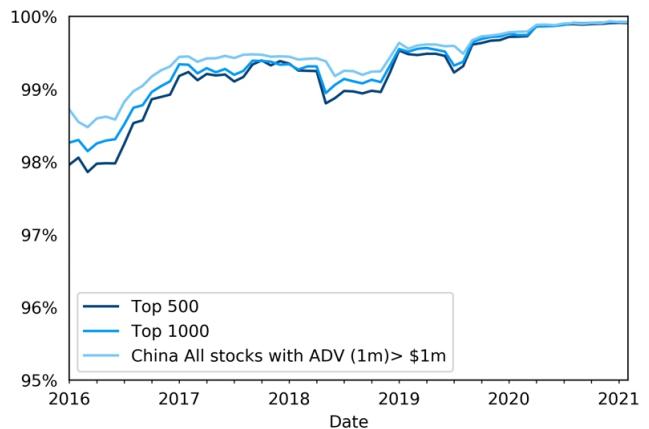
Three universes of interest: 500 and 1,000 largest firms, and China, all with a liquidity filter of US\$1m

Figure 1: New Sentiment Score stock coverage %



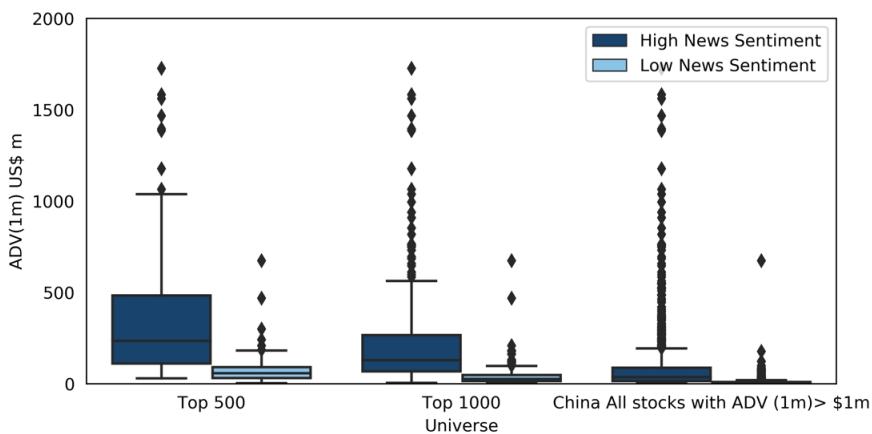
Source : DataYes, FactSet, UBS Quant Research

Figure 2: New Sentiment Score market cap coverage %



Source : DataYes, FactSet, UBS Quant Research

Figure 3: Latest liquidity distribution in different universes (US\$ m)



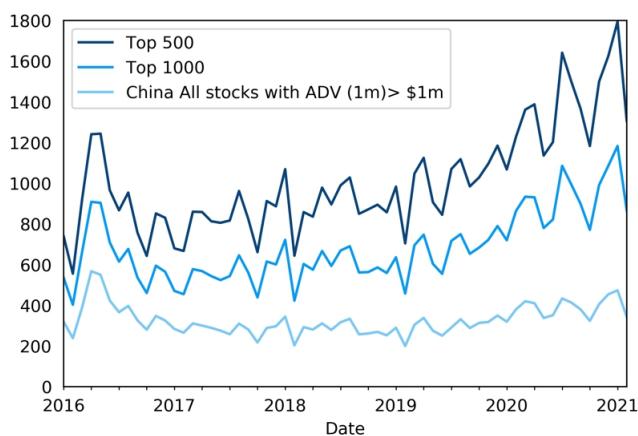
Source : DataYes, FactSet, UBS Quant Research

In Figure 3, we show the average stock liquidity in the three universes considered, split on news sentiment at the end of February 2021. We report only on the top and bottom terciles of news sentiment score. As previously discussed in [Quantitative Monographs "Can we trade on news sentiment in China?"](#), the news sentiment data is not only skewed toward large caps, but large caps also tend to have more news and more positive sentiment. The spread in the news sentiment score between the largest market cap stocks and the rest of the market also continues to widen. Figure 4 and Figure 5 show the monthly average number of news reports per stock in each universe. In

February, the average stock in the Top 500 universe had more than five times the average number of non-duplicated news reports as the stocks in the overall universe. In all three universes, the stocks with the lowest number of news reports are largely stocks with lower average liquidity.

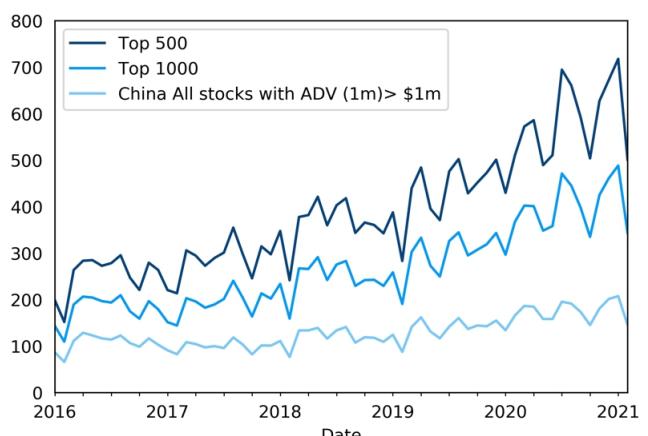
It should be noted that the Top 500 universe and the Top 1,000 universe cover respectively 64% and 81% of the overall market cap available in our China All stocks with ADV greater than US\$1m universe. There are benefits in terms of including more stocks. Figure 3 largely hides the fact that overall, liquidity in the Chinese market has been increasing over 2016-21. The average daily value traded in the long basket of the Top 500 universe is US\$340m, decreasing to US\$227m in the Top 1,000 universe, and dropping to US\$86m in the larger universe. The change is even more drastic in the low news sentiment tercile, declining from US\$73m in the Top 500, to US\$40m in the Top 1,000, and to only US\$9m in the larger universe. It is clear that the news sentiment dataset information content is biased towards larger and more liquid stocks. It is also the case that there is plenty of liquidity available in the Chinese market as of today, and that our overall universe has grown from about 2,600 stocks in 2016 to just over 4,000 stocks in February 2021.

Figure 4: Average total number of news reports in different universes



Source : DataYes, FactSet, UBS Quant Research

Figure 5: Average non-duplicated number of news reports in different universes

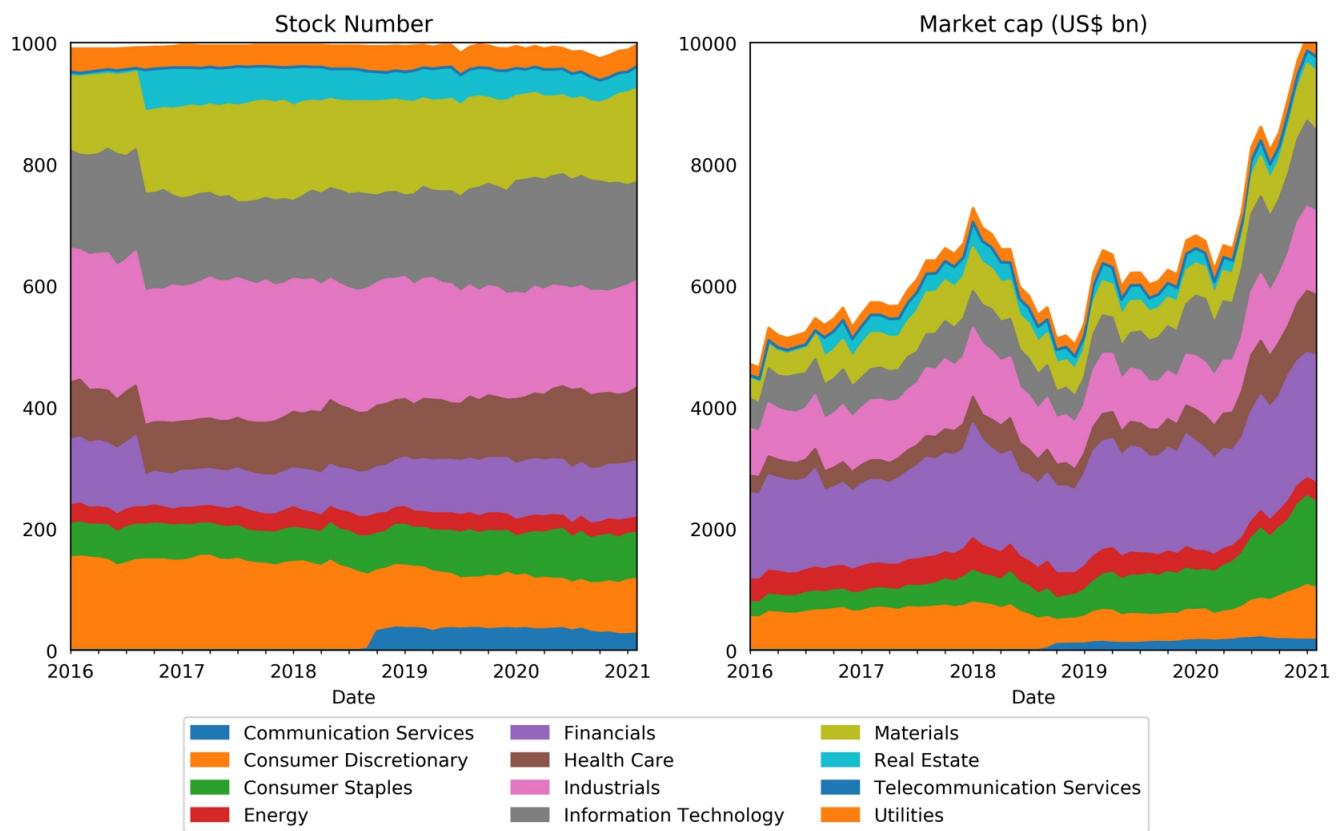


Source : DataYes, FactSet, UBS Quant Research

Figure 6 shows the distribution of stocks in terms of GICS sector in the Top 1,000 universe (see Figure 22 and Figure 30 for the other two universes). It is interesting to note that the market is largely made up of Financials, Industrials, IT, Health Care, and Materials. As the market cap capture increases, the relative proportion of Financials tends to decrease and diversification increases. In [Quantitative Monographs "Can we trade on news sentiment in China?"](#), we demonstrated that the news sentiment data is also skewed in terms of sector and that Industrials, Consumer Discretionary, and Tech generally have a higher sentiment score, while Energy, Material, and Financials have a lower sentiment score.

In the rest of the note, we will mostly focus on the Top 1,000 universe. Results for the Top 500 and overall universe are provided in the Appendix.

Figure 6: Sector distribution



Source : DataYes, FactSet, UBS Quant Research

A monthly rebalanced news sentiment factor

In this section, we first investigate the performance of the monthly rebalanced news sentiment factor. For more detail on the construction of the factor, see [Quantitative Monographs "Can we trade on news sentiment in China?"](#) and ["Can we trade on news sentiment in China? Part II: onshore mutual fund"](#). We first compare the performance of augmenting regular quant factors at the intersection with news sentiment. Then we discuss the results obtained when creating an average composite score of a regular quant factor and news sentiment score and how that affects available liquidity and performance.

Smarter monthly rebalanced long-short quant factors

News sentiment factor construction:

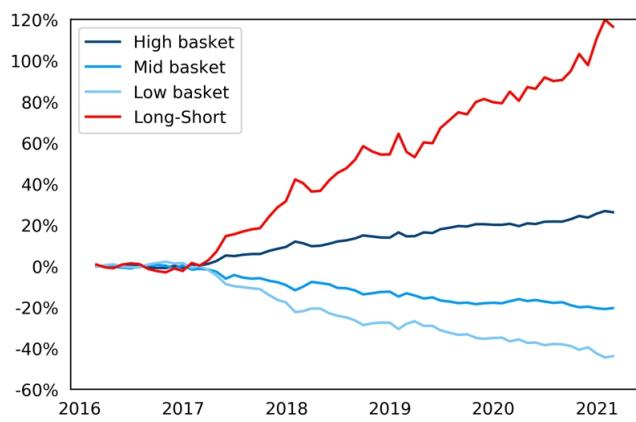
- (1) Sort the universe into three baskets using the News Sentiment Score
- (2) Long stocks in the top third, ie, the High-Sentiment basket
- (3) Short stocks in the bottom third, ie, the Low-Sentiment basket

The news sentiment factor is a long-short factor. All stocks are ranked in the cross-section based on their news sentiment score and the factor longs the top tercile of highest news sentiment stocks and shorts the bottom tercile of lowest news sentiment scores. Figure 7 shows the performance of the factor, Figure 8 shows the liquidity in each of the three terciles, and Figure 9 provides an overview of the performance of our news sentiment factor within three universes of stocks ranked on market cap (Top 500, Top 1000, and All China stocks that trade more than US\$1m per day on average).

There is a monotonic improvement in absolute performance of the news sentiment factor as we increase the size of the universe. The best absolute performance is obtained for the Top 1,000 universe. It should be noted that the Sharpe ratio is lower for the Top 1,000 universe, at 1.65, compared to 1.69 for the Top 500 universe. As we have explained before, the dataset is biased towards large and liquid stocks. However, it would appear that if there is value in adding more stocks in terms of absolute performance, it comes at the expense of higher volatility. Increasing the size of the universe past 1,000 stocks all the way to our largest universe results in decreasing absolute and risk-adjusted performance. There is a clear loss of signal in the dataset in the broader Chinese stocks universe compared to the Top 1,000. Both annualised returns, at 8.5%, and Sharpe ratio, at 0.76, are lower; maximum drawdown is also significantly higher at -16.7%, compared to only -5.2% for the Top 500 universe and -6.9% for the Top 1,000 universe. Yet, it is also the case that we can manufacture a factor with a very large access to liquidity that still delivers a Sharpe ratio of 0.76.

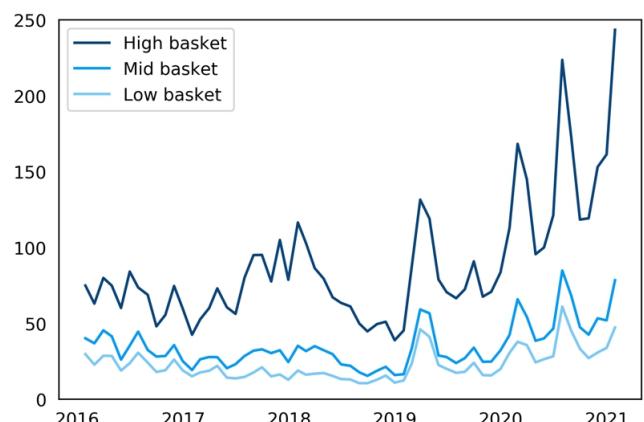
best absolute performance in the universe of the largest 1,000 stocks

Figure 7: Strategy performance, based on News Sentiment Score



Source : DataYes, FactSet, UBS Quant Research

Figure 8: Average ADV (1m) in US\$m in different news sentiment baskets



Source : DataYes, FactSet, UBS Quant Research

Figure 9: News Sentiment Score strategy statistics in different universes

Statistics	Top 500	Top 1000	China All stocks with ADV (1m) > US\$1m
Annualised Return	15.74%	15.95%	8.50%
Annualised Volatility	9.15%	9.53%	11.74%
Sharpe Ratio	1.69	1.65	0.76
Maximum Drawdown	-5.2%	-6.9%	-16.7%

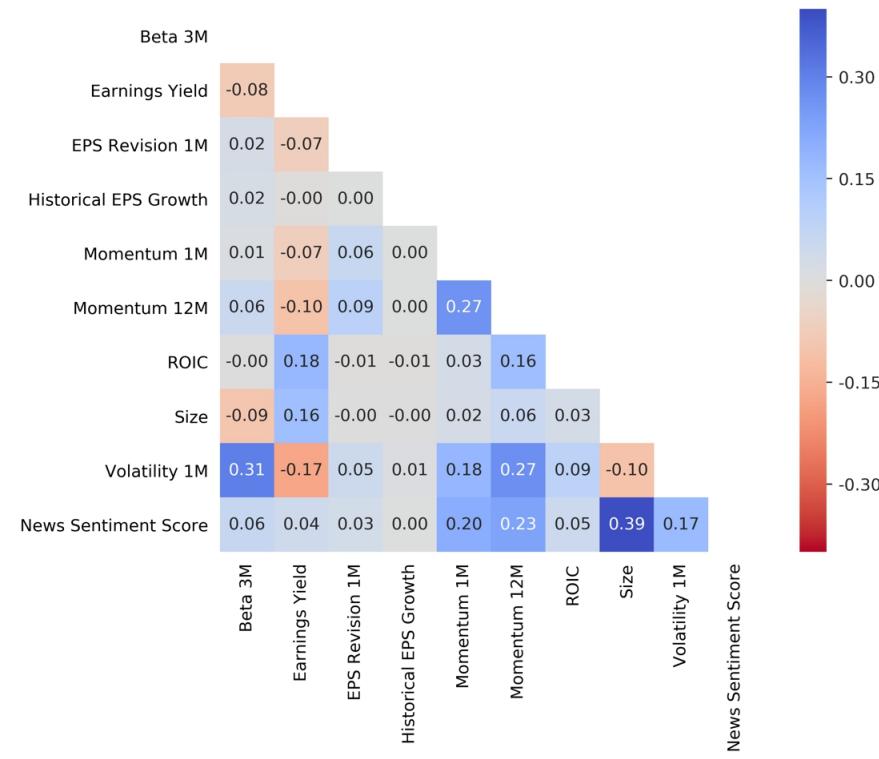
Source : DataYes, FactSet, UBS Quant Research

In the following section, all factors are constructed similarly to the news sentiment factor. Stocks are ranked in the cross section and the factor longs the high score and shorts the low score. Beta and Volatility are exceptions to that rule and refer to the low beta and low volatility factors. Size does not capture the small-cap premium, rather it longs large market cap and shorts small market cap, see [Quantitative Monographs "Understanding Size Investing"](#). Figure 10 shows the average period correlation between the news sentiment factor and a set of regular quant factors. Overall, news sentiment is a different factor and the correlation to most quant factors is very low. Size is an exception that is inherent to the biases in the dataset. It should be noted that correlation is also slightly higher for short-term and long-term momentum and low volatility. The results are consistent for all three universes (see Figure 25 and Figure 33 for more detail).

As mentioned in our previous two reports on news sentiment, we believe news sentiment can be used as a proxy for retail activity. Indeed, we have shown that our news sentiment factor is positively correlated with the net inflow from individual investors. Considering that as much as 80% of the daily value traded in the Chinese market can be attributed to retail activity, we believe news sentiment is a great candidate to augment regular quant factor definitions.

News Sentiment a proxy for retail flow?

Figure 10: Average factor correlations (January 2016- February 2021)



Source : DataYes, FactSet, UBS Quant Research

Trading news sentiment augmented factors

In the following section we report on the performance of augmented factors in the Top 1,000 universe. When building a factor, we ideally want to be able to spread stocks apart based on characteristics. Yet we also want a large and liquid investible universe. As a result, two factor constructions are discussed. First, we construct the intersection of news sentiment with regular quant factors. As both factors are based on terciles, and the terciles of quant factors are split into terciles based on the news sentiment score, this results in a universe being diced into ninths and a reduced access to liquidity and stocks. As we will see, this construction generally delivers better absolute performance. In the second part, we investigate a composite score that is the sum of the ranks on news sentiment and a quant factor. The resulting factor trades terciles and maintains a greater access to liquidity and stocks.

Composite score or sorting on quant factor and then sorting on news sentiment

Augmented Factor 1: High-conviction signals only

(intersection)

We first investigate the interaction effect at the intersection of news sentiment and regular quant factors. This results in having both high (low) factor scores and high (low) sentiment scores simultaneously. The strategy is rebalanced monthly, within the universe of Top 1,000 largest market-cap stocks:

(1) Long: High-factor score, High-Sentiment basket

(2) Short: Low-factor score, Low-Sentiment basket

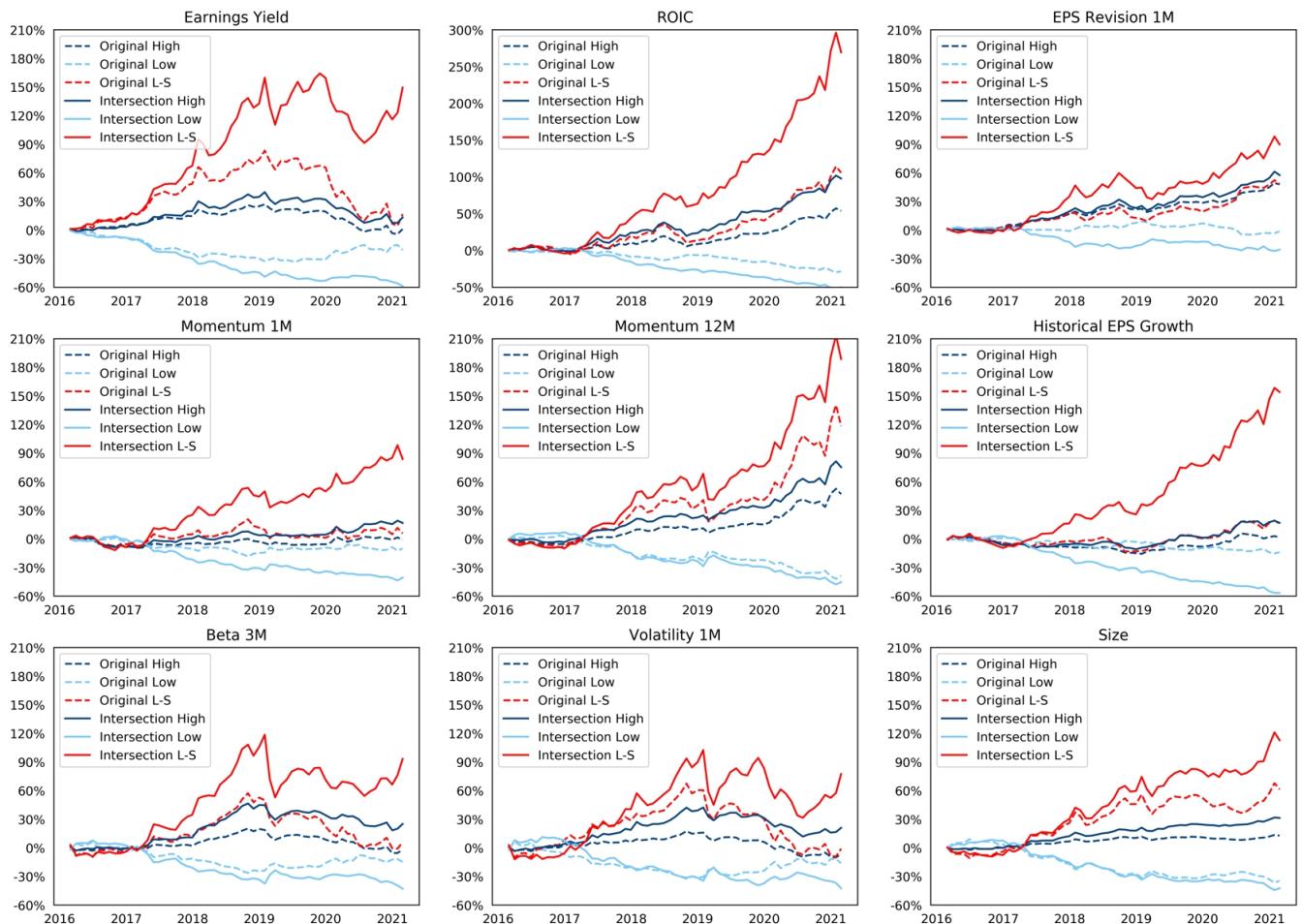
Performance is reported in Figure 11 for the original set of regular quant factors and the augmented factors. The charts show that for all factors selected the augmented factors at the intersection with news sentiment had better absolute performance. Generally, improved performance was obtained on both the long and short leg of the factor

definition. The largest improvements were found in ROIC, Historical EPS Growth, and 1-month Momentum. The performance of the regular Historical EPS Growth and 1-month Momentum factors was flat when it is strongly positive after augmenting with the news sentiment.

Factors improvement results were very similar in the Top 500 universe, but generally with slightly lower absolute returns. In the larger universe, less improvement was generally found at the intersection of news sentiment and some of these deferrals probably relate to Size. Although Quality and EPS Revision 1M benefited from the news sentiment factor, adding news sentiment did not benefit 1-month Momentum performance, which remained flat over the backtest. It is also interesting to see that the Size factor deliver positive performance in the Large cap space of the Top 500 and Top 1,000 universe when it is flat in the broader China All stock universe. The intersection with news sentiment benefited the Size factor in the Top 500 and Top 1,000 universe but is not enough to reinvigorate Size in the broad Chinese stock universe.

Intersection of quant factors and news sentiment provides best performance improvements

Figure 11: Intersection factor performance



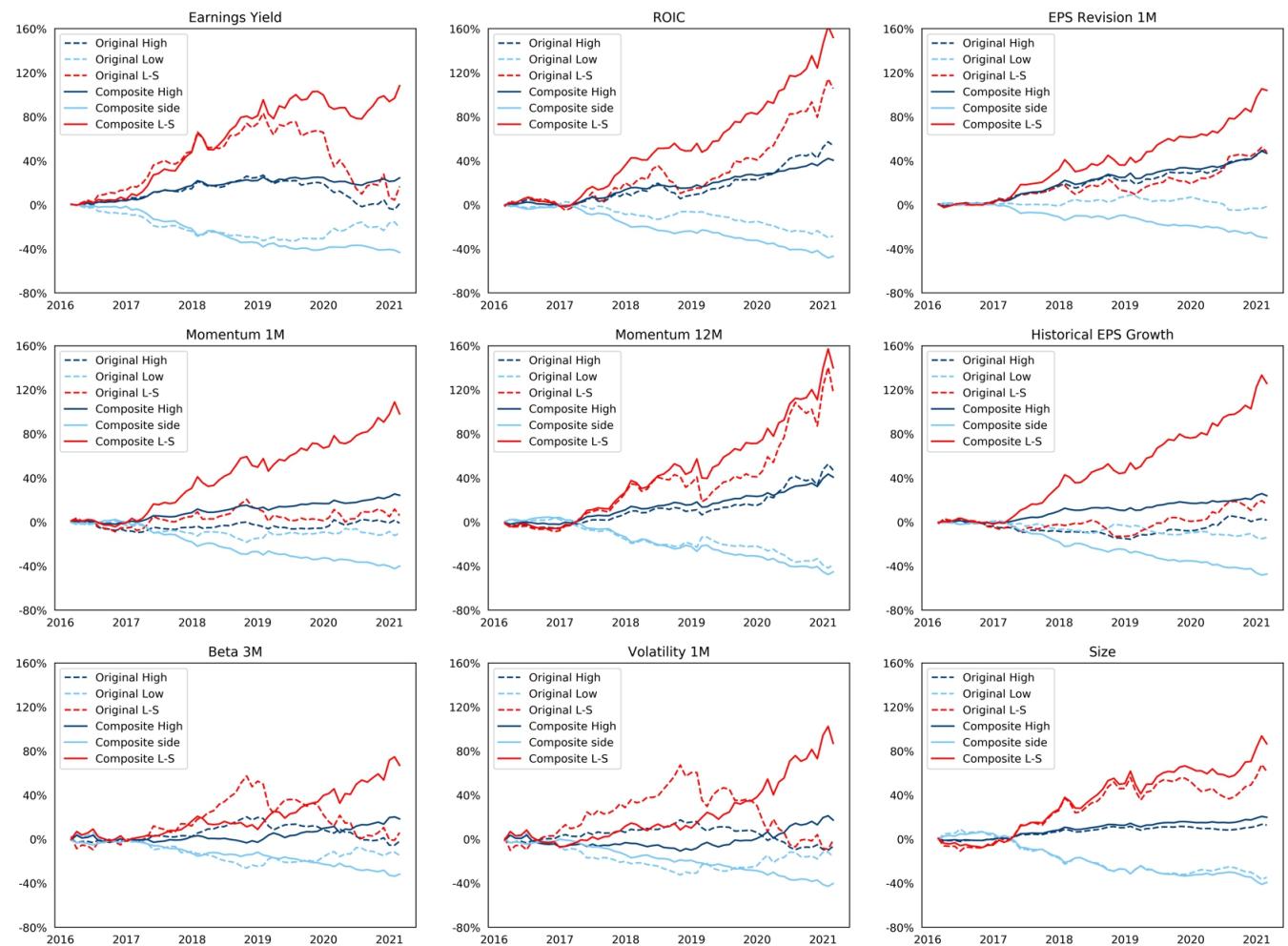
Source : DataYes, FactSet, UBS Quant Research

Augmented Factor 2: Composite score

We build a composite score that is an equal-weight average of regular quant factor scores and the news sentiment score. The new composite factors long the top third of stocks and short the bottom third. The results are shown in Figure 12. The overall results are similar to what we have seen at the intersections of news sentiment and quant factors. Compared with Figure 11, all factors benefit, but to a lesser degree, and provide access lower performance. The most notable exception are the Low volatility factor and the EPS Revision 1M in both the Top 500 and Top 1,000 universe, and the 1-month Momentum factor in the Top 1,000 universe.

Similarly to what we found for the intersection of quant factors and news sentiment, the performance in the top 500 universe is overall very comparable to the performance in the Top 1,000, and there is little to no improvement in the broader China All stocks universe. The main exceptions are 1-month Momentum, 1-month EPS Revision, and Historical EPS Growth.

Figure 12: Composite factor performance

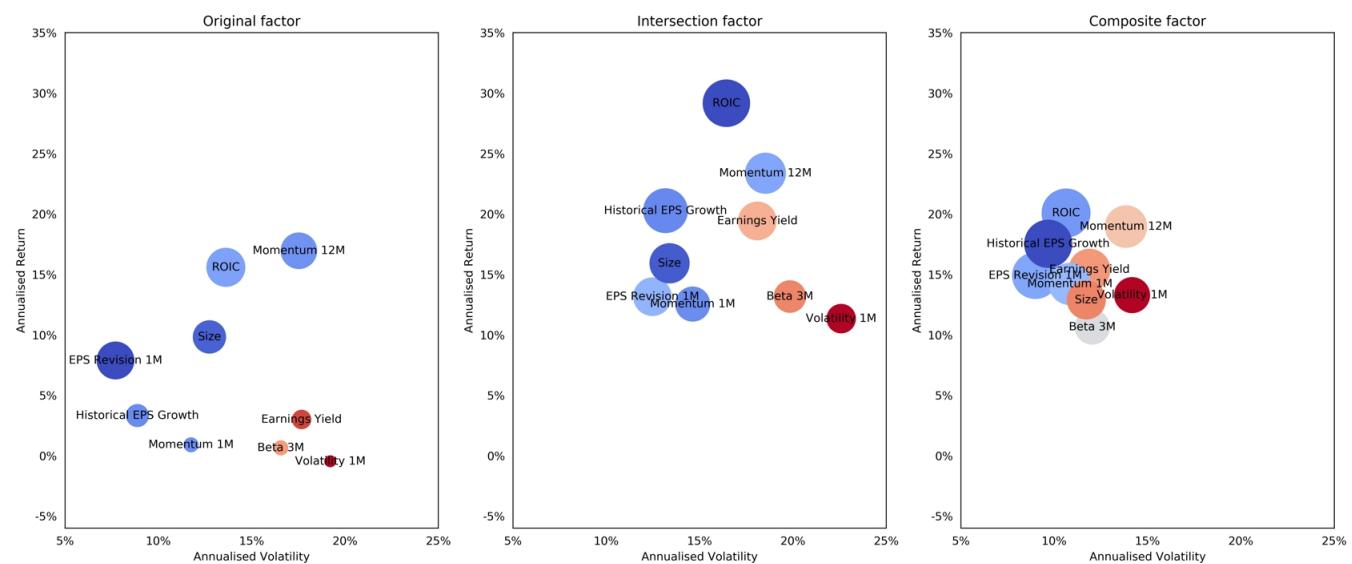


Source : DataYes, FactSet, UBS Quant Research

In Figure 13, we map the performance on a 2-D Return/Volatility bubble chart where the size of the bubble corresponds to the Sharpe ratio and the colour to the value of Maximum drawdown. It is interesting to see that most factors benefit from being augmented with our news sentiment factor. The effect of factor construction is also striking. The charts highlight the spread of performance and risk between the different factors. Introducing a common factor into the definition of all the quant factors of interest leads to less diversification and more concentration in performance. However, the intersection, although it reduces the size of the tradable universe by a factor of 3, maintains a significant amount of diversification. Conversely, the composite factor provides access to a larger tradable universe and to more liquidity, yet it yields more correlated factors and more concentrated factor performance, as seen by the clustering on Figure 13.

The performance of all the quant factors in the three universes considered is shown in Figures 14 to 16.

Figure 13: Factor performance statistics



Source : DataYes, FactSet, UBS Quant Research

Finally, Figure 17 shows the liquidity distribution in the long and short leg for each of the original, intersection, and composite factor definitions. Again, it can be noted that the size bias in the news sentiment data generally results in factors that are loading on size. Even factors such as Low beta and Low volatility that are generally short large cap are now positively loading on size after being augmented. This bias is pronounced and observed across all factors and all universes.

Figure 14: Annualised returns summary

Universes	Top500			Top1000			China All stocks with ADV (1m) > US \$1m		
	Original	Intersect.	Comp.	Original	Intersect.	Comp.	Original	Intersect.	Comp.
Factors									
Earnings Yield	0.2%	15.0%	11.9%	3.0%	19.3%	15.2%	6.9%	11.6%	11.0%
ROIC	17.6%	32.5%	17.8%	15.0%	28.8%	19.6%	12.1%	15.1%	11.5%
EPS Revision 1M	7.1%	12.6%	15.6%	7.9%	13.2%	14.8%	7.6%	15.3%	13.8%
Momentum 1M	2.7%	14.5%	13.5%	1.1%	12.5%	14.2%	0.6%	3.4%	7.6%
Momentum 12M	13.9%	21.3%	18.4%	16.3%	22.8%	18.5%	14.8%	14.3%	11.7%
Historical EPS Growth	2.2%	18.9%	16.3%	2.9%	19.8%	17.1%	6.9%	10.4%	12.4%
Beta 3M	0.0%	13.3%	10.1%	1.1%	13.6%	10.4%	2.2%	9.1%	9.5%
Volatility 1M	-3.4%	10.4%	12.9%	-0.2%	11.7%	12.9%	5.8%	10.9%	5.0%
Size	7.9%	15.6%	11.9%	9.7%	15.7%	12.8%	2.7%	2.2%	3.2%

Source : DataYes, FactSet, UBS Quant Research

Figure 15: Sharpe ratio summary

Universes	Top500			Top1000			China All stocks with ADV (1m) > US \$1m		
	Original	Intersect.	Comp.	Original	Intersect.	Comp.	Original	Intersect.	Comp.
Factors									
Earnings Yield	0.11	0.83	1.02	0.26	1.09	1.28	0.54	0.75	0.84
ROIC	1.15	1.64	1.54	1.11	1.66	1.77	1.09	0.98	0.96
EPS Revision 1M	0.88	0.98	1.77	1.04	1.08	1.61	1.13	1.09	1.39
Momentum 1M	0.28	0.98	1.30	0.15	0.89	1.30	0.11	0.28	0.63
Momentum 12M	0.82	1.07	1.32	0.97	1.23	1.32	0.92	0.78	0.83
Historical EPS Growth	0.27	1.26	1.74	0.37	1.47	1.71	0.91	0.76	1.05
Beta 3M	0.09	0.72	0.84	0.15	0.76	0.90	0.22	0.56	0.86
Volatility 1M	-0.08	0.56	0.91	0.09	0.62	0.94	0.41	0.57	0.45
Size	0.72	1.27	1.09	0.80	1.18	1.11	0.25	0.21	0.28

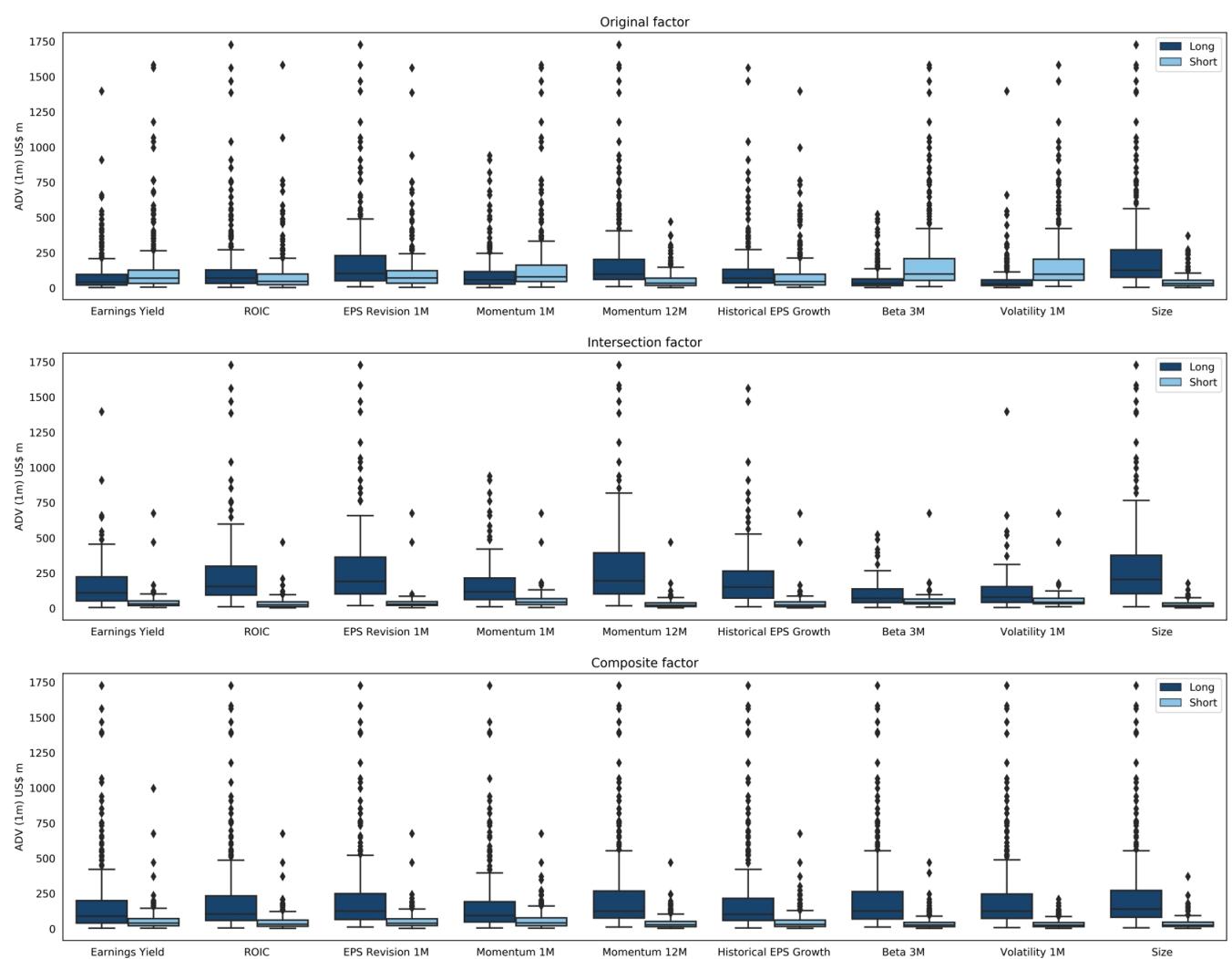
Source : DataYes, FactSet, UBS Quant Research

Figure 16: Annualised volatility summary

Universes	Top500			Top1000			China All stocks with ADV (1m) > US \$1m		
Factors	Original	Intersect.	Comp.	Original	Intersect.	Comp.	Original	Intersect.	Comp.
Earnings Yield	19.0%	19.3%	12.0%	17.7%	18.1%	11.9%	14.6%	17.0%	13.7%
ROIC	15.5%	18.7%	11.2%	13.6%	16.4%	10.6%	11.3%	15.9%	12.3%
EPS Revision 1M	8.4%	13.2%	8.6%	7.7%	12.5%	9.0%	6.8%	14.3%	9.8%
Momentum 1M	12.1%	15.3%	10.4%	11.8%	14.6%	10.8%	12.1%	17.3%	13.3%
Momentum 12M	18.3%	20.3%	13.8%	17.5%	18.5%	13.8%	16.8%	20.0%	14.9%
Historical EPS Growth	10.0%	14.9%	9.1%	8.9%	13.2%	9.7%	7.8%	14.7%	12.0%
Beta 3M	17.2%	21.0%	12.6%	16.6%	19.8%	12.0%	15.4%	19.4%	11.6%
Volatility 1M	19.7%	23.0%	14.8%	19.2%	22.6%	14.2%	18.0%	23.3%	13.0%
Size	11.6%	12.2%	11.1%	12.7%	13.4%	11.7%	16.8%	18.3%	15.8%

Source : DataYes, FactSet, UBS Quant Research

Figure 17: Latest liquidity distribution for different factors (US\$ m)



Source : DataYes, FactSet, UBS Quant Research

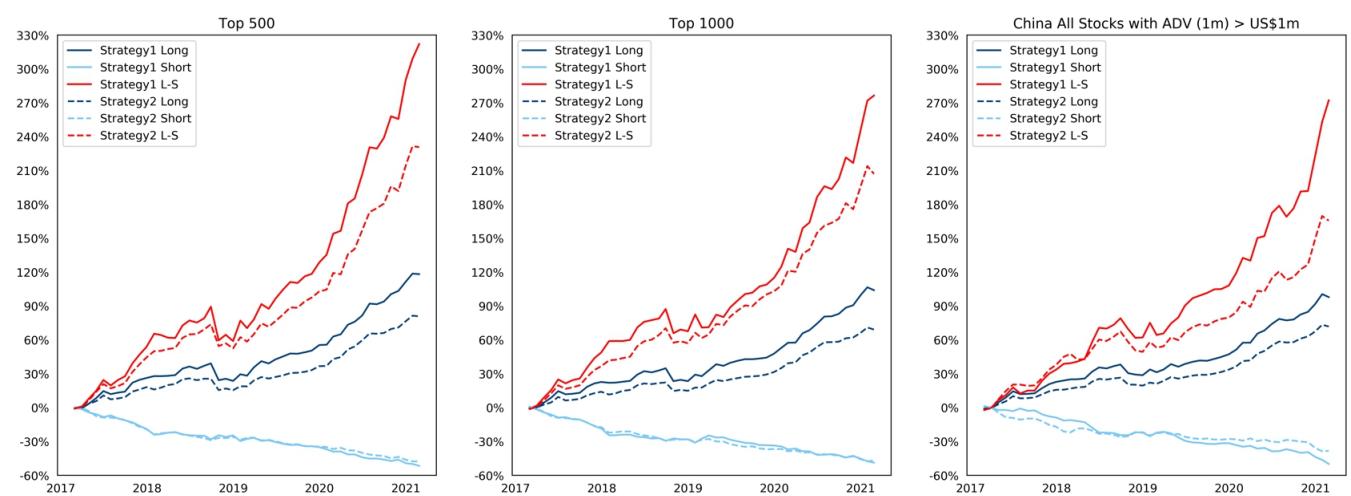
Revised institutional flow and holdings factors

Northbound Stock Connect Strategies

In this section we extend the work discussed in [Quantitative Monographs "Can we trade on news sentiment in China?"](#). We revisit Strategy 1 and Strategy 2 and expand the study to the larger universes described in this note, namely the Top 500, Top 1,000 and China All Stocks with ADV greater than US\$1m. As a reminder, Strategy 1 is the intersection of the Northbound Stock Connect factor derived in [Quantitative Monographs "Who is the smart money in China?"](#) with the news sentiment score, and trades only the basket of stocks that fall simultaneously in the high Northbound - high sentiment basket. Strategy 2 relaxes the investment constraints of Strategy 1. It longs high Northbound stocks except stocks that are subject to low sentiment and shorts low sentiment (except the stocks subject to high Northbound signal). As a result, it doubles the size of the investible universe. Both strategies are rebalanced monthly.

It should be noted that the Northbound signal covers about 900 stocks across a range of market caps: when constrained to the Top 500 stocks on market cap we actually capture about 450 stocks with a Northbound score, about 800 stocks when looking at the Top 1,000 universe, and virtually all names for the larger China All stocks universe.

Figure 18: Monthly rebalance Northbound strategy 1 and strategy 2 performance in different universes



Source : DataYes, FactSet, UBS Quant Research

The cumulative returns for each strategy in each universe are provided in Figure 18 and the performance metrics are reported in Figure 19. In Figure 18 it can be seen that performance for the short leg is mostly unaffected by the change in investment constraints (Strategy 1 vs. Strategy 2) and the change of universe. Strategy 1 and Strategy 2 achieve better absolute performance in the smallest universe of the Top 500 stocks but that is at the expense of higher volatility. There is a general trend that shows better results in the smaller universe (the largest 500 companies on market cap). In the Top 500 universe, Strategy 1 returns 32.5% while it has an annualised return of 29.4% in the Top 1,000 and 29.5% in the larger universe. The results are similar for Strategy 2. The risk decreases when the strategy is run less concentrated on a larger universe of stocks. The best Sharpe ratios are obtained in the Top 1,000 universe. The maximum drawdown is also higher for Strategy 1 and Strategy 2 in the Top 500.

Figure 19: Northbound strategy performance statistics

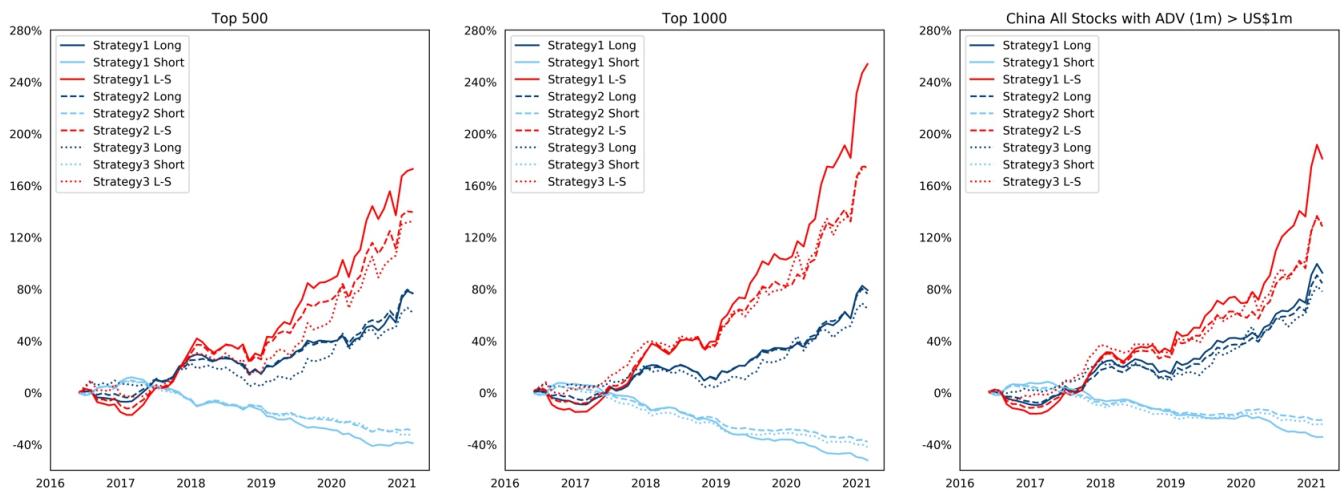
Universes	Top 500		Top 1000		China All stocks with ADV (1m) > US \$1m	
Statistics	Strategy1	Strategy2	Strategy1	Strategy2	Strategy1	Strategy2
Annualised return	32.5%	26.4%	29.4%	24.5%	29.5%	21.7%
Annualised Volatility	15.2%	12.2%	14.2%	10.8%	14.0%	12.5%
Sharpe Ratio	2.30	2.43	2.38	2.63	2.40	1.99
Maximum Drawdown	-16.1%	-12.2%	-11.4%	-7.8%	-9.7%	-10.8%

Source : DataYes, FactSet, UBS Quant Research

China onshore mutual fund strategies

In this section we extend the work presented in "["Can we trade on news sentiment in China? Part II: onshore mutual fund"](#)" and discuss Strategy 1 and Strategy 2, then investigate the intersection of China onshore mutual fund holdings with our news sentiment factor. Strategy 3 then considers the intersection of China onshore quarter-quarter flow with news sentiment. Strategy 1 and Strategy 2 are similar to the Northbound strategies discussed in the previous subsection. Details of Strategy 3 can be found in this [report](#) and the fund selection methodology is discussed in "["Who is the smart money in China? Part II: onshore mutual funds"](#)".

Figure 20: Quarterly rebalance Mutual fund strategy 1, 2 and 3 performance in different universes



Source : DataYes, FactSet, UBS Quant Research

Figure 20 shows the cumulative returns of the three strategies in the three universes of interest, and performance metrics are reported in Figure 21. The best absolute returns, as well as the best Sharpe ratios and lower maximum drawdowns, are all available in the Top 1,000 universe for all three strategies—although it should be noted that the performance is strong in all universes. The maximum Sharpe ratio of all strategies is 1.78 for Strategy 1 in the Top 100 universe. It compares to 1.33 in the in the Top 500 universe and 1.47 in the broader Chinese universe.

These strategies do not seem to benefit from trading in a smaller universe capturing only the larger market cap (as was the case for the Northbound stock connect strategies). In Figure 20, it becomes clear that the excess performance obtained in the Top 1,000 universe is driven by the short leg of the strategies. There are also differences in the performance of the long legs, but these are not necessarily as pronounced.

Figure 21: Mutual fund strategy performance statistics

Universes	Top 500			Top 1000			China All stocks with ADV (1m) > US \$1m		
Statistics	Strategy1	Strategy2	Strategy3	Strategy1	Strategy2	Strategy3	Strategy1	Strategy2	Strategy3
Annualised return	21.1%	18.2%	16.9%	27.5%	21.0%	21.0%	21.9%	17.1%	17.6%
Annualised Volatility	16.8%	14.3%	16.0%	15.5%	12.8%	13.5%	15.4%	13.0%	13.2%
Sharpe Ratio	1.33	1.34	1.17	1.78	1.71	1.63	1.47	1.39	1.38
Max. Drawdown	-19.7%	-14.4%	-12.4%	-17.4%	-12.2%	-8.6%	-18.3%	-13.7%	-9.1%

Source : DataYes, FactSet, UBS Quant Research

Conclusion

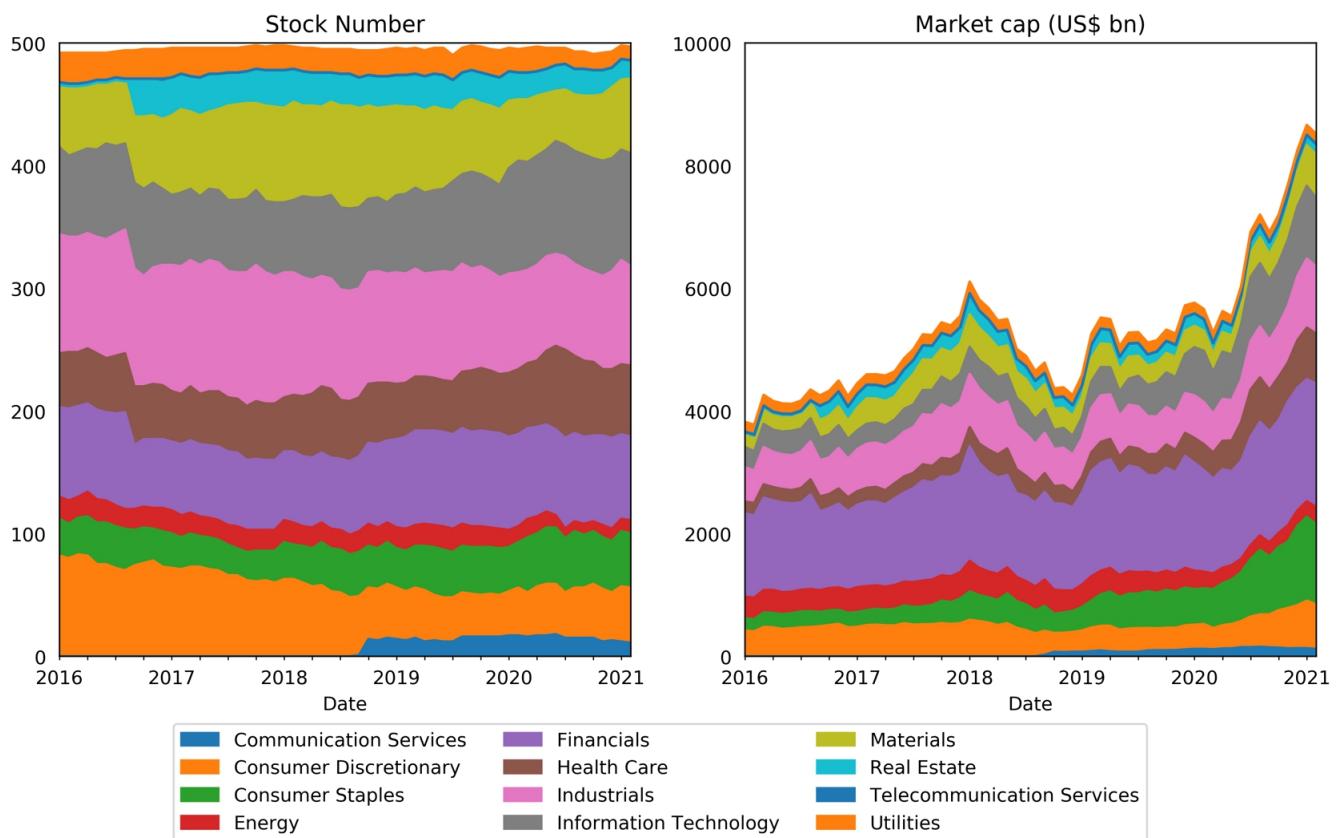
We use news sentiment data and a factor created off the *DataYes News Sentiment Dataset* to build a set of augmented quant factors. We demonstrate that significant performance improvement is available when augmenting regular quant factors with a news sentiment factor. The best performance improvements were found for the Top 1,000 universe using the intersection (rather than a composite score) of quant factors and a news sentiment factor.

In the second part of the report, we revisit the strategies discussed in [Part I](#) and [Part II](#) of our "Can we trade on news sentiment in China?" series. We show that extending the universe of interest to capture more market cap largely benefits the factors for both strategies dealing with the Northbound Stock Connect factor and the China onshore mutual fund factors.

Appendix

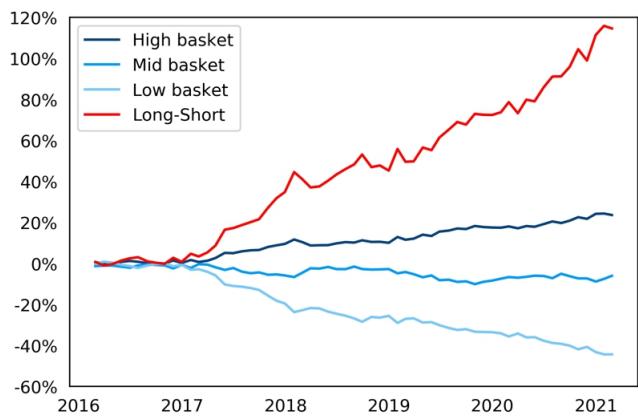
Top 500 largest stocks

Figure 22: Sector distribution



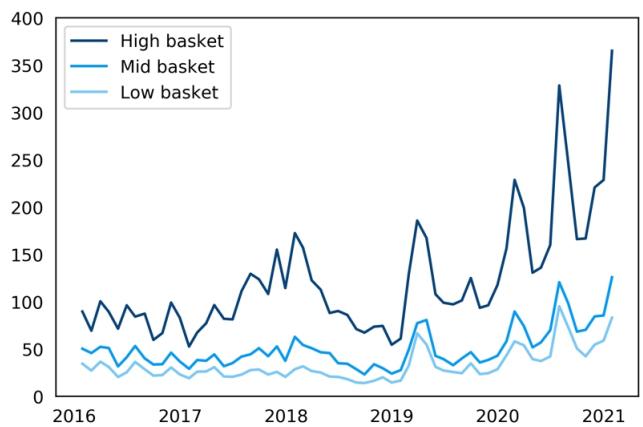
Source : DataYes, FactSet, UBS Quant Research

Figure 23: Strategy performance, based on News Sentiment Score



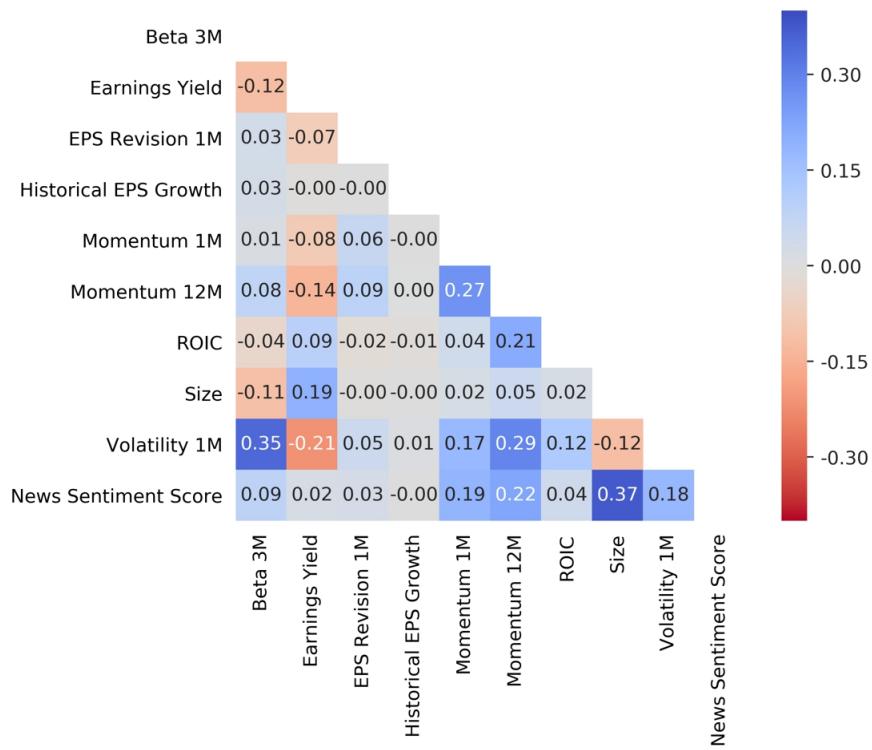
Source : DataYes, FactSet, UBS Quant Research

Figure 24: Average ADV (1m) in US\$m in different news sentiment baskets



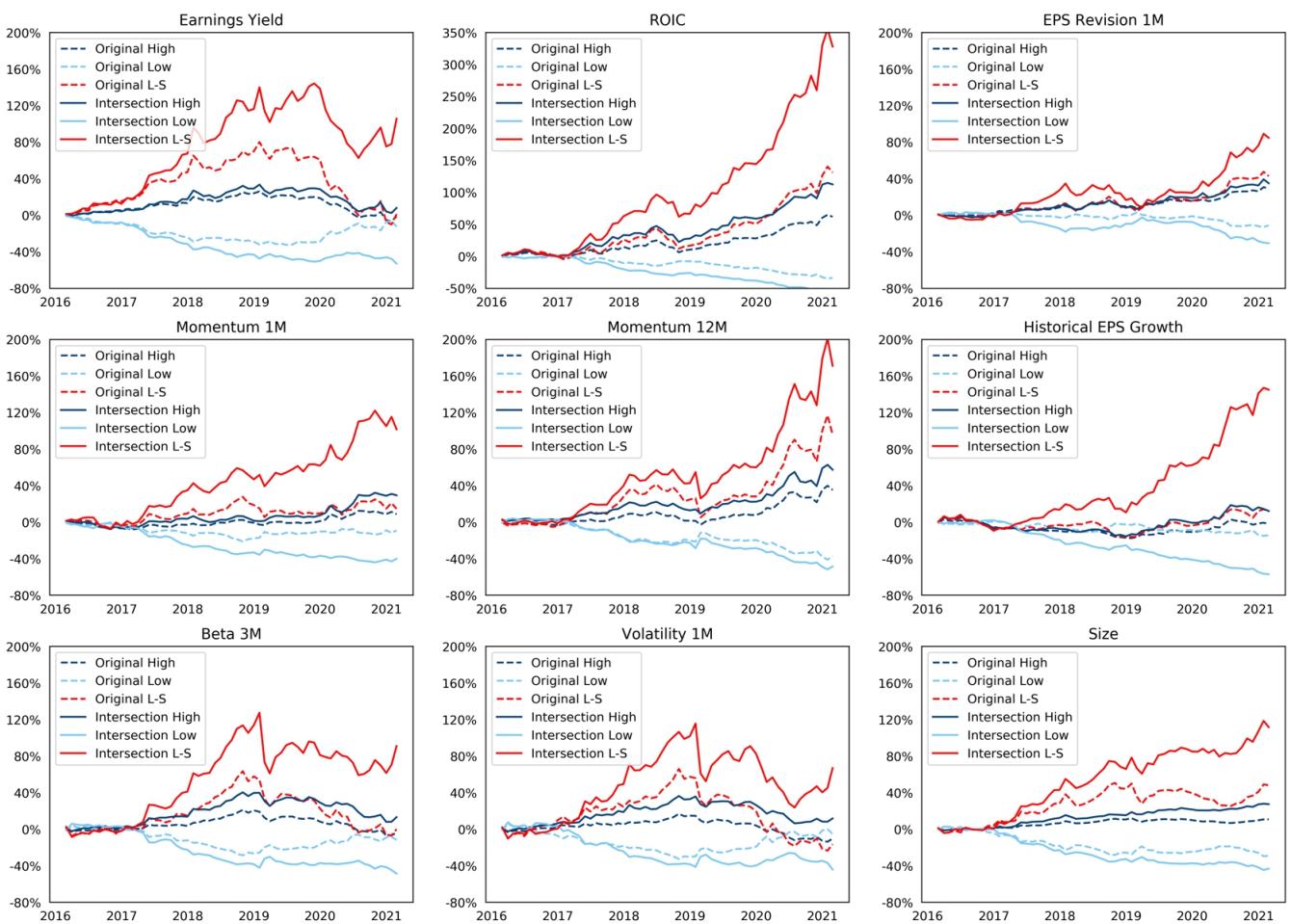
Source : DataYes, FactSet, UBS Quant Research

Figure 25: Average factor correlations



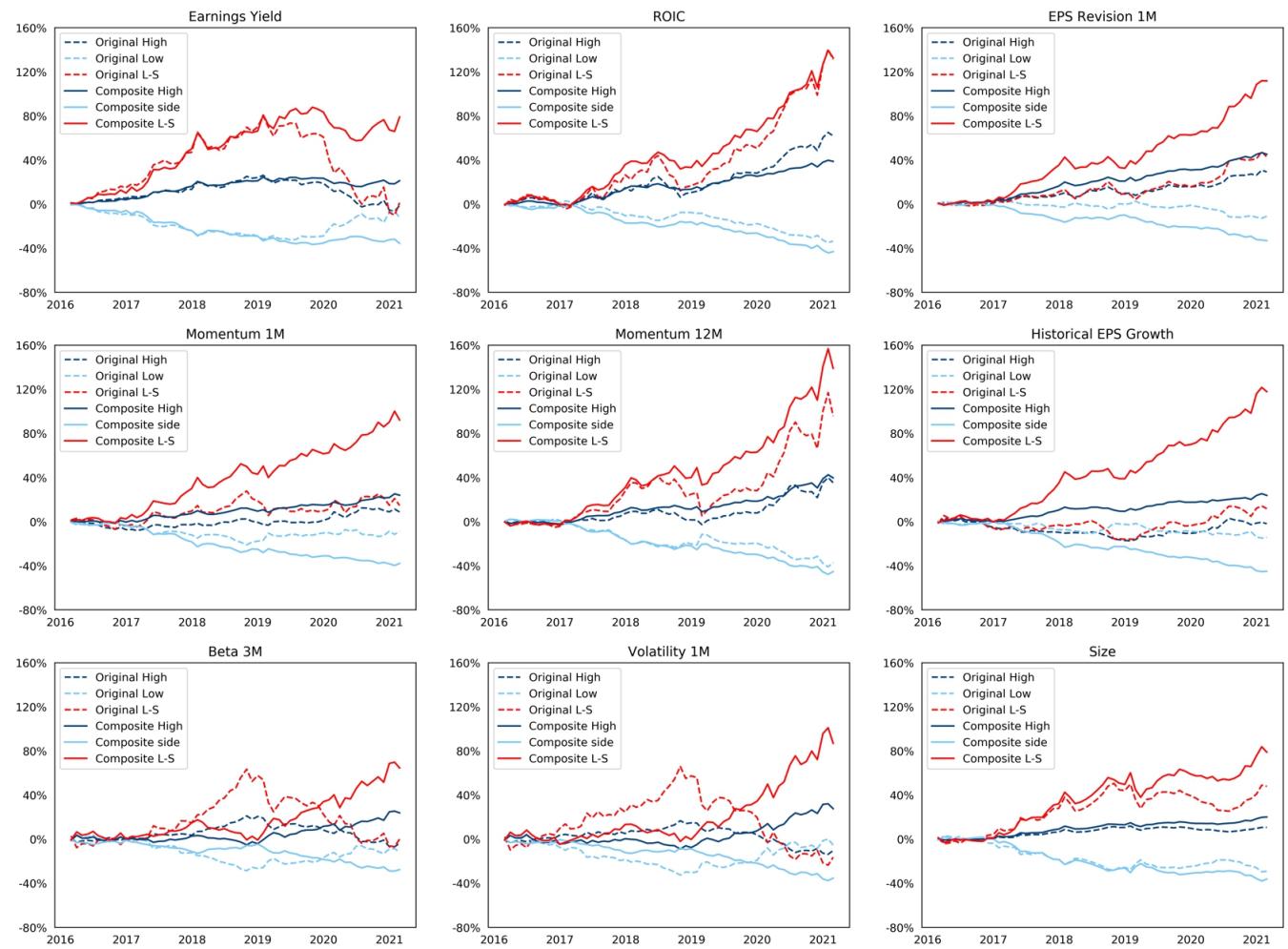
Source : DataYes, FactSet, UBS Quant Research

Figure 26: Intersection factor performance



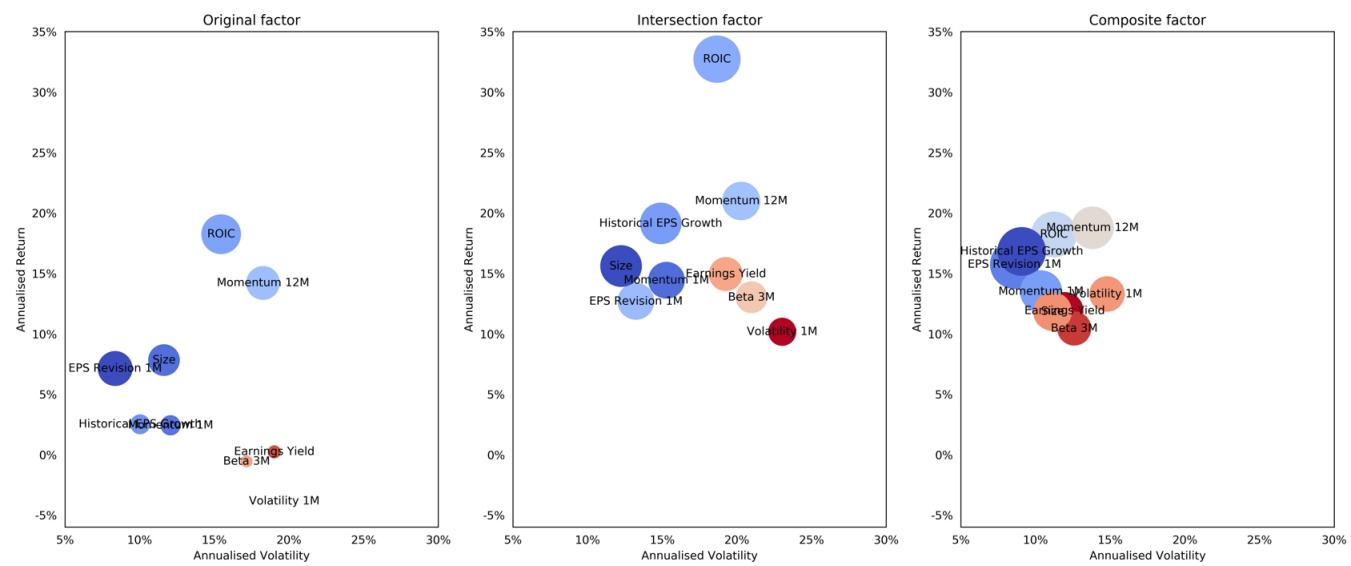
Source : DataYes, FactSet, UBS Quant Research

Figure 27: Composite factor performance



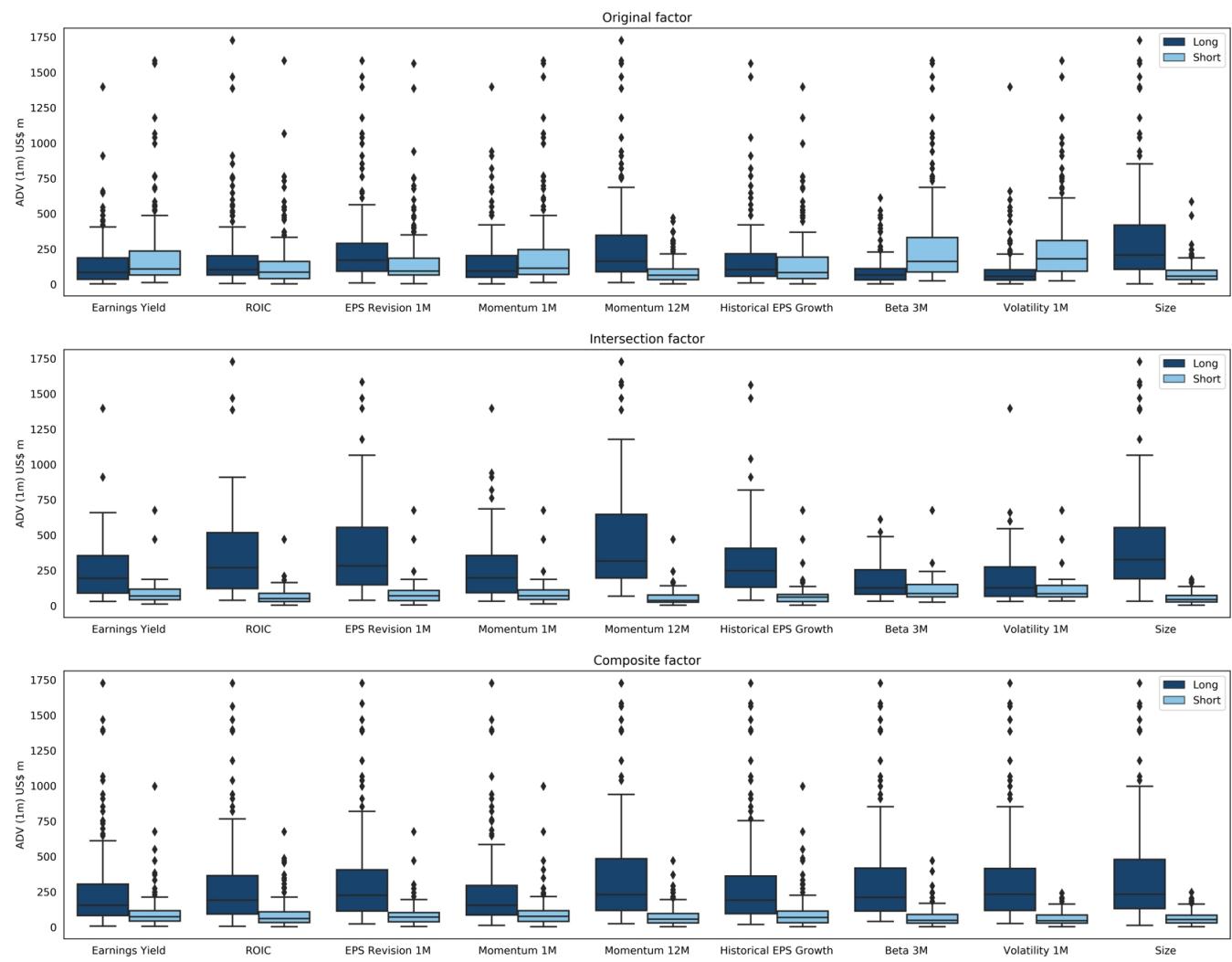
Source : DataYes, FactSet, UBS Quant Research

Figure 28: Factor performance statistics



Source : DataYes, FactSet, UBS Quant Research

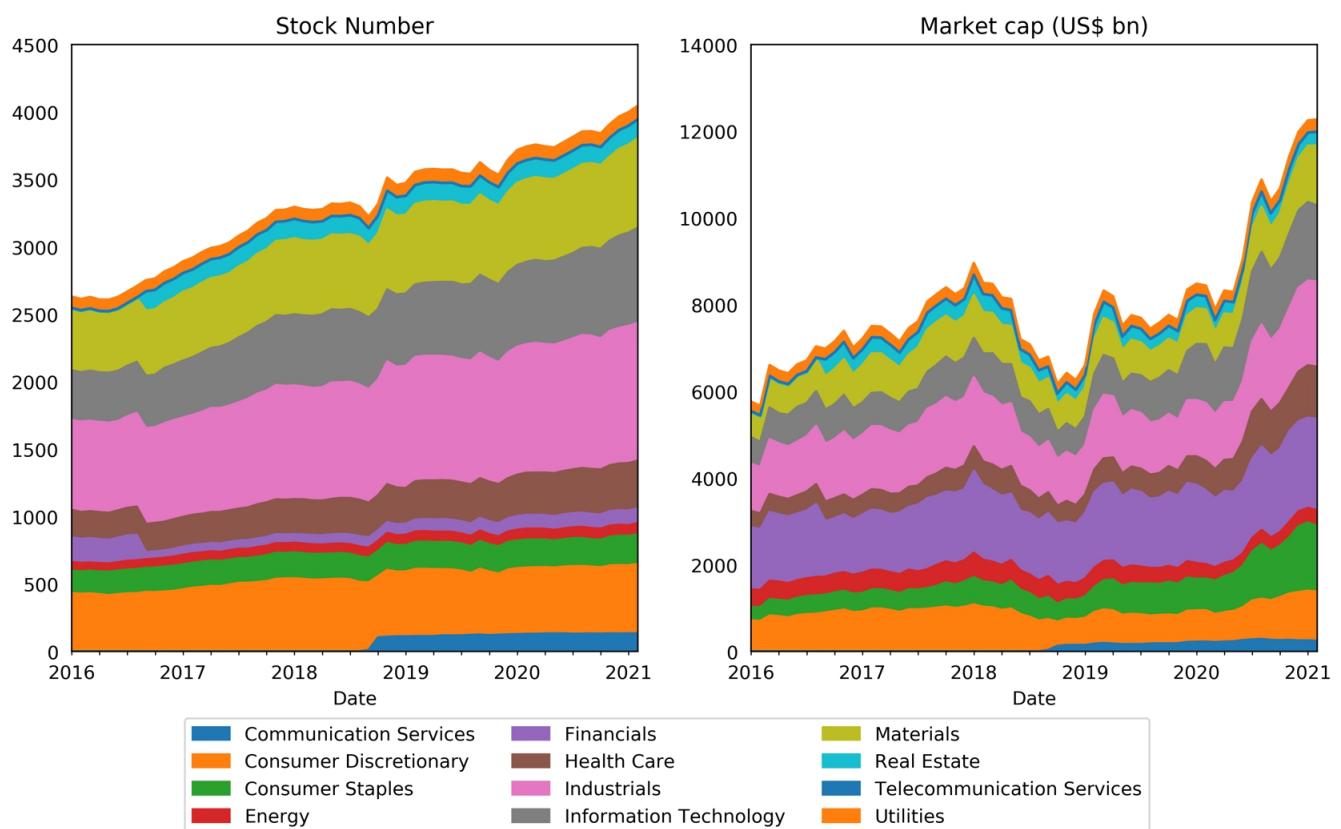
Figure 29: Latest liquidity distribution for different factors (US\$ m)



Source : DataYes, FactSet, UBS Quant Research

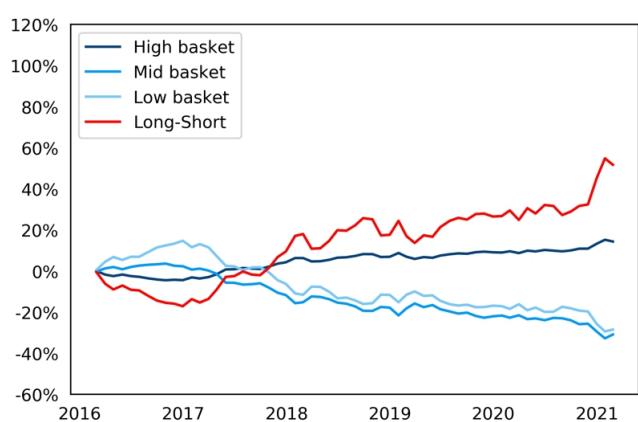
China All stocks with ADV (1m) larger than US \$1m

Figure 30: Sector distribution



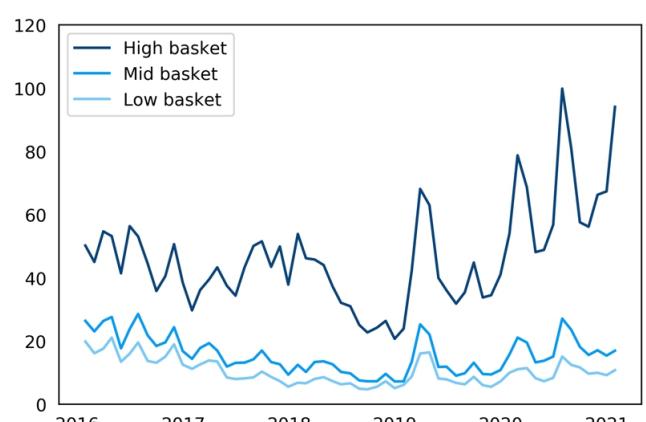
Source : DataYes, FactSet, UBS Quant Research

Figure 31: Strategy performance, based on News Sentiment Score



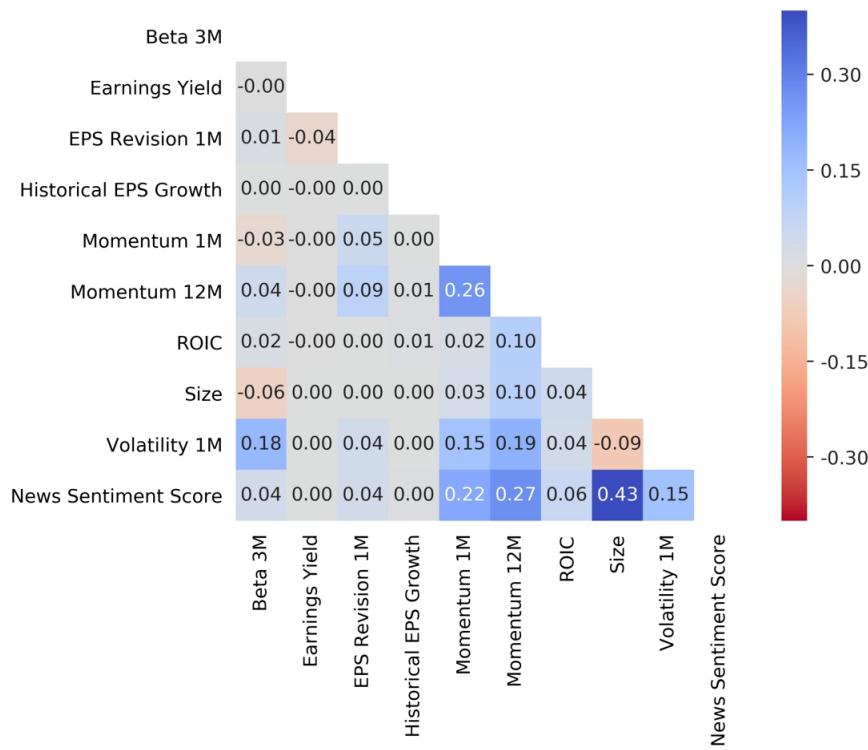
Source : DataYes, FactSet, UBS Quant Research

Figure 32: Average ADV (1m) in US\$m in different news sentiment baskets



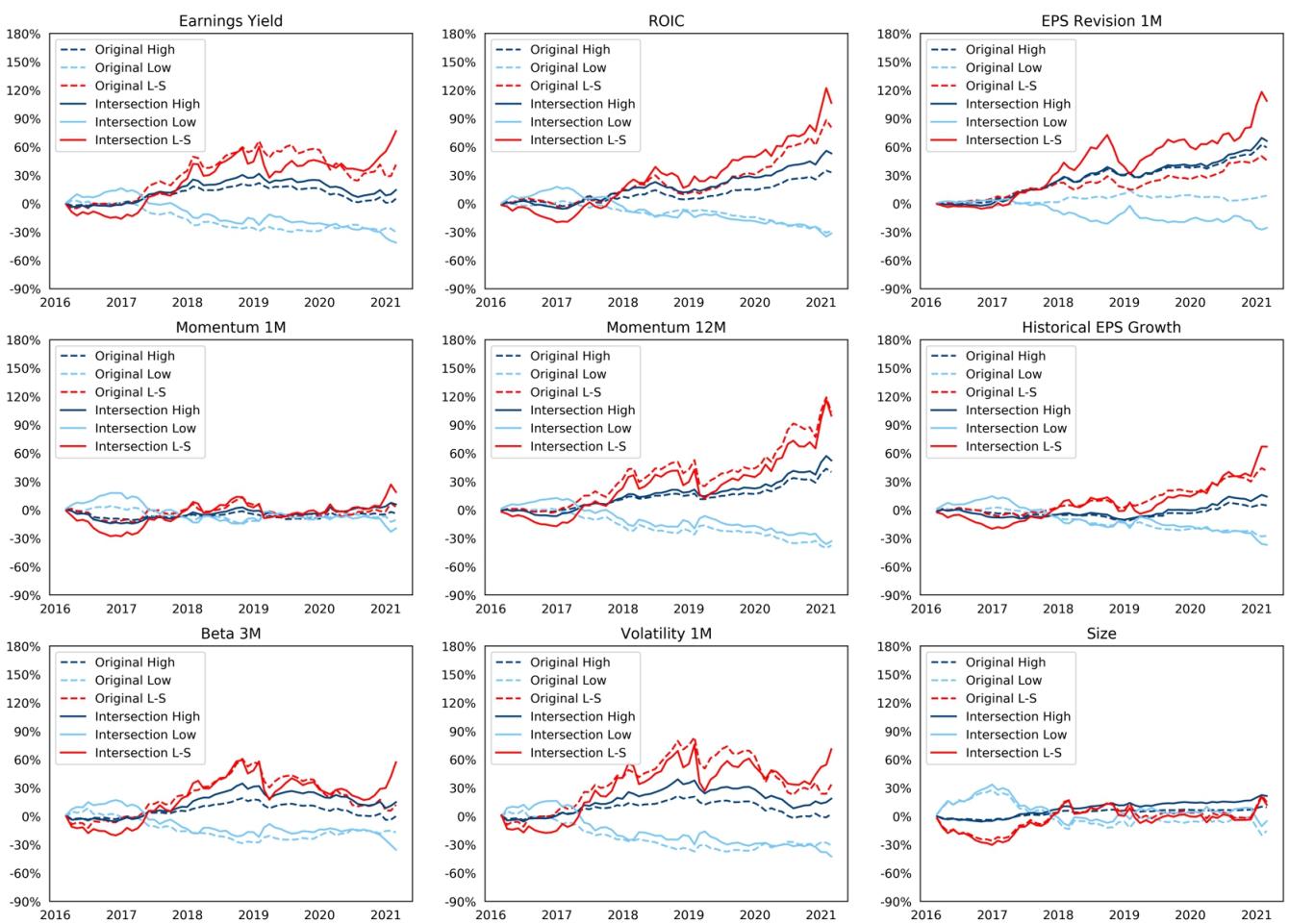
Source : DataYes, FactSet, UBS Quant Research

Figure 33: Average factor correlations



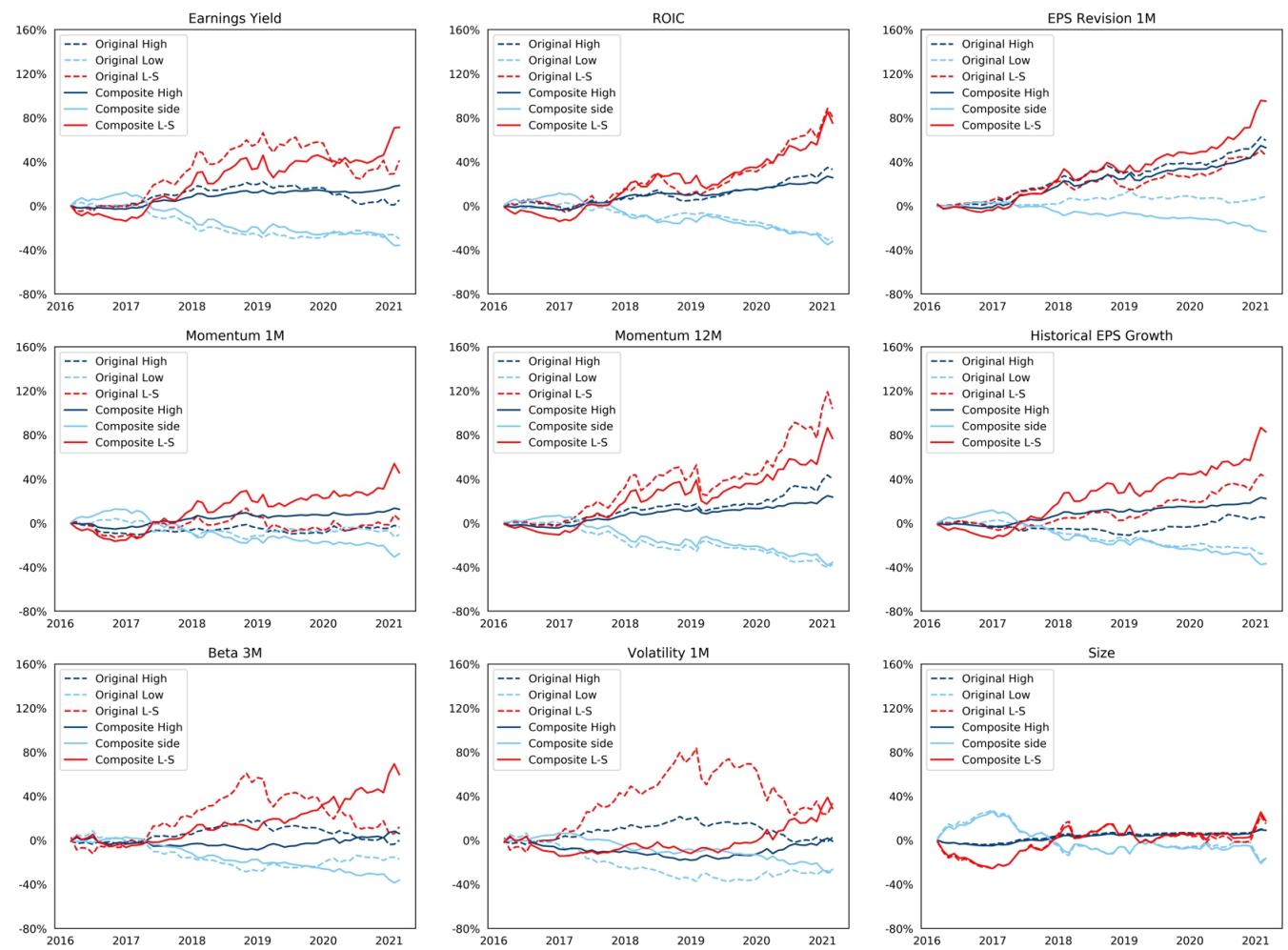
Source : DataYes, FactSet, UBS Quant Research

Figure 34: Intersection factor performance



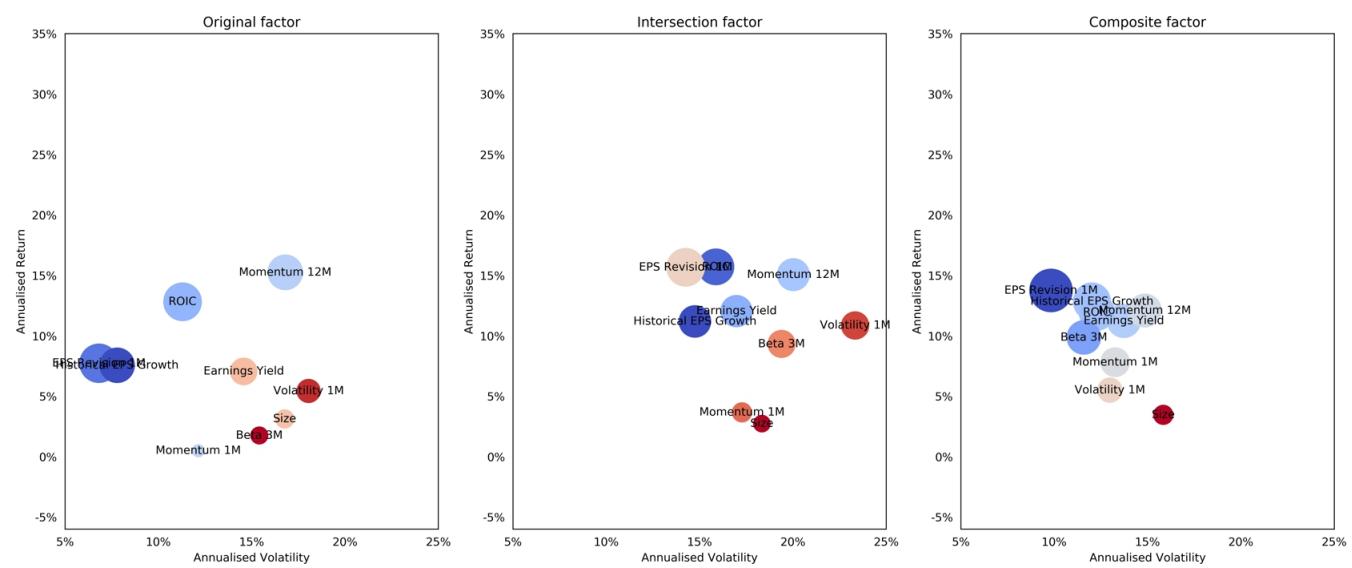
Source : DataYes, FactSet, UBS Quant Research

Figure 35: Composite factor performance



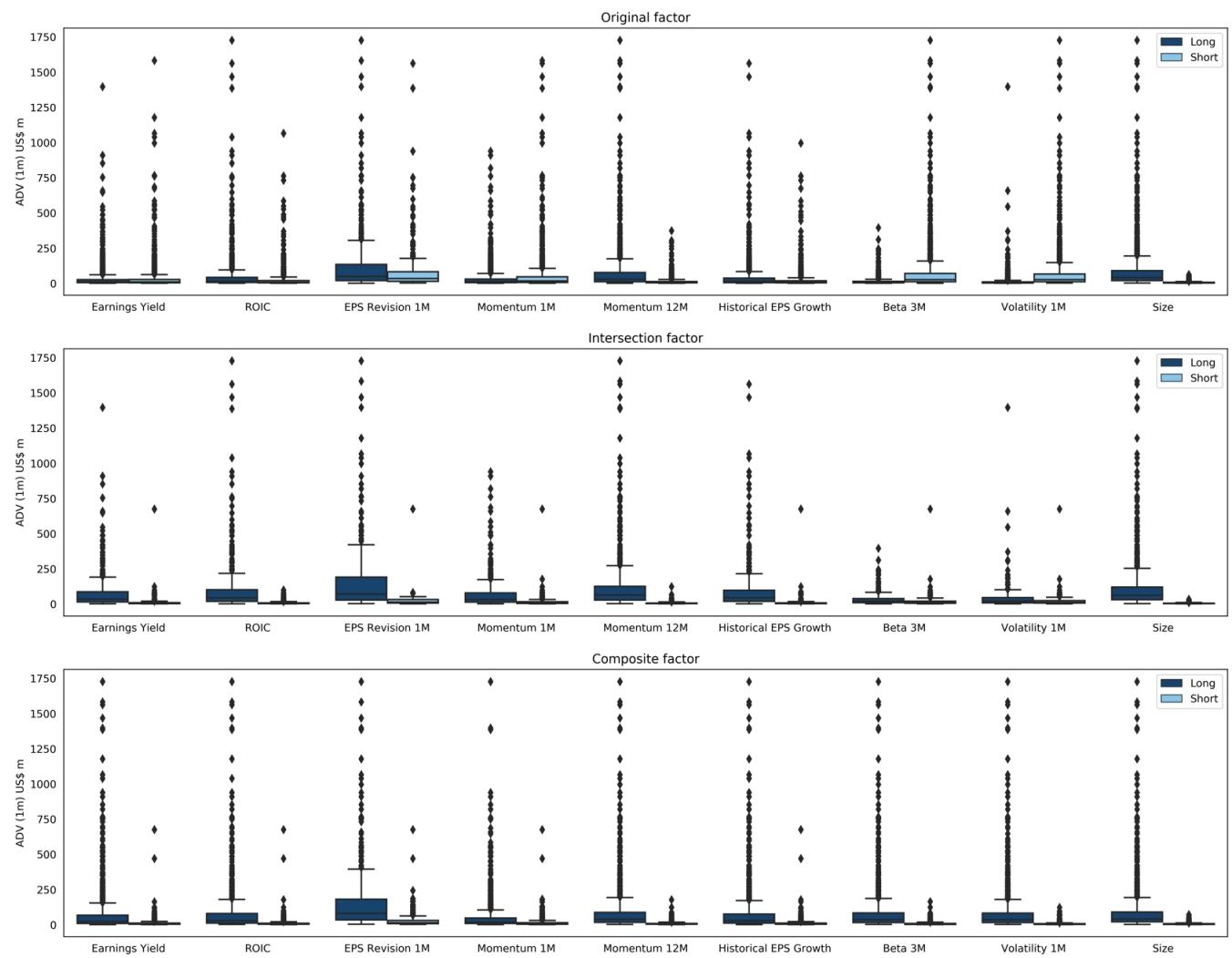
Source : DataYes, FactSet, UBS Quant Research

Figure 36: Performance statistics



Source : DataYes, FactSet, UBS Quant Research

Figure 37: Latest liquidity distribution for different factors (US\$ m)



Source : DataYes, FactSet, UBS Quant Research

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 mis-stated by a company). Also, the models employ historical data to estimate the efficacy of stock selection strategies and the relationships among strategies, which may change in the future. Additionally, unusual company-specific events could overwhelm the systematic influence of the strategies used to rank and score stocks.

Required Disclosures

This report has been prepared by UBS Securities Asia Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; certain additional disclosures concerning UBS research recommendations; and terms and conditions for certain third party data used in research report, please visit <https://www.ubs.com/disclosures>. The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities Co. Limited is licensed to conduct securities investment consultancy businesses by the China Securities Regulatory Commission. UBS acts or may act as principal in the debt securities (or in related derivatives) that may be the subject of this report. This recommendation was finalized on: 31 March 2021 12:45 PM GMT. UBS has designated certain Research department members as Derivatives Research Analysts where those department members publish research principally on the analysis of the price or market for a derivative, and provide information reasonably sufficient upon which to base a decision to enter into a derivatives transaction. Where Derivatives Research Analysts co-author research reports with Equity Research Analysts or Economists, the Derivatives Research Analyst is responsible for the derivatives investment views, forecasts, and/or recommendations. **Quantitative Research Review:** UBS publishes a quantitative assessment of its analysts' responses to certain questions about the likelihood of an occurrence of a number of short term factors in a product known as the 'Quantitative Research Review'. Views contained in this assessment on a particular stock reflect only the views on those short term factors which are a different timeframe to the 12-month timeframe reflected in any equity rating set out in this note. For the latest responses, please click <https://neo.ubs.com/quantitative>, or speak to your UBS sales representative for access to the report.

Analyst Certification:

Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

UBS Investment Research: Global Equity Rating Definitions

12-Month Rating	Definition	Coverage ¹	IB Services ²
Buy	FSR is > 6% above the MRA.	51%	31%
Neutral	FSR is between -6% and 6% of the MRA.	37%	29%
Sell	FSR is > 6% below the MRA.	12%	18%
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 31 December 2020.

1:Percentage of companies under coverage globally within the 12-month rating category.

2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.

3:Percentage of companies under coverage globally within the Short-Term rating category.

4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

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

EXCEPTIONS AND SPECIAL CASES: UK and European Investment Fund ratings and definitions are: **Buy:** Positive on factors such as structure, management, performance record, discount; **Neutral:** Neutral on factors such as structure, management, performance record, discount; **Sell:** Negative on factors such as structure, management, performance record, discount. **Core Banding Exceptions (CBE):** Exceptions to the standard +/-6% bands may be granted by the Investment Review Committee (IRC).

Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to the rating. When such exceptions apply, they will be identified in the Company Disclosures table in the relevant research piece.

Research analysts contributing to this report who are employed by any non-US affiliate of UBS Securities LLC are not registered/qualified as research analysts with FINRA. Such analysts may not be associated persons of UBS Securities LLC and therefore are not subject to the FINRA restrictions on communications with a subject company, public appearances, and trading securities held by a research analyst account. The name of each affiliate and analyst employed by that affiliate contributing to this report, if any, follows.

UBS AG Hong Kong Branch: Aaron Guo, CFA, Fabrice Schloegel, PhD.**UBS AG London Branch:** Andreas Schroeder, CFA.**UBS Securities Australia Ltd:** Oliver Antrobus, CFA, Paul Winter.**UBS Securities Co. Limited:** Cathy Fang, PhD, Lynce Wang.**UBS Securities LLC:** Michael Gray.

The views in this report are based on UBS's proprietary quantitative models. These views are made independently of the recommendations of UBS's fundamental equity research analysts.

Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report. For a complete set of disclosure statements associated with the companies discussed in this report, including information on valuation and risk, please contact UBS Securities LLC, 1285 Avenue of Americas, New York, NY 10019, USA, Attention: Investment Research.

Global Disclaimer

This document has been prepared by UBS Securities Asia Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

This Document is provided solely to recipients who are expressly authorized by UBS to receive it. If you are not so authorized you must immediately destroy the Document.

Global Research is provided to our clients through UBS Neo, and in certain instances, UBS.com and any other system or distribution method specifically identified in one or more communications distributed through UBS Neo or UBS.com (each a system) as an approved means for distributing Global Research. It may also be made available through third party vendors and distributed by UBS and/or third parties via e-mail or alternative electronic means. The level and types of services provided by Global Research to a client may vary depending upon various factors such as a client's individual preferences as to the frequency and manner of receiving communications, a client's risk profile and investment focus and perspective (e.g., market wide, sector specific, long-term, short-term, etc.), the size and scope of the overall client relationship with UBS and legal and regulatory constraints.

All Global Research is available on UBS Neo. Please contact your UBS sales representative if you wish to discuss your access to UBS Neo.

When you receive Global Research through a system, your access and/or use of such Global Research is subject to this Global Research Disclaimer and to the UBS Neo Platform Use Agreement (the "Neo Terms") together with any other relevant terms of use governing the applicable System.

When you receive Global Research via a third party vendor, e-mail or other electronic means, you agree that use shall be subject to this Global Research Disclaimer, the Neo Terms and where applicable the UBS Investment Bank terms of business (<https://www.ubs.com/global/en/investment-bank/regulatory.html>) and to UBS's Terms of Use/Disclaimer (<http://www.ubs.com/global/en/legalinfo2/disclaimer.html>). In addition, you consent to UBS processing your personal data and using cookies in accordance with our Privacy Statement (<http://www.ubs.com/global/en/legalinfo2/privacy.html>) and cookie notice (<http://www.ubs.com/global/en/homepage/cookies/cookie-management.html>).

If you receive Global Research, whether through a System or by any other means, you agree that you shall not copy, revise, amend, create a derivative work, provide to any third party, or in any way commercially exploit any UBS research provided via Global Research or otherwise, and that you shall not extract data from any research or estimates provided to you via Global Research or otherwise, without the prior written consent of UBS.

In certain circumstances (including for example, if you are an academic or a member of the media) you may receive Global Research otherwise than in the capacity of a client of UBS and you understand and agree that (i) the Global Research is provided to you for information purposes only; (ii) for the purposes of receiving it you are not intended to be and will not be treated as a "client" of UBS for any legal or regulatory purpose; (iii) the Global Research must not be relied on or acted upon for any purpose; and (iv) such content is subject to the relevant disclaimers that follow.

This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject UBS to any registration or licensing requirement within such jurisdiction.

This document is a general communication and is educational in nature; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. By providing this document, none of UBS or its representatives has any responsibility or authority to provide or have provided investment advice in a fiduciary capacity or otherwise. Investments involve risks, and investors should exercise prudence and their own judgment in making their investment decisions. None of UBS or its representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. By receiving this document, the recipient acknowledges and agrees with the intended purpose described above and further disclaims any expectation or belief that the information constitutes investment advice to the recipient or otherwise purports to meet the investment objectives of the recipient. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors.

Options, structured derivative products and futures (including OTC derivatives) are not suitable for all investors. Trading in these instruments is considered risky and may be appropriate only for sophisticated investors. Prior to buying or selling an option, and for the complete risks relating to options, you must receive a copy of "The Characteristics and Risks of Standardized Options." You may read the document at <http://www.theocc.com/publications/risks/riskchap1.jsp> or ask your salesperson for a copy. Various theoretical explanations of the risks associated with these instruments have been published. Supporting documentation for any claims, comparisons, recommendations, statistics or other technical data will be supplied upon request. Past performance is not necessarily indicative of future results. Transaction costs may be significant in option strategies calling for multiple purchases and sales of options, such as spreads and straddles. Because of the importance of tax considerations to many options transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full (or any) amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the Information.

Prior to making any investment or financial decisions, any recipient of this document or the information should take steps to understand the risk and return of the investment and seek individualized advice from his or her personal financial, legal, tax and other professional advisors that takes into account all the particular facts and circumstances of his or her investment objectives.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

No representation or warranty, either expressed or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in any materials to which this document relates (the "Information"), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups, personnel or other representative of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party. In no circumstances may this document or any of the Information (including any forecast, value, index or other calculated amount ("Values")) be used for any of the following purposes:

- (i) valuation or accounting purposes;
- (ii) to determine the amounts due or payable, the price or the value of any financial instrument or financial contract; or
- (iii) to measure the performance of any financial instrument including, without limitation, for the purpose of tracking the return or performance of any Value or of defining the asset allocation of portfolio or of computing performance fees.

By receiving this document and the Information you will be deemed to represent and warrant to UBS that you will not use this document or any of the Information for any of the above purposes or otherwise rely upon this document or any of the Information.

UBS has policies and procedures, which include, without limitation, independence policies and permanent information barriers, that are intended, and upon which UBS relies, to manage potential conflicts of interest and control the flow of information within divisions of UBS and among its subsidiaries, branches and affiliates. For further information on the ways in which UBS manages conflicts and maintains independence of its research products, historical performance information and certain additional disclosures concerning UBS research recommendations, please visit <https://www.ubs.com/disclosures>.

Research will initiate, update and cease coverage solely at the discretion of UBS Research Management, which will also have sole discretion on the timing and frequency of any published research product. The analysis contained in this document is based on numerous assumptions. All material information in relation to published research reports, such as valuation methodology, risk statements, underlying assumptions (including sensitivity analysis of those assumptions), ratings history etc. as required by the Market Abuse Regulation, can be found on UBS Neo. Different assumptions could result in materially different results.

The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however,

compensation may relate to the revenues of UBS and/or its divisions as a whole, of which investment banking, sales and trading are a part, and UBS's subsidiaries, branches and affiliates as a whole.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms under English law or, if not carried out by UBS in the UK the law of the relevant jurisdiction in which UBS determines it carries out the activity) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

Within the past 12 months UBS AG, its affiliates or subsidiaries may have received or provided investment services and activities or ancillary services as per MiFID II which may have given rise to a payment or promise of a payment in relation to these services from or to this company.

Where Global Research refers to "UBS Evidence Lab Inside" or has made use of data provided by UBS Evidence Lab you understand that UBS Evidence Lab is a separate department to Global Research and that UBS Evidence Lab does not provide research, investment recommendations or advice. UBS Evidence Lab may provide services to other internal and external clients.

United Kingdom: This material is distributed by UBS AG, London Branch to persons who are eligible counterparties or professional clients. UBS AG, London Branch is authorised by the Prudential Regulation Authority and subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority.

Europe: Except as otherwise specified herein, these materials are distributed by UBS Europe SE, a subsidiary of UBS AG, to persons who are eligible counterparties or professional clients (as detailed in the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) Rules and according to MiFID) and are only available to such persons. The information does not apply to, and should not be relied upon by, retail clients. UBS Europe SE is authorised by the European Central Bank (ECB) and regulated by the BaFin and the ECB.

Germany: Where an analyst of UBS Europe SE has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE. In all cases it is distributed by UBS Europe SE and UBS AG, London Branch.

Luxembourg, the Netherlands, Belgium and Ireland: Where an analyst of UBS Europe SE has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE. In all cases it is distributed by UBS Europe SE and UBS AG, London Branch.

Turkey: Distributed by UBS AG, London Branch. No information in this document is provided for the purpose of offering, marketing and sale by any means of any capital market instruments and services in the Republic of Turkey. Therefore, this document may not be considered as an offer made or to be made to residents of the Republic of Turkey. UBS AG, London Branch is not licensed by the Turkish Capital Market Board under the provisions of the Capital Market Law (Law No. 6362). Accordingly, neither this document nor any other offering material related to the instruments/services may be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the Capital Market Board. However, according to article 15 (d) (ii) of the Decree No. 32, there is no restriction on the purchase or sale of the securities abroad by residents of the Republic of Turkey.

Poland: Distributed by UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce regulated by the Polish Financial Supervision Authority. Where an analyst of UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE (spółka z ograniczoną odpowiedzialnością) Oddział w Polsce.

Russia: Prepared and distributed by UBS Bank (OOO). "Should not be construed as an individual Investment Recommendation for the purpose of the Russian Law" - Federal Law #39-FZ ON THE SECURITIES MARKET Articles 6.1-6.2.

Switzerland: Distributed by UBS AG to persons who are institutional investors only. UBS AG is regulated by the Swiss Financial Market Supervisory Authority (FINMA).

Italy: Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, Italy Branch. Where an analyst of UBS Europe SE, Italy Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, Italy Branch.

France: Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, France Branch. Where an analyst of UBS Europe SE, France Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, France Branch.

Spain: Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, Spain Branch. Where an analyst of UBS Europe SE, Spain Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, Spain Branch.

Sweden: Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, Sweden Branch. Where an analyst of UBS Europe SE, Sweden Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, Sweden Branch.

South Africa: Distributed by UBS South Africa (Pty) Limited (Registration No. 1995/011140/07), an authorised user of the JSE and an authorised Financial Services Provider (FSP 7328).

Saudi Arabia: This document has been issued by UBS AG (and/or any of its subsidiaries, branches or affiliates), a public company limited by shares, incorporated in Switzerland with its registered offices at Aeschenvorstadt 1, CH-4051 Basel and Bahnhofstrasse 45, CH-8001 Zurich. This publication has been approved by UBS Saudi Arabia (a subsidiary of UBS AG), a Saudi closed joint stock company incorporated in the Kingdom of Saudi Arabia under commercial register number 1010257812 having its registered office at Tatweer Towers, P.O. Box 75724, Riyadh 11588, Kingdom of Saudi Arabia. UBS Saudi Arabia is authorized and regulated by the Capital Market Authority to conduct securities business under license number 08113-37.

UAE / Dubai: The information distributed by UBS AG Dubai Branch is only intended for Professional Clients and/or Market Counterparties, as classified under the DFSA rulebook. No other person should act upon this material/communication. The information is not for further distribution within the United Arab Emirates. UBS AG Dubai Branch is regulated by the DFSA in the DIFC. UBS is not licensed to provide banking services in the UAE by the Central Bank of the UAE, nor is it licensed by the UAE Securities and Commodities Authority.

Israel: This Material is distributed by UBS AG, London Branch. UBS Securities Israel Ltd is a licensed Investment Marketer that is supervised by the Israel Securities Authority (ISA). UBS AG, London Branch and its affiliates incorporated outside Israel are not licensed under the Israeli Advisory Law. UBS may engage among others in issuance of Financial Assets or in distribution of Financial Assets of other issuers for fees or other benefits. UBS AG, London Branch and its affiliates may prefer various Financial Assets to which they have or may have an Affiliation (as such term is defined under the Israeli Advisory Law).

Nothing in this Material should be considered as investment advice under the Israeli Advisory Law. This Material is being issued only to and/or is directed only at persons who are Eligible Clients within the meaning of the Israeli Advisory Law, and this Material must not be furnished to, relied on or acted upon by any other persons.

United States: Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a '**non-US affiliate**') to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a report prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this report must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. UBS Securities LLC is not acting as a municipal advisor to any municipal entity or obligated person within the meaning of Section 15B of the Securities Exchange Act (the "Municipal Advisor Rule"), and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of the Municipal Advisor Rule.

Canada: Distributed by UBS Securities Canada Inc., a registered investment dealer in Canada and a Member-Canadian Investor Protection Fund, or by another affiliate of UBS AG that is registered to conduct business in Canada or is otherwise exempt from registration.

Brazil: Except as otherwise specified herein, this material is prepared by UBS Brasil CCTVM S.A.¹ to persons who are eligible investors residing in Brazil, which are considered to be Investidores Profissionais, as designated by the applicable regulation, mainly the CVM Instruction No. 539 from the 13th of November 2013 (determines the duty to verify the suitability of products, services and transactions with regards to the client's profile).

¹UBS Brasil CCTVM S.A. is a subsidiary of UBS BB Servicos de Assessoria Financeira e Participacoes S.A. ("UBS BB"). UBS BB is an association between UBS AG and Banco do Brasil, of which UBS AG is the majority owner.

Mexico: This report has been distributed and prepared by UBS Casa de Bolsa, S.A. de C.V., a subsidiary of UBS AG. This document is intended for distribution to institutional or sophisticated investors only. Research reports only reflect the views of the analysts responsible for the report. Analysts do not receive any compensation from the persons or entities different from UBS Casa de Bolsa, S.A. de C.V., or different from entities belonging to the same financial group or business group of such

Hong Kong: Distributed by UBS Securities Asia Limited. Please contact local licensed persons of UBS Securities Asia Limited in respect of any matters arising from, or in connection with, the analysis or document.

Singapore: Distributed by UBS Securities Pte. Ltd. [MCI (P) 003/08/2020 and Co. Reg. No.: 198500648C] or UBS AG, Singapore Branch. Please contact UBS Securities Pte. Ltd., an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110); or UBS AG, Singapore Branch, an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110) and a wholesale bank licensed under the Singapore Banking Act (Cap. 19) regulated by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with, the analysis or document.

The recipients of this document represent and warrant that they are accredited and institutional investors as defined in the Securities and Futures Act (Cap. 289).

Japan: Distributed by UBS Securities Japan Co., Ltd. to professional investors (except as otherwise permitted). Where this report has been prepared by UBS Securities Japan Co., Ltd., UBS Securities Japan Co., Ltd. is the author, publisher and distributor of the report. Distributed by UBS AG, Tokyo Branch to Professional Investors (except as otherwise permitted) in relation to foreign exchange and other banking businesses when relevant.

Australia: Clients of UBS AG: Distributed by UBS AG (ABN 47 088 129 613 and holder of Australian Financial Services License No. 231087).

Clients of UBS Securities Australia Ltd: Distributed by UBS Securities Australia Ltd (ABN 62 008 586 481 and holder of Australian Financial Services License No. 231098). This Document contains general information and/or general advice only and does not constitute personal financial product advice. As such, the Information in this document has been prepared without taking into account any investor's objectives, financial situation or needs, and investors should, before acting on the Information, consider the appropriateness of the Information, having regard to their objectives, financial situation and needs. If the Information contained in this document relates to the acquisition, or potential acquisition of a particular financial product by a 'Retail' client as defined by section 761G of the Corporations Act 2001 where a Product Disclosure Statement would be required, the retail client should obtain and consider the Product Disclosure Statement relating to the product before making any decision about whether to acquire the product.

New Zealand: Distributed by UBS New Zealand Ltd. UBS New Zealand Ltd is not a registered bank in New Zealand. You are being provided with this UBS publication or material because you have indicated to UBS that you are a "wholesale client" within the meaning of section 5C of the Financial Advisers Act 2008 of New Zealand (Permitted Client). This publication or material is not intended for clients who are not Permitted Clients (non-permitted Clients). If you are a non-permitted Client you must not rely on this publication or material. If despite this warning you nevertheless rely on this publication or material, you hereby (i) acknowledge that you may not rely on the content of this publication or material and that any recommendations or opinions in such this publication or material are not made or provided to you, and (ii) to the maximum extent permitted by law (a) indemnify UBS and its associates or related entities (and their respective Directors, officers, agents and Advisors) (each a 'Relevant Person') for any loss, damage, liability or claim any of them may

incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material and (b) waive any rights or remedies you may have against any Relevant Person for (or in respect of) any loss, damage, liability or claim you may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material. **Korea:** Distributed in Korea by UBS Securities Pte. Ltd., Seoul Branch. This report may have been edited or contributed to from time to time by affiliates of UBS Securities Pte. Ltd., Seoul Branch. This material is intended for professional/institutional clients only and not for distribution to any retail clients. **Malaysia:** This material is authorized to be distributed in Malaysia by UBS Securities Malaysia Sdn. Bhd (Capital Markets Services License No.: CMSL/A0063/2007). This material is intended for professional/institutional clients only and not for distribution to any retail clients. **India:** Distributed by UBS Securities India Private Ltd. (Corporate Identity Number U67120MH1996PTC097299) 2/F, 2 North Avenue, Maker Maxity, Bandra Kurla Complex, Bandra (East), Mumbai (India) 400051. Phone: +912261555000. It provides brokerage services bearing SEBI Registration Number: INZ000259830; merchant banking services bearing SEBI Registration Number: INM000010809 and Research Analyst services bearing SEBI Registration Number: INH000001204. UBS AG, its affiliates or subsidiaries may have debt holdings or positions in the subject Indian company/companies. Within the past 12 months, UBS AG, its affiliates or subsidiaries may have received compensation for non-investment banking securities-related services and/or non-securities services from the subject Indian company/companies. The subject company/companies may have been a client/clients of UBS AG, its affiliates or subsidiaries during the 12 months preceding the date of distribution of the research report with respect to investment banking and/or non-investment banking securities-related services and/or non-securities services. With regard to information on associates, please refer to the Annual Report at: http://www.ubs.com/global/en/about_ubs/investor_relations/annualreporting.html **Taiwan:** Except as otherwise specified herein, this material may not be distributed in Taiwan. Information and material on securities/instruments that are traded in a Taiwan organized exchange is deemed to be issued and distributed by UBS Securities Pte. LTD., Taipei Branch, which is licensed and regulated by Taiwan Financial Supervisory Commission. Save for securities/instruments that are traded in a Taiwan organized exchange, this material should not constitute "recommendation" to clients or recipients in Taiwan for the covered companies or any companies mentioned in this document. No portion of the document may be reproduced or quoted by the press or any other person without authorisation from UBS. **Indonesia:** This report is being distributed by PT UBS Sekuritas Indonesia and is delivered by its licensed employee(s), including marketing/sales person, to its client. PT UBS Sekuritas Indonesia, having its registered office at Sequis Tower Level 22 unit 22-1,Jl.Jend. Sudirman, kav.71, SCBD lot 11B, Jakarta 12190, Indonesia, is a subsidiary company of UBS AG and licensed under Capital Market Law no. 8 year 1995, a holder of broker-dealer and underwriter licenses issued by the Capital Market and Financial Institution Supervisory Agency (now Otoritas Jasa Keuangan/OJK). PT UBS Sekuritas Indonesia is also a member of Indonesia Stock Exchange and supervised by Otoritas Jasa Keuangan (OJK). Neither this report nor any copy hereof may be distributed in Indonesia or to any Indonesian citizens except in compliance with applicable Indonesian capital market laws and regulations. This report is not an offer of securities in Indonesia and may not be distributed within the territory of the Republic of Indonesia or to Indonesian citizens in circumstance which constitutes an offering within the meaning of Indonesian capital market laws and regulations.

The disclosures contained in research documents produced by UBS AG, London Branch or UBS Europe SE shall be governed by and construed in accordance with English law.

UBS specifically prohibits the redistribution of this document in whole or in part without the written permission of UBS and in any event UBS accepts no liability whatsoever for any redistribution of this document or its contents or the actions of third parties in this respect. Images may depict objects or elements that are protected by third party copyright, trademarks and other intellectual property rights. © UBS 2021. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.

