Quantitative Insights

A Definitive Approach to Crowding

Equities

Global

Quantitative

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Comprehensive Crowding Factor

We define a comprehensive UBS crowding factor based on a combination of multiple external and internal data sets. A complementary blend of prime brokerage data, stock loan data, 13F regulatory filings, and proprietary data provides a good overall lens for positioning information. This encompasses data on both the long and short sides and we think is a much more effective approach than attempting to define crowding through incomplete data sets or secondary approaches such as price movements, factor spreads, or various correlations.

This paper is an introduction to our new work on an overall positioning framework to describe current loadings and changes in loadings at the sector, factor, and security level. The focus in this note will be on crowding-- a topic near and dear to the heart of many market participants.

Data Sources

Data Sources	Side
Prime brokerage position data	long/short
13F regulatory filings	long
Stock loan data	short
UBS internal data	short

Source: DataLend, FactSet, IHS Markit, UBS

Crowding Implementation

An alpha based approach can be considered, but a more effective implementation can be on the risk side. Constraints at the factor level or individual stock level can help mitigate crowding based price effects. Crowding is missed by traditional quantitative risk models, so incorporating it into a portfolio construction or attribution process provides critical information.

Screens for Individual Stocks

A particularly effective use of a crowding metric for fundamental managers is to identify the most crowded names in a certain sector or region. These can then be constrained during portfolio construction and help mitigate the risk of adverse price movements. Coupling this with information about potential catalysts in a name becomes very interesting and potentially very valuable.

CROWDING

Summary

This is the first research piece from our new and comprehensive positioning work. The goal is to try and better understand how market participants are behaving as far as sectors, factors, and individual securities. We will examine time series behavior for various market cohorts and construct a coherent overall descriptive framework.

Crowding Definition

We will start by introducing a proprietary look at crowding. Crowding is sometimes ill-defined, the 'know it when you see it' sort of phenomena. But for a variety of reasons, it is an interesting and important topic to quantify. We will define crowding from an investment perspective, why it's important, and its practical implications.

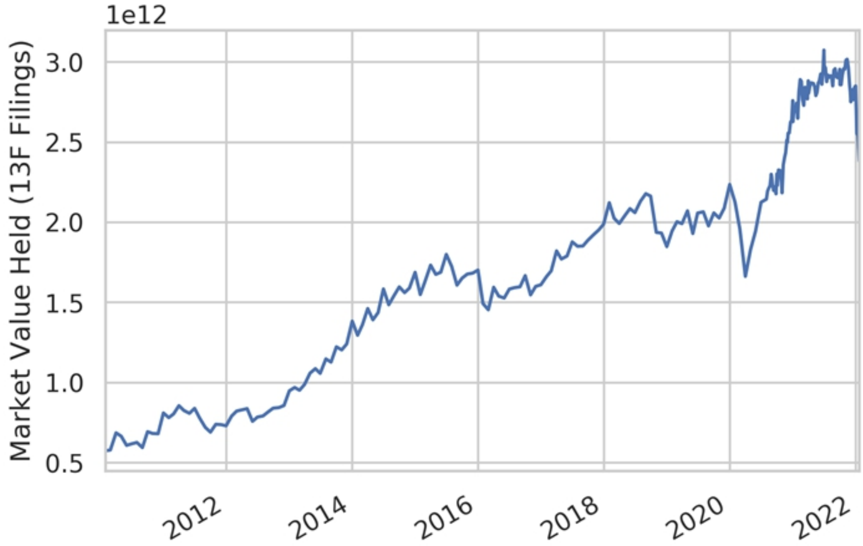
Introduction

At the most basic level, crowding is simply too many of the same type of market participants holding the same or similar positions. It can be a position in a particular stock, a derivative position of that stock, or even positions that load similarly on the same types of factors as that stock. An example of the last point is if many market participants are loading heavily on a momentum factor, they may not hold all of the exact same positions but the overlap is nontrivial. Crowding can occur on the long or short sides of names. Both have issues and the shorts can be particularly painful at times.

There are various reasons crowding may occur. Investors may be looking at similar types of alpha factors such as value or momentum, pursuing strategies based on common news stories, or even just using similar data sets to build strategies. Similar portfolio optimization approaches and trading frequencies can also contribute.

Leverage deserves special mention here. Different investors have very different tolerances and approaches to leverage. The ones that use the most can have outsized impacts on positions, liquidity, and timing of trades during market dislocations. As leverage levels increase across market participants, they are more susceptible to de-risking at similar moments or simultaneously due to forced liquidations. Figure 1 shows 13F reported hedge fund positions over time. Of course, this is US centric, long only, and misses certain types of positions, but it gives an idea of what is going on in the space. The overall level does not monotonically increase--the various peaks and troughs are important. But if the overall level does go up over time, it implies that crowding may be becoming even more important than it has been in the past. This necessitates a better understanding of the issues and exploring potential solutions.

Figure 1: Hedge Fund Long Positions



Source: FactSet, UBS

Crowding Life Cycle

Crowding Life Cycle

One can imagine the life cycle of crowding in a particular stock. Initially, there are a handful of owners for various reasons. The stock becomes more popular due to certain characteristics, stories, or other catalysts and more market participants enter into positions. This flow causes better performance, which in turn attracts more flow. Which in turn attracts more stories and awareness. If this continues, the number of owners and the aggregate position becomes large. If it is large compared to the typical level of liquidity for the stock, this is a very real risk of this crowding leading to a potentially bad situation if there is a negative catalyst for the market in general or something more specific to this company. If a significant de-risking does occur, this weeds out both the number of holders as well as the aggregate position and the stock is back to uncrowded status (along with a presumably reduced stock price).

Why is it Important?

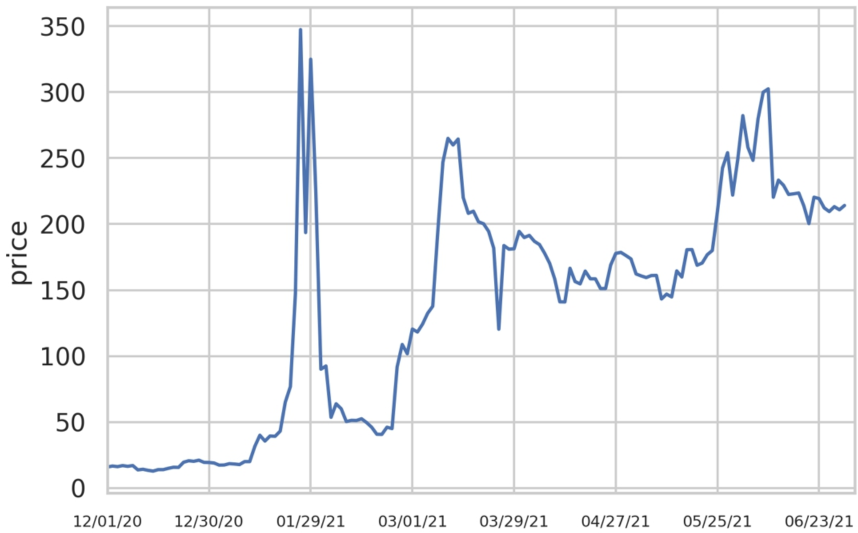
Crowding shouldn't be thought of as having a particularly stable alpha associated with it. Crowded positions and strategies can outperform for significant stretches of time if the level of overlap keeps increasing and flows continue in the space. They can also drift along up or down without catalysts or events that would trigger flows in any direction. However, if there is a time when many market participants try to exit at the same time, things turn ugly quickly. During market dislocations or periods of heavy de-risking (either reducing leverage levels or exiting the position entirely), many people are trading in the same direction with sometimes limited liquidity. This can result in large price impacts that are directly attributable to crowding.

Crowding at the Security Level

Crowding on the Short Side

The path of retail favorite GameStop during 2021 is fascinating. Long a neglected and range bound stock, it went from 19 at the beginning of the year to a peak of 483 in late January. The increase in volume and volatility was huge. A 25x move during a month is obviously not driven by earnings growth or potential--this is a classic case of investors herding into a particular name. Few things last, and that valuation definitely did not. It is still well above its starting point as interest and the investor base has changed, so crowding effects continue to be present.

Figure 2: Retail Short Squeeze Example- GME



Source: FactSet

Crowding at the Strategy Level

Strategy Level Crowding

A broader based example of crowding was the quant meltdown in August 2007. This is a classic example of many managers having overlapping strategies and types of approaches. It was a broad based factor sell-off that likely had its catalyst in the sudden liquidation of one manager's book. The resulting price impacts likely triggered stop losses and risk constraints in other managers. The contagion across many quantitative managers was very sudden and brutal, and caused large losses for many managers. One academic paper (Lo 2007) modeled the 3 day prices moves as a 12 standard deviation event—before leverage! Prices stabilized and rebounded significantly when the liquidations ended and some participants were able to put fresh capital to use in buying names at distressed prices. Much of this went unnoticed by other market participants until after the fact because the crowding damage was mostly constrained to quantitative strategies. This strongly implies a liquidity/liquidation type of event. If the original strategy that was liquidated was orthogonal to other quants, and thus no crowding, there wouldn't have been contagion.

Crowding at the Market Level

Liquidations or Delevering

An even broader crowding example is when the market as a whole experiences a discontinuity or time of stress. The first quarter of 2020 is the most recent example as participants realized Covid wasn't quickly going away. There was a large and very fast sell off as people reduced risk and delevered, some of this was voluntary and some was involuntary and triggered by prime brokers. The rebound was relatively quick, but again, this was a broad based performance where crowding played a role as investors exited and then reentered similar positions.

Figure 3: US Market Performance

Source: FactSet

Implementation of Crowding

It's possible to try to extract a positive alpha from crowding by modeling flow and inflection points. This requires some sort of regime model and this is usually difficult to do well. Previous data points are often limited and assumptions almost invariably have large error bars. This time is never exactly like the last time and so forth.

Crowding Implementation as a Screen

Alternatively, it may be more effective to implement crowding as a risk control metric. Crowding awareness in certain names, sectors, or factor loadings may mitigate poor performance during those periods of market stress. Practically, this could take the form of a list of names to avoid on the long and short sides of a portfolio or could be implemented in terms of a factor with constrained exposure at the portfolio level. Investors can simply not traffic in potentially problematic stocks or limit their exposure to these cohorts and search for alpha with better risk/reward characteristics. And that's important to emphasize- traditional risk models and factors do not model crowding. It appears in the residuals and isn't understood or even recognized. We can do better than this.

Data

UBS has constructed a comprehensive crowding factor based on a variety of data sources. As seen in Figure 4, we have combined inputs from prime broker holdings data, FactSet 13F ownership data, Equilend stock loan data, and internal proprietary UBS data. As such, this encompasses inputs from a wide variety of sources and describes different market participant cohorts.

Multiple Data Sets Utilized

We have utilized monthly data to build a medium to long-term crowding factor that could fit in with non high-frequency quants and fundamental managers. We also clean the data to remove M&A positions which can bias position counts on the long or short sides. Arbitrage activity in stock swap deals can also contribute significant effects in various stock loan metrics.

Figure 4: Complementary Data Sources

Data Sources	Side
Prime brokerage position data	long/short
13F regulatory filings	long
Stock loan data	short
UBS internal data	short

Source: DataLend, FactSet, IHS Markit, UBS

The inputs used are long and short positions, long holdings data broken down into fund types and positions, and various stock loan metrics at the security level. The latter piece is both vendor data as well as UBS data. We are only describing the process at a high level with no visibility on the specific inputs.

Proprietary Crowding Factor

The combination of these will effectively describe crowding on both the long and short sides at a factor level or at the individual stock level. This approach is a more direct and stable path than attempting to define crowding through incomplete data sets or secondary approaches such as price movements, factor spreads, or various correlations.

Global coverage is very good with visibility fairly deep into all markets.

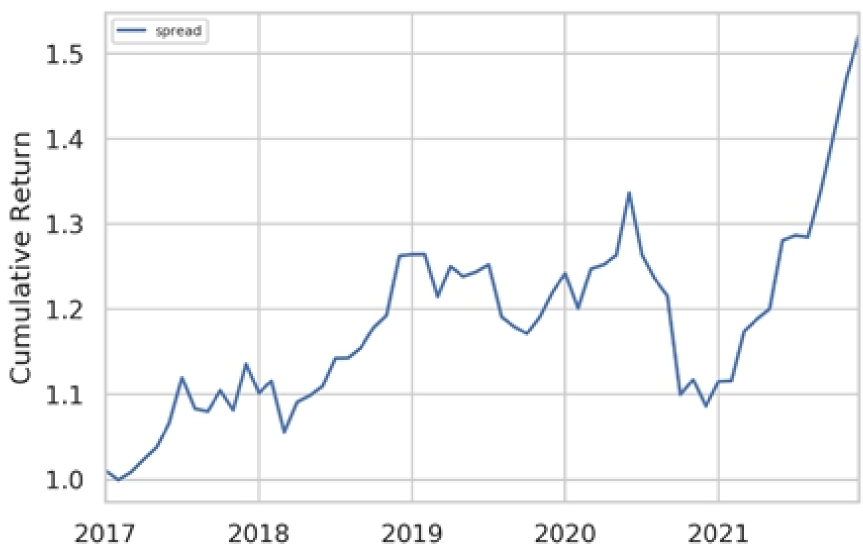
Results

Once we have a crowding factor defined, we can generate security level loadings, construct stock screens of names that could be vulnerable to crowding price effects, and we can also calculate a factor return to examine a time series impact of crowding for a given universe. We've chosen to initially focus on the MSCI World index to show broad based effects.

Crowding and Residuals

Figure 5 shows the long/short factor return over the last five years. While we don't expect a steady alpha from this sort of exercise, we nonetheless see outperformance over much of the period. More importantly, we see periods where this factor can have large returns- both positive and negative. This is what we were after and can explain residual returns during periods of market stress, deleveraging, or extraordinary events like squeezes.

Figure 5: Long/Short Crowding Factor Performance



Source: DataLend, FactSet, IHS Markit, UBS

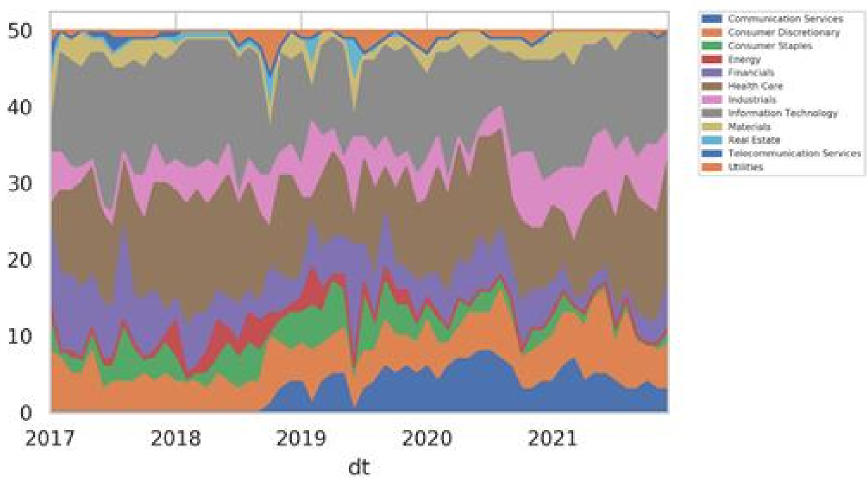
Sector Loadings

It is now worth exploring the sector loadings of crowding. We have not constrained anything, so a priori we would expect crowding to perhaps be more significant in some sectors and to possibly move around over time as investors change focus for a variety of reasons (sentiment, momentum, etc.). Figure 6 shows the sector distribution of the top 50 long crowded names.

Sector Loadings

Over the last few years, health care and technology have accounted for the large majority of long crowding. Sectors such as energy, financials, or real estate barely show up. The distribution across sectors seems surprisingly static. Although there are variations over this period, any one sector hasn't dominated everything else and the various fractions don't change dramatically. Tech draws much of the interest, but it periodically contracts a bit when other names garner more attention.

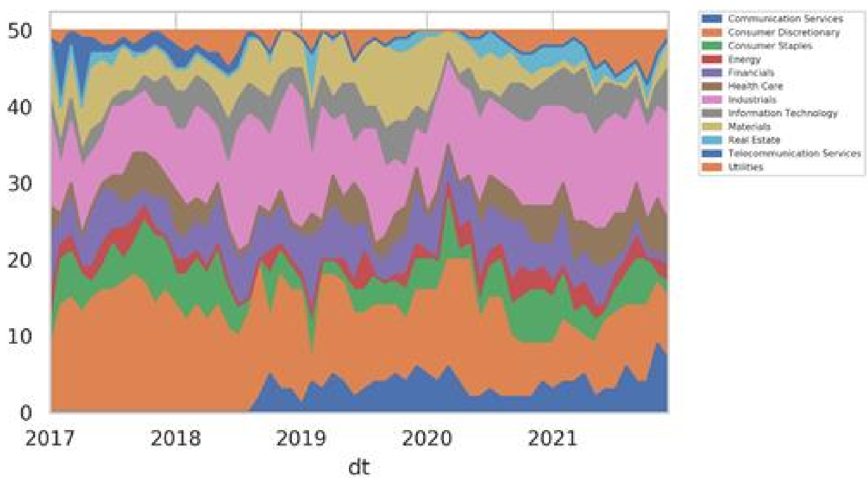
Figure 6: Long Crowding Loading in Sectors



Source: DataLend, FactSet, IHS Markit, UBS

Figure 7 shows the top 50 short crowding names distributed over sectors through time. It's a different flavor than the long side with a much more even distribution. Industrials have the largest share here currently, but they do not dominate by any means.

Figure 7: Short Crowding in Sectors



Source: DataLend, FactSet, IHS Markit, UBS

Interactions with Quant Factors

Another area worthy of thought is how crowding interacts with typical quant factors. One could imagine that there could be some overlap in return streams and certain factors would provide a better place for crowding effects to live. We've examined a handful of the most common factors and performed independent double sorts on the crowding and the individual quant factor to attempt to better understand the interactions. Figure 8 shows the average monthly returns for the period of 2017-2021. Crowding quintiles are horizontal with increasing crowding going to the right. The factor quintiles are vertical with increasing loadings going down.

Interactions with Quant Factors

Across all quant factors, the highest quintile of crowding typically produces the highest average returns. This follows from the positive alpha seen in the factor return. However, we can still extract more information within the factors. Some of the highlights are:

- Momentum: The lowest momentum quintile row shows higher returns. This is interesting and different than momentum alone. The beaten up names do better now. But within the most crowded column, momentum doesn't really function as a good differentiator.
- Volatility: No surprise here. High vol and crowding live in the same space.
- Liquidity: The least liquid row generally shows the lowest returns. Within high crowding, the least liquid names do the worst.
- Estimated Earnings Growth: Seems similar to vol and the opposite of value with the highest crowded column.

Figure 8: Crowding and Factor 2x2 Return Sorts

		Crowding Quintile (low to high)				
	Factor Quintile	1	2	3	4	5
Momentum	1 low	0.67%	0.90%	0.99%	1.28%	1.60%
	2	0.69%	0.59%	0.70%	0.76%	1.26%
	3	0.91%	0.69%	0.72%	1.01%	1.11%
	4	1.05%	0.86%	0.93%	0.96%	1.29%
	5 high	0.55%	0.80%	0.59%	0.96%	1.14%
Volatility	1 low	0.97%	0.46%	0.58%	0.93%	0.91%
	2	1.15%	0.85%	0.64%	0.81%	1.00%
	3	0.70%	0.83%	0.84%	0.90%	1.19%
	4	0.39%	0.65%	0.80%	1.18%	1.35%
	5 high	0.70%	1.06%	1.14%	1.12%	1.86%
Liquidity	1 low	0.93%	0.56%	0.52%	0.88%	0.90%
	2	0.45%	0.58%	0.75%	0.81%	1.16%
	3	0.29%	0.71%	0.90%	1.13%	1.24%
	4	0.87%	0.80%	0.74%	0.86%	1.28%
	5 high	1.29%	1.39%	1.09%	1.21%	1.37%
Value	1 low	1.01%	0.67%	0.84%	1.35%	1.48%
	2	0.66%	1.01%	1.02%	0.99%	1.08%
	3	0.64%	0.62%	0.79%	1.18%	1.28%
	4	0.44%	0.55%	0.56%	0.70%	1.17%
	5 high	0.91%	0.95%	0.75%	0.76%	1.20%
Quality	1 low	0.55%	0.59%	0.87%	1.28%	1.13%
	2	0.83%	0.41%	0.79%	0.97%	1.20%
	3	0.92%	1.03%	0.71%	0.56%	1.12%
	4	0.70%	0.85%	0.65%	1.12%	1.25%
	5 high	0.94%	1.03%	0.91%	1.03%	1.40%
Est Earn Growth	1 low	0.88%	0.61%	0.48%	0.62%	0.86%
	2	0.84%	0.72%	0.70%	0.88%	1.09%
	3	0.79%	1.07%	0.79%	1.11%	1.18%
	4	0.61%	0.66%	1.17%	1.02%	1.49%
	5 high	0.67%	0.80%	0.88%	1.29%	1.38%

Source: DataLend, FactSet, IHS Markit, UBS

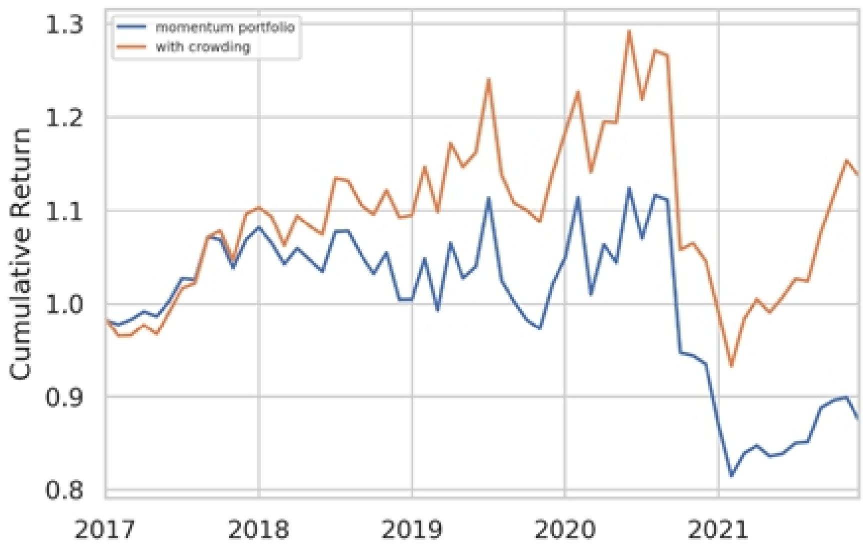
Some of these interactions are worth further examination, especially via a time series lens. A portfolio can be tilted with crowding to take advantage of richer alpha areas.

Crowding and Momentum

The graph below compares a typical momentum strategy to one that is conditioned on crowding as well. The former simply goes long and short the top and bottom quintiles. The latter does that but also cuts on the top and bottom two quintiles of crowding. So the resulting long side is high momentum with high crowding while the short side is the mirror image.

The spread between the returns gradually widens over time and shows a significant increase in alpha. The drawdown in the latter half of 2020 is especially interesting. The combined momentum and crowding portfolio does worse as investors quickly exit these names. After the liquidations, it bounces back much more dramatically however with a very significant performance differential.

Figure 9: Crowding and Momentum Interaction



Source: DataLend, FactSet, IHS Markit, UBS

Crowding and Growth

Figure 10 compares a strategy based on estimated EPS growth to one that is conditioned on crowding as well. It's the same approach as above with momentum, so the resulting long side is high growth with high crowding while the short side is the mirror image.

This time the spread between the portfolio seems to monotonically widen as the crowding interaction slowly and steadily adds alpha.

Figure 10: Crowding and Growth Interaction

Source: DataLend, FactSet, IHS Markit, UBS

Stock Screens

A particularly effective use of a crowding metric for fundamental managers is to identify the most crowded names in a certain sector or region. These can then be constrained during portfolio construction and help mitigate the risk of adverse price movements. Coupling this with information about potential catalysts in a name becomes very interesting and potentially very valuable.

Stock Screens

UBS can generate screen of the most crowded names within a sector or region. These names are potentially more difficult to unwind with significant price impact if they surprise on the downside. Below is a link to the recent names that are most crowded in different geographic regions:

https://neo.ubs.com/shared/d2Ogl8DPrPYCuJ

Conclusion

In our first research report on positioning, we define crowding, emphasize its importance, and construct a comprehensive crowding factor based on a variety of relevant data sets. Probably the most effective implementation is as a risk control metric. We explore a long/short factor return, which sectors are most represented, and then how it interacts with some typical quant factors.

UBS can provide a composite crowding score at the security level for clients. We can also help with bespoke research requests within this genre.

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.

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Buy	FSR is > 6% above the MRA.	55%	32%
Neutral	FSR is between -6% and 6% of the MRA.	35%	29%
Sell	FSR is > 6% below the MRA.	10%	26%
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 2021.
1:Percentage of companies under coverage globally within the 12-month rating category.
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