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AN AUSSIE SENSE OF STYLE (PART ONE)

Olivier d'Assier

Introduction

It is common wisdom in the industry that not all alpha factors make good risk factors. There is, however, plenty of evidence in the literature that some of the style risk factors commonly found in fundamental multi-factor models accurately capture factor premia that have outperformed broad capitalisation-weighted benchmarks over long periods of time. Some of these factors include growth, momentum, quality/profitability, value, and the low volatility anomaly.

In response to investors' demand for these factor premia, asset managers have released families of Smart Beta products aimed at capturing one or more of them. Axioma has written at length about these attempts and in this note we take a closer look at the compromises involved in constructing a viable smart beta product. The key portfolio construction issue we are focusing on here is how to balance our desire for target-factor purity with our goal of achieving a high exposure to the target factor. Can we have both? The poster child for this goal is the utopian ideal of a factor-mimicking portfolio (FMP). These FMPs are long-short dollar neutral portfolio constructed over the risk model's estimation universe and used by model builders to represent pure factor returns. These portfolios are often not investible and incur a lot of turnover across periods. They are

therefore not suitable for a long-only manager wishing to construct a low-cost smart beta product.

The first portfolio construction strategy ('LO-FMP') we will use will simply tries to 'replicate' a reconstructed FMP portfolio subject to a long-only constraint by using the S&P/ASX 200 as investment universe. We want to see how close to the long-short FMP we can get and what is the implicit cost of the long-only constraint, both in terms of target factor exposure obtained as well as the return delivered by this optimised portfolio versus the FMP return we seek to capture. We fully accept that under this strategy, unlike the attribution of a pure FMP, the total return of the portfolio will come from multiple sources (i.e. other styles, industry exposures, and specific risk as we are not imposing any constraints on the optimisation). This strategy is labelled 'LO-FMP' in the tables below.

The next three strategies are long-only and fully invested, with the objective of maximising active exposure to the target style factor subject to a 3% tracking error target relative to the S&P/ASX200 index, which doubles as our investable universe. Portfolios are rebalanced monthly, at month-end, from December 30th 2016 through to October 31st 2017. There are no constraints other than those mentioned below to differentiate between our three strategies. With no liquidity or turnover constraints, these portfolios are also not always investable, but in this way, we avoid the issues of path dependency.

The three versions of our ‘Active Style’ portfolios will differ along these sets of constraints:

- The ‘Unconstrained’ variant, as the name suggests, does not constrain non-target styles or industries, thereby allowing the optimiser to maximise the exposure to the target style factor by going long or short other styles or industries as it sees fit, subject to the Active Risk constraint.
- The ‘No Style’ variant constrains active exposure to all non-target style factors, but does not constrain industry exposures.
- The ‘No Style / No Industry’ variant constrains active exposures to both non-target styles as well as industries.

Additionally, we constructed two variants of a minimum variance strategy to test whether the low volatility anomaly has been present in Australia this year. Note that the MinVar portfolios only include the ‘No Style’ and ‘Unconstrained’ variants, and does not target a specific factor exposure; it just seeks to minimise overall variance.

We performed a daily YTD factor-based performance attribution using Axioma’s Portfolio Analytics on each variant of the five style factor portfolios, go through an analysis of the impact of constraints on their ability to capture as much of the target style factor premium as possible and discuss the costs implicit with their respective set of constraints.

As for two of the variants each time, the ‘No Style’ and the ‘No Style / No Ind’ variants, because we are constraining the factor block of the model so much, the strategies end up with the majority of the risk budget showing up as specific risk/return. Although not desirable in a factor portfolio, this is inevitable by construction and we draw the reader’s attention to the white paper “Turning Negative into Nothing: An explanation of adjusted factor-based performance attribution” by our research team for further insights into why that is and what can be done about it.

Each table and chart will include the following strategies as well as the target factor return for each (note that the budget constraint means ‘fully invested’):

Strategy Name	Objective Function	Constraints	Inv. Universe
Target Factor	N/A	N/A	AXAU4-MH
LO-FMP	Min TE to FMP	Budget	ASX 200
Unconstrained	Max Exp. To Target Factor	3% TE, Budget	ASX 200
No Style	Max Exp. To Target Factor	3% TE, Budget, Style	ASX 200
No Style/No Ind	Max Exp. To Target Factor	3% TE, Budget, Style, Industry	ASX 200

Note that the ‘LO-FMP’ strategy does not have an explicit active risk constraint, only an objective to minimise the tracking error between itself and the L/S FMP portfolio. The active risk reported in the performance attribution tables is the active risk of the optimal solution to the S&P/ASX 200 for comparability purposes with the other strategies. All figures are sourced from Axioma unless specifically stated.

Momentum

By construction, each of the four strategies has an additional constraint from the previous one targeting a specific segment of the factor covariance matrix used in the optimisation. It is therefore not surprising to see that as the number of systematic constraints increases, the contribution to active risk of the style factors decreases, and in turn, the contribution from stock specific risk increases. In the case of our momentum strategy, style risk was 76% of the active risk budget in the ‘LO-FMP’ strategy, 54% in the ‘Unconstrained’ strategy, 36% in the ‘No Style’ strategy, and just 23% in the ‘No Style / No Ind’ strategy. Conversely, specific risk as a percentage of active risk increased from 9%, to 36%, to 51%, and to 77% respectively (see Figure 1).

In terms of target factor exposure, the ‘LO-FMP’ strategy failed to get any exposure to the target style factor with an average exposure during the period of -0.09, the lowest of any factor strategy. The unconstrained variant achieved the highest exposure (0.59) to momentum by being able to go short dividend yield and size, and go long value. By contrast, the ‘No Style’ variant took larger industry factor bets but was still only able to reach an exposure to momentum of 0.50. The ‘No Style / No Ind’ variant could only achieve an exposure of 0.40, being denied the opportunity to use either styles or industry bets. Overall, it would seem that getting exposure to momentum is particularly impacted by the long-only constraint since the ‘Unconstrained’ variant was only able to get an exposure of 0.59 to the momentum factor – the lowest of all the factor strategies in this paper for this particular variant.

Figure 2 contrasts the sector allocations between the only three variants allowed to use sector bets to gain momentum exposure. The ‘LO-FMP’ strategy goes (very) long defensive sectors (real estate mostly), and (very) short cyclical ones (financials mostly). As for the other two strategies, despite a positive correlation between their active sector weights of 0.57, there were strong disagreements in a few cases (financials, materials, consumer staples) but the overall size of their active allocation remained well within the +/-5% range. Like the ‘LO-FMP’ strategy, the ‘No Style’ strategy was long defensive sectors and short cyclical ones. In contrast, the ‘Unconstrained’ strategy was the reverse.

The momentum risk premium performed well this year, especially in Q3, and all four variants outperformed the core benchmark with most of the outperformance being driven by their momentum exposure (see Figure 3). The unconstrained variant, having the highest exposure to momentum, outperformed the most by far. The ‘LO-FMP’ strategy, not having any momentum exposure, saw most of its outperformance being driven by its small cap bias (size exp. = -0.95)

Figure 5 shows the correlation of daily returns of all four variants with each other as well as with the momentum factor return and the S&P/ASX 200. All variants have returns that are quite similar to each other, the momentum factor, and (to a lesser degree) the benchmark, with the unconstrained variant achieving the most positive correlation across the board. The momentum strategies were the most positively correlated to each other of all five strategies we built for this paper.

In summary, when it comes to capturing the momentum risk premium, an unconstrained strategy seems best. The ‘LO-FMP’ strategy yielded returns that were much more erratic than the other strategies. Overall, constraints hurt performance and delivered returns that were less similar to the pure factor return than the unconstrained variant and with lower target-factor exposure.

Figure 1. Momentum – Percent of Active Risk

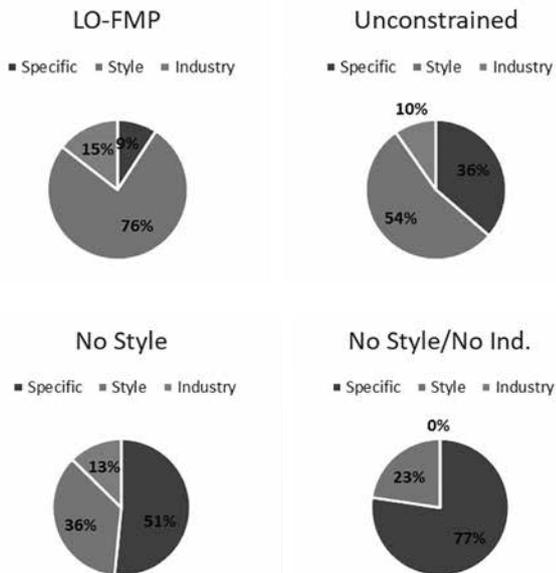


Figure 2. Momentum – Sector Allocation

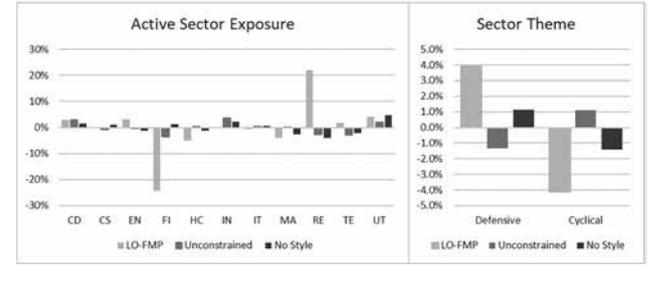


Figure 3. Momentum – Cumulative performance

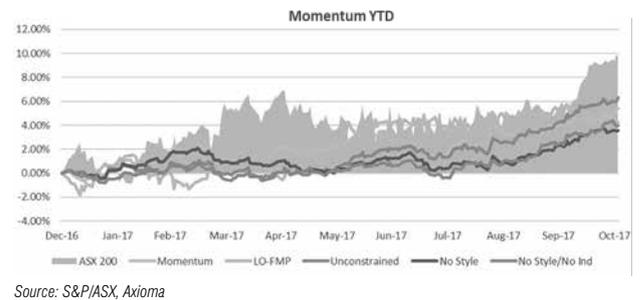


Figure 4. Momentum – Performance Attribution

Source of Return	LO-FMP		Unconstrained		No Style		No Style/No Ind.					
	Risk Exposure	Return	Risk Exposure	Return	Risk Exposure	Return	Risk Exposure	Return				
Portfolio	5.02%	14.02%	10.68%	16.07%	10.52%	13.36%	10.30%	13.77%				
Benchmark	9.79%	9.78%	9.79%	9.78%	9.79%	9.78%	9.79%	9.78%				
Active	7.25%	4.24%	2.91%	6.29%	2.62%	3.58%	2.57%	3.99%				
Specific Return	2.51%	1.92%	1.72%	1.45%	2.02%	-0.10%	2.40%	1.75%				
Factor Contribution	7.38%	2.32%	2.21%	4.84%	1.80%	3.68%	1.29%	2.23%				
Style	7.25%	5.60%	2.09%	4.41%	1.68%	2.83%	1.30%	2.20%				
Dividend Yield	0.53%	-0.24	0.74%	0.60%	-0.25	0.59%	0.04%	0.00	0.04%	0.03%	-0.01	0.06%
EM Sensitivity	0.54%	0.19	-0.20%	0.38%	0.12	-0.15%	0.04%	0.01	-0.01%	0.06%	0.01	-0.04%
Exchange Rate Sensitivity	0.18%	-0.05	0.03%	0.32%	0.09	-0.30%	0.02%	0.00	-0.04%	0.04%	-0.01	0.01%
Growth	0.71%	0.28	1.11%	0.12%	0.02	0.15%	0.08%	0.01	-0.02%	0.03%	0.00	0.03%
Leverage	0.42%	-0.20	0.26%	0.39%	-0.19	0.25%	0.02%	0.00	0.00%	0.02%	0.00	0.00%
Liquidity	3.57%	-1.15	0.44%	0.24%	0.08	-0.07%	0.03%	0.01	-0.03%	0.03%	0.00	-0.03%
Market Sensitivity	4.61%	-1.24	-0.19%	0.21%	0.05	0.01%	0.06%	0.00	-0.02%	0.06%	-0.01	0.01%
Medium-Term Momentum	0.38%	-0.09	-0.47%	2.01%	0.59	3.44%	1.68%	0.50	2.80%	1.31%	0.40	2.21%
Profitability	0.21%	0.07	0.38%	0.07%	0.01	0.04%	0.07%	0.01	0.12%	0.04%	0.01	-0.01%
Size	4.59%	-0.95	4.19%	0.64%	-0.13	0.59%	0.02%	0.00	0.02%	0.01%	0.00	0.01%
Value	0.34%	0.12	-0.22%	0.13%	-0.03	0.20%	0.02%	0.00	0.00%	0.03%	0.00	-0.02%
Volatility	1.08%	0.18	-0.48%	0.79%	0.13	-0.34%	0.05%	0.01	-0.04%	0.05%	0.00	-0.03%
Sectors	3.16%	-3.28%	0.89%	0.42%	1.00%	0.83%	0.05%	0.00%	0.02%			

Figure 5. Momentum – Correlation matrix of daily returns

	Momentum	LO-FMP	Unconstrained	No Style	No Style/No Ind
Momentum					
LO-FMP	0.77				
Unconstrained	0.88	0.74			
No Style	0.74	0.36	0.82		
No Style/No Ind	0.84	0.57	0.94	0.89	
ASX 200	0.73	0.45	0.66	0.65	0.66

Figure 6. Value – Percent of Active Risk

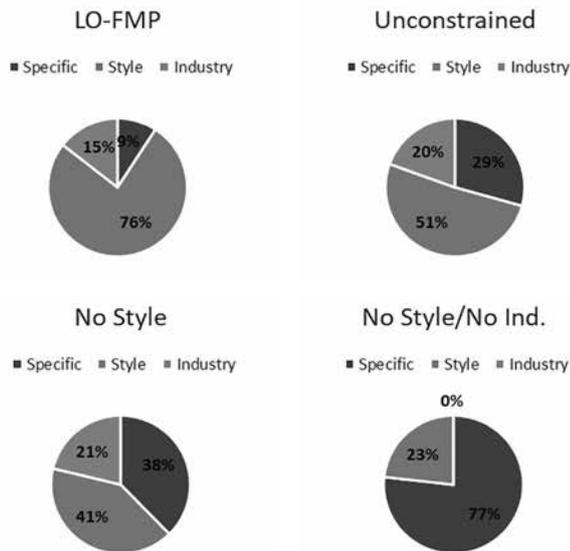


Figure 7. Value – Sector Allocation

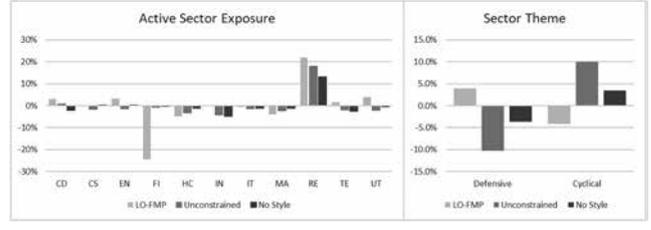


Figure 8. Value – Cumulative performance

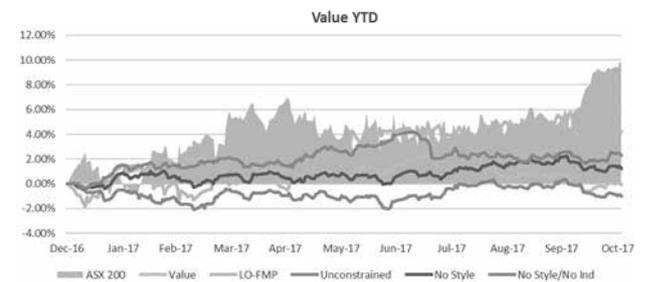


Figure 9. Value – Performance Attribution

Source of Return	LO-FMP		Unconstrained		No Style		No Style/No Ind.					
	Risk Exposure	Return	Risk Exposure	Return	Risk Exposure	Return	Risk Exposure	Return				
Portfolio	5.01%	14.03%	10.17%	8.74%	10.25%	11.03%	10.16%	12.06%				
Benchmark	9.79%	9.78%	9.79%	9.78%	9.79%	9.78%	9.79%	9.78%				
Active	7.25%	4.25%	2.67%	-1.04%	2.41%	1.25%	2.80%	2.28%				
Specific Return	2.52%	1.94%	1.94%	0.43%	1.85%	1.17%	2.57%	2.74%				
Factor Contribution	7.38%	2.31%	2.30%	-1.47%	1.99%	0.08%	1.42%	-0.46%				
Style	7.25%	5.57%	2.56%	-0.12%	1.93%	-0.42%	1.41%	-0.47%				
Dividend Yield	0.53%	-0.24	0.74%	0.57%	0.25	-0.58%	0.06%	0.01	0.06%	0.07%	0.00	0.04%
EM Sensitivity	0.54%	0.19	-0.20%	0.37%	0.15	-0.26%	0.03%	0.00	-0.01%	0.05%	0.00	-0.01%
Exchange Rate Sensitivity	0.18%	-0.05	0.03%	0.07%	0.01	-0.13%	0.03%	0.00	-0.03%	0.04%	0.00	-0.10%
Growth	0.71%	0.28	1.11%	0.34%	0.13	0.37%	0.07%	0.00	-0.13%	0.10%	-0.01	-0.22%
Leverage	0.42%	-0.20	0.26%	0.46%	-0.23	0.35%	0.02%	0.00	0.02%	0.02%	0.00	0.00%
Liquidity	3.57%	-1.15	0.44%	0.29%	0.10	-0.03%	0.03%	0.00	-0.03%	0.04%	0.00	-0.01%
Market Sensitivity	4.61%	-1.24	-0.19%	0.07%	-0.01	0.00%	0.03%	0.00	0.01%	0.04%	0.00	0.03%
Medium-Term Momentum	0.40%	-0.09	-0.50%	0.19%	-0.05	-0.26%	0.06%	0.00	0.01%	0.08%	0.00	0.01%
Profitability	0.21%	0.07	0.38%	0.13%	-0.04	-0.23%	0.06%	0.00	-0.10%	0.05%	0.00	-0.09%
Size	4.59%	-0.95	4.19%	1.02%	-0.21	0.93%	0.02%	0.00	0.00%	0.03%	0.00	0.03%
Value	0.36%	0.13	-0.22%	2.40%	0.86	-0.20%	1.92%	0.68	-0.14%	1.40%	0.49	-0.10%
Volatility	1.08%	0.18	-0.48%	0.15%	0.02	-0.08%	0.04%	0.00	-0.06%	0.05%	0.00	-0.04%
Sectors	3.16%	-3.26%	1.58%	-1.37%	1.39%	0.48%	0.05%	-0.01%				

Figure 10. Value – Correlation matrix of daily returns

	Value	LO-FMP	Unconstrained	No Style	No Style/No Ind
Value					
LO-FMP	-0.13				
Unconstrained	-0.15	0.41			
No Style	-0.11	0.72	0.67		
No Style/No Ind	0.33	0.66	-0.09	0.37	
ASX 200	-0.22	0.45	0.17	0.49	0.35

Value

Figure 6 shows a similar story to the momentum portfolios mentioned above, namely constraints pushed a lot of the risk budget into stock specific risk. style risk went from being 76% of the risk budget in the 'LO-FMP' strategy, to 51% in the 'Unconstrained', to 41% in the 'No Style', dropping to just 23% in the 'No Style / No Ind' one. All in favour of specific risk.

As with momentum, constraints also hampered the optimiser's ability to gain exposure to the value factor, but not by as much. The performance attribution table in Figure 9 shows the 'LO-FMP' strategy was again unable to gain a significant exposure to the target factor, reaching only 0.13. The 'Unconstrained' strategy had an exposure of 0.86 (versus 0.59 in the momentum strategy), the 'No Style' strategy 0.68 (versus 0.50), and the 'No Style / No Ind' 0.49 (versus 0.40).

Interestingly, value had a mixed year in Australia in 2017 and, after a positive start, had a bad Q3 and ended October in negative territory YTD. The contribution to return from each of the variant's value exposures accurately reflects that fact, but the strong positive contribution to return from stock specific sources yielded a positive portfolio return for the two constrained strategies giving them a return footprint that does not match that of the risk premium targeted. The 'LO-FMP' strategy also had a positive cumulative return YTD, again mostly due to its (negative) size and (positive) growth style tilts.

Unlike momentum, there was broad agreement between the 'No Style' and 'Unconstrained' strategies when it comes to sector allocation, with the exception of consumer discretionary, consumer staples, and energy. Figure 7 shows both strategies with a very large over-weight in real estate of 13.2% and 17.9% respectively, and an

under-weight in industrials. Overall, both were under-weight defensive sectors and over-weight cyclical ones (thanks in large part to their active real estate exposure). The 'LO-FMP' strategy is again the contrarian in the group with the same outsized sector bets as in its momentum counterpart.

Figure 10 highlights how uncorrelated these strategies are with the returns of a long-short factor mimicking portfolio (i.e. value factor return). In fact, they are more positively correlated with the S&P/ASX 200 than the value factor return, with the exception of the 'No Style / No Ind' variant which has a 0.33 correlation with value. Interestingly with the exception of the 'Unconstrained' - 'No Style / No Ind' pair, the returns of these strategies are all positively correlated with each other (Avg. 0.57).

In summary, harvesting value with constraints has a cost in terms of the target factor exposure you can get, but not as high as for momentum. We also see that the increased level of 'noise' in the portfolio (i.e. random returns) from rising specific returns for the more constrained strategies resulted in YTD active returns that bear little resemblance to the value factor return observed in the market. Not constraining industries drove some pretty large directional bets (in particular for real estate) which the manager may not be comfortable with. Perhaps not constraining other styles but imposing a loose constraint (e.g. max 10% active weight) on industries might be a good compromise. **FS**

Part two of this paper will continue to look at the the three remaining factors of growth, profitability and minimum variance and their impact on different portfolio construction strategies.