Quantitative Research Conference 2017

Simple approaches to reducing turnover

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Introduction

- Reducing turnover reduces trading costs and increases the capacity of a strategy.
- But how far can you suppress turnover before you lose all the alpha or change the character of your investing strategy?

- We compare three simple approaches to reducing turnover:
  - naïve rules-of-thumb
  - "no trade zone" approach which requires a simple, linear optimisation
  - Full optimisation with a risk model

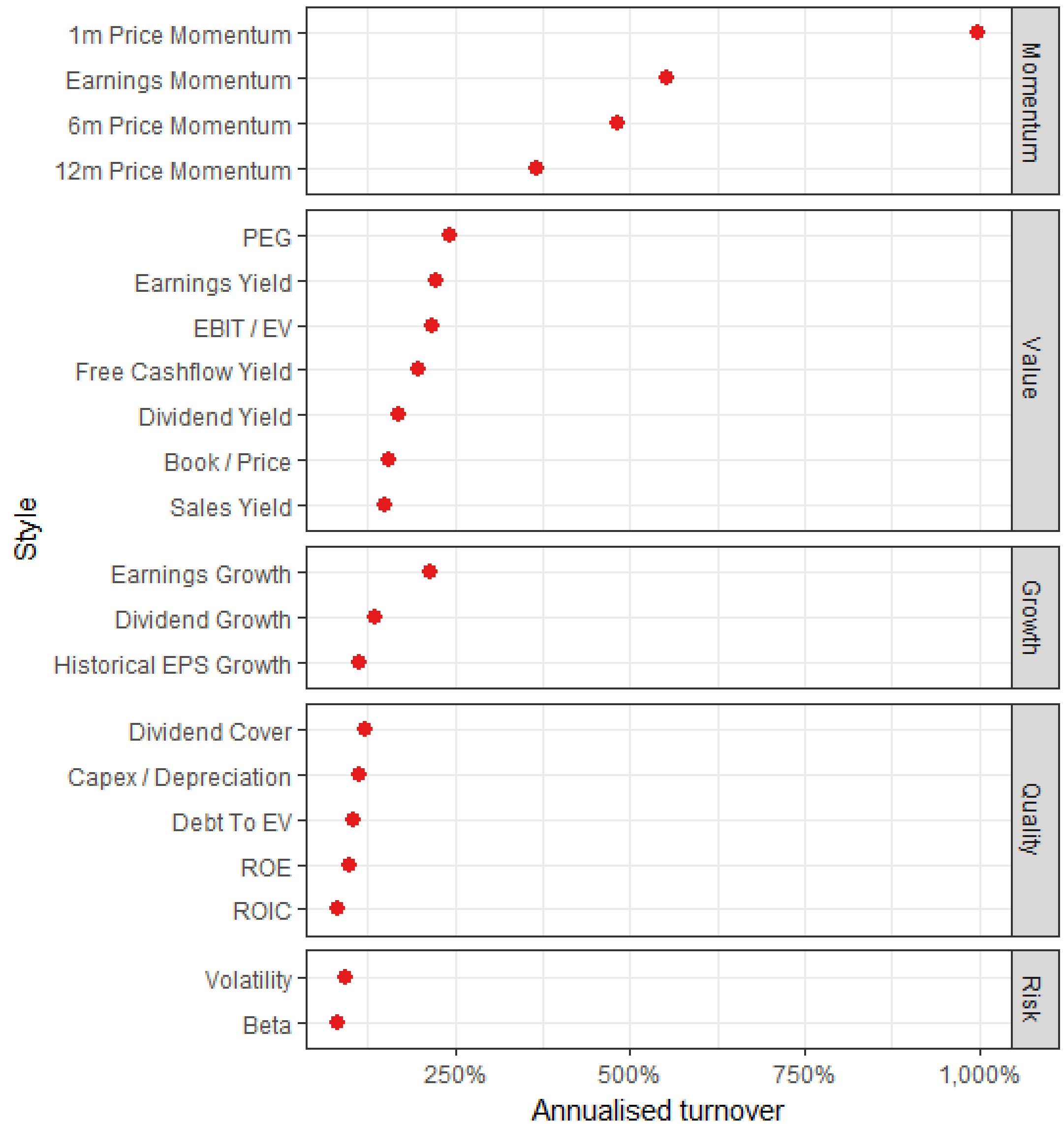
- We find that heuristic approaches to reducing turnover work well, but you are still better off with an optimiser.

Data

- We start with simple factor portfolios. We take a very simple definition:
  - Universe is the MSCI Europe index
  - Top quintile of each factor
  - Market cap weighted
  - Not sector neutral
  - Rebalanced monthly
- We use 21 different factors, representing the value, growth, momentum, quality and risk families of style investing.
- All of the analysis is over the 20-year period from 31-Jan-1997 to 31-Jan-2017.

What are we up against?

- Without attempting to control the turnover, turnover on some styles is very high.
- Unsurprisingly, the momentum styles have very high turnover, with 1-month price momentum seeing annualised one-way turnover of almost 1000% or c. 80% per month.
- At the other extreme, the beta style has annualised turnover of around 80% or c. 7% per month.



Source: UBS Quants

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How do we measure success? (1)

Does our low turnover portfolio keep the "essence" of the original factor portfolio? How do we know?

Two viewpoints:

- We care about returns not platonic ideals
  - Tracking error should be our metric of success.
- … but there is Rumsfeld risk
  - If your portfolio doesn't hold the "real" value stocks, but just stocks that co-move with them, then you are leaving yourself defenceless against risks which make your portfolio's TE against the value portfolio jump dramatically.
  - One way to measure this is the weighted average factor score of the stocks in the portfolio. A higher weighted average indicates a more "true" portfolio.

Think about BOTH the tracking error AND the weighted average factor score.

How do we measure success? (2)

- Ultimately, we want higher after costs performance.
- Since different clients face different transaction costs, we break that out into:
  1. Change in gross return
  2. Change in turnover

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Section 1

Naïve approaches

Naïve approaches

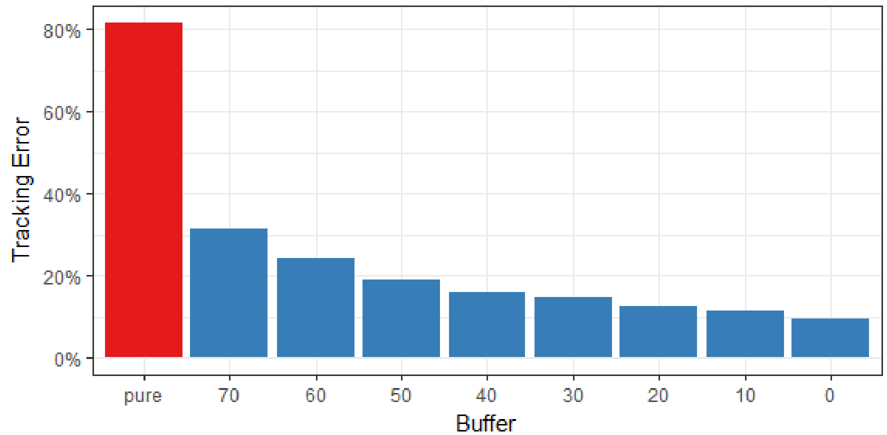
The two simplest approaches to reducing turnover are:

- Add a buffer
  - We start with a portfolio of all stocks with a factor score above the 80th percentile, but we don't replace a stock in the portfolio until its factor score has fallen below e.g. the 70th percentile.
  - When a stock does fall out of the portfolio, we replace it with the top scoring name not already in the portfolio.
- Reduce the trading frequency
  - Instead of rebalancing the whole portfolio each month, rebalance one n-th of the portfolio every n months e.g. rebalance one third of the portfolio quarterly.

Effect of buffers (1)

Turnover

- Buffers are extremely successful at reducing turnover.
- A buffer at the 70th percentile reduces the annualised turnover in the beta style from c. 80% to c. 30%.



Source: UBS Quants

Average factor score

- The average factor score drops off as you reduce the buffer percentile.
- It falls particularly quickly for the momentum family styles because of their low style persistency.

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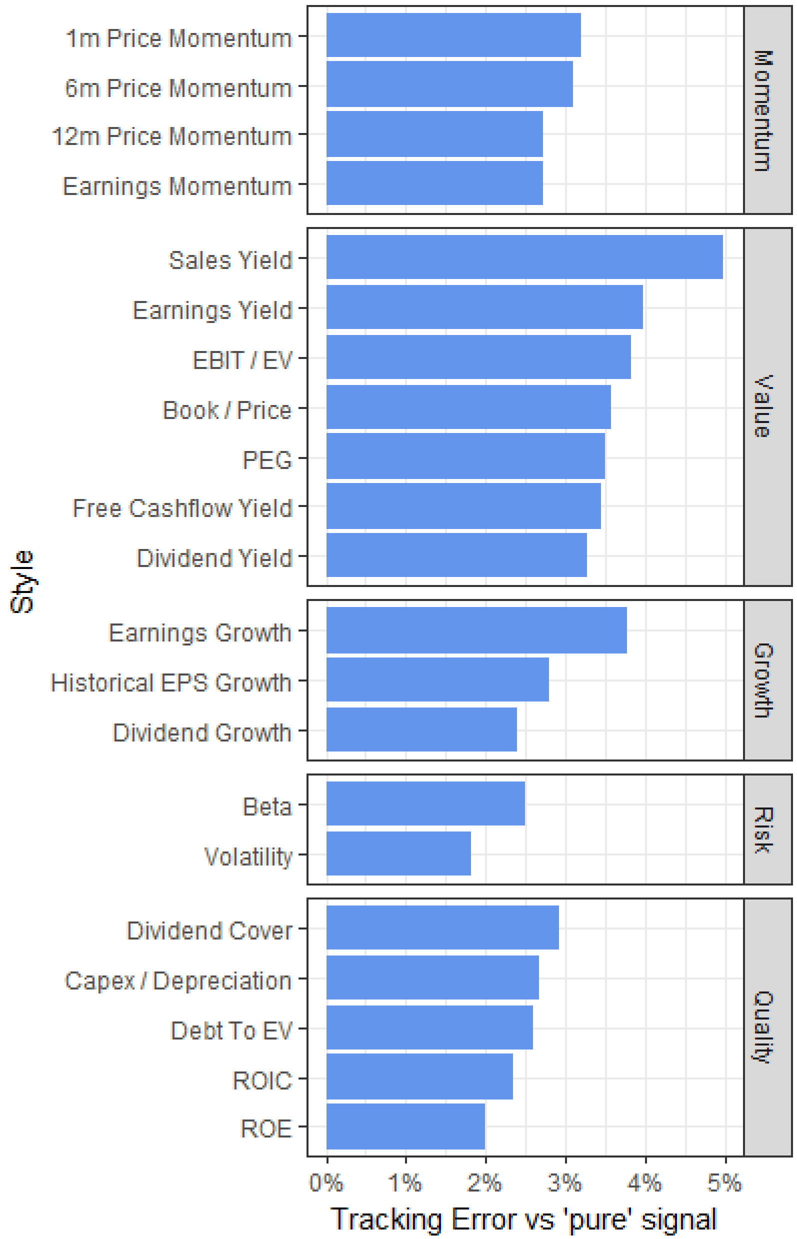
Effect of buffers (2)



Source: UBS Quants

Tracking Error

- However, even with the 70th percentile buffer, these low turnover portfolios have high tracking errors versus the "pure" factors.
- Only the volatility and ROE factors remain strongly representative of the original factor portfolio.

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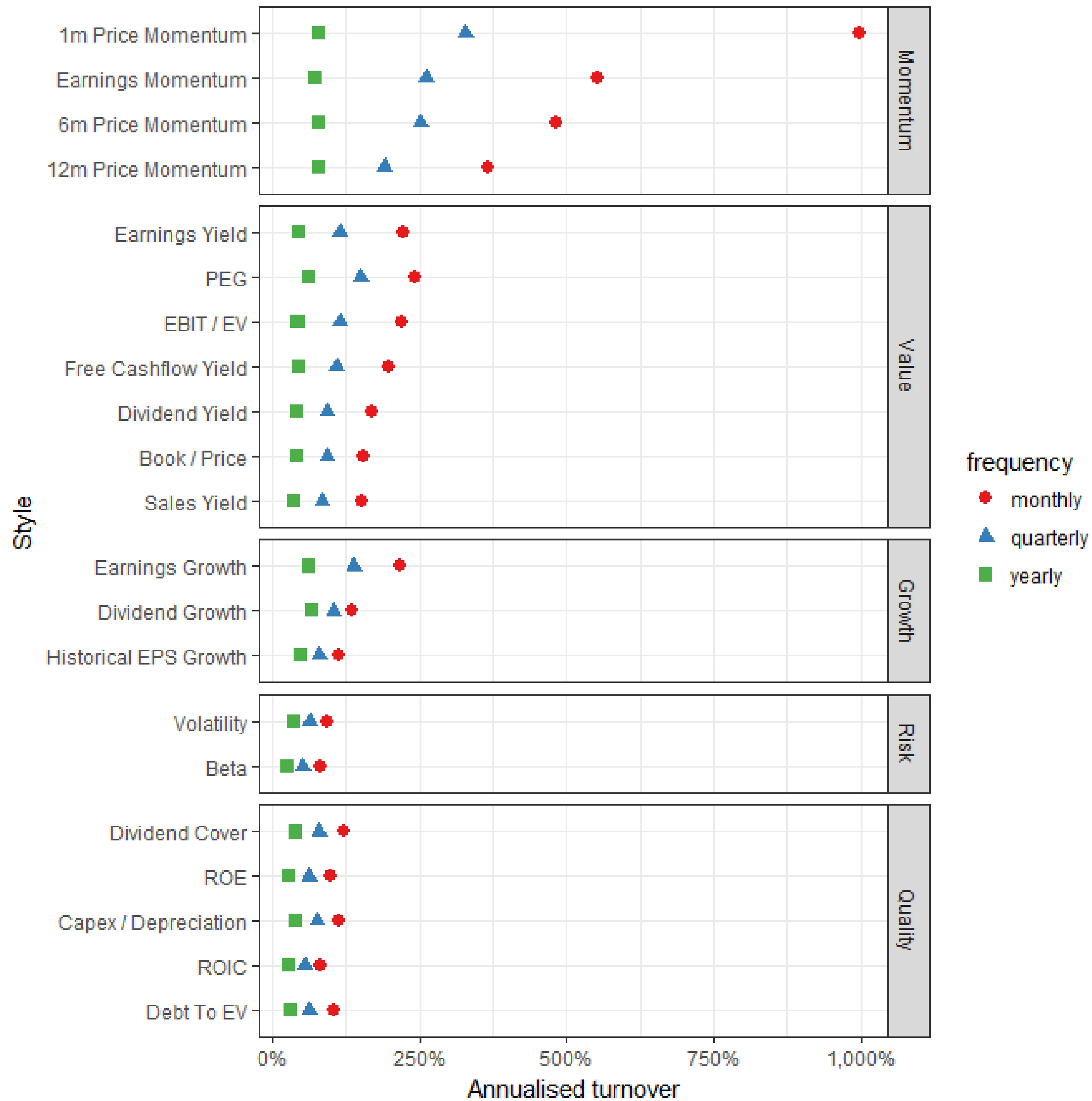
Effect of lower rebalancing frequency (1)

- Turnover is a lot lower with quarterly or yearly rebalancing – typically 40% and 70% lower respectively.



Source: UBS Quants

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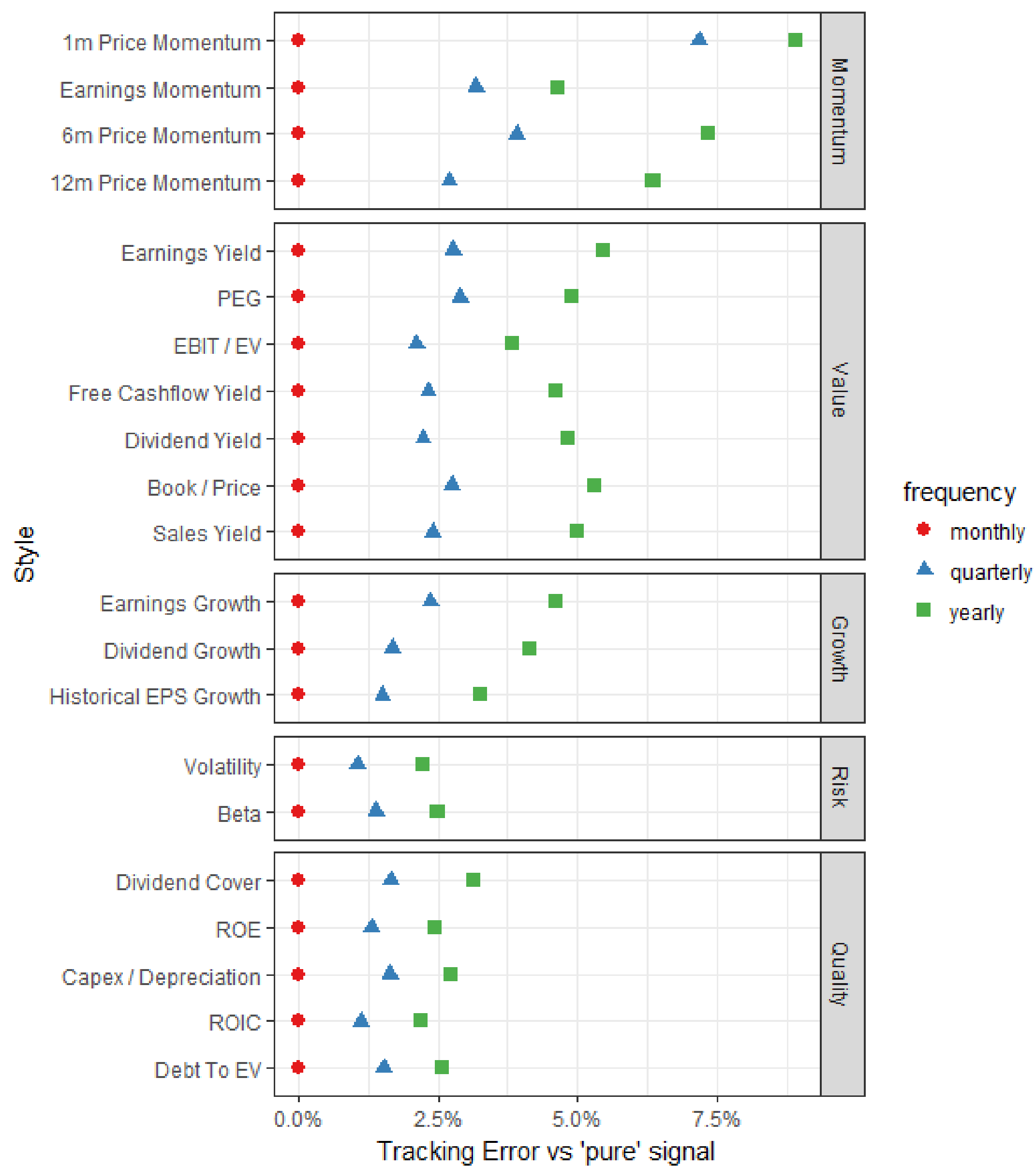
Effect of lower rebalancing frequency (2)

- How low can you go? Looking at the tracking error it appears that:
  - For price reversal – definitely only monthly
  - For value and momentum styles except price reversal, you probably must rebalance monthly
  - For growth, you can consider quarterly
  - For risk and quality, you may be able to drop to quarterly or perhaps even yearly rebalancing without "too" serious effects.



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Section 2

No trade zone

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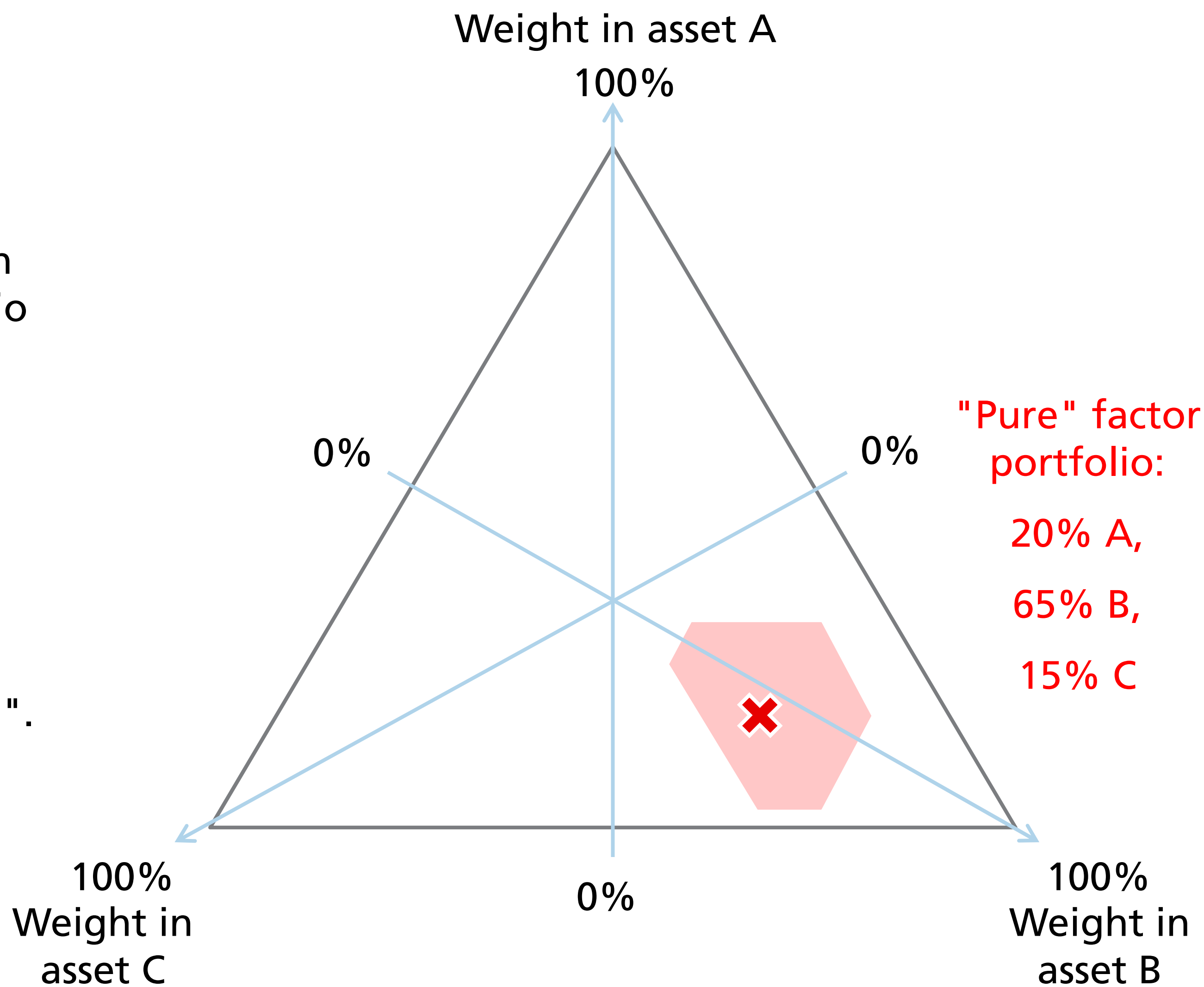
No trade zone

- A slightly more complex approach to reducing turnover is the "no trade zone" approach.
- We decide whether a portfolio is sufficiently similar to the "pure" factor portfolio.
  - If yes, then we say the portfolio lies in the "no trade zone" and we don't trade.
  - If no, then we trade to the nearest portfolio which *is* sufficiently similar.
- This approach requires a simple linear optimisation to find the portfolio with the smallest turnover from your current holdings which satisfies our criteria for sufficiently similar.

No Trade Zone Illustration

- Weights sum to 100%
- Portfolio weights are within 1.5% of the "pure" portfolio
- Weighted average factor score is above a threshold, which we set at 90.
- If you are outside the "no trade zone" then trade to the nearest point on the *edge* of the "no trade zone".



Source: UBS Quants, Illustrative diagram

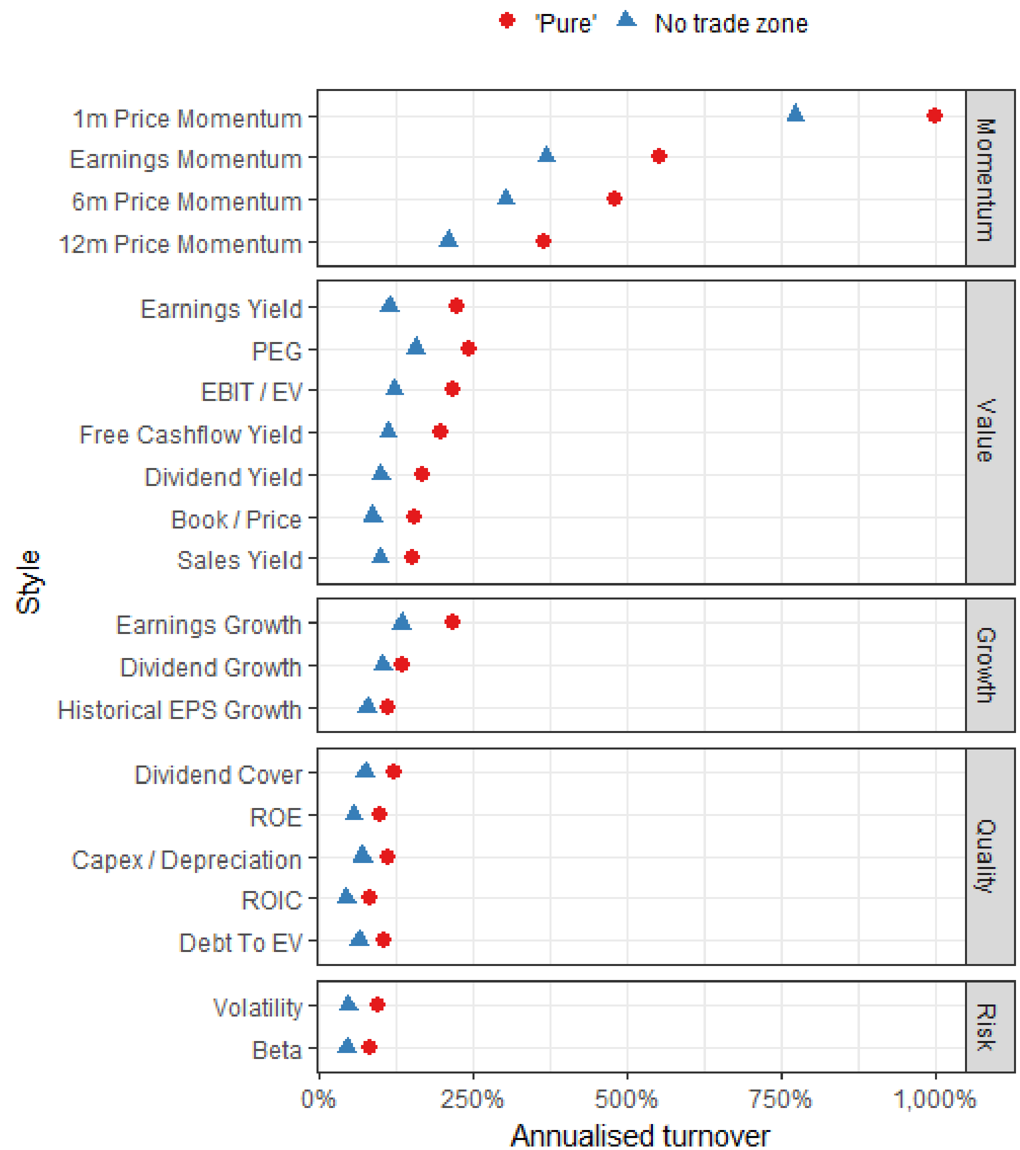
Effect of no trade zone (1)

Average factor score

– By construction the no-trade-zone portfolios have a reasonable average factor score.

Turnover

– Turnover falls by roughly half for the risk and quality styles, and by between 20%-40% for other styles.



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Effect of no trade zone (2)

Average factor score

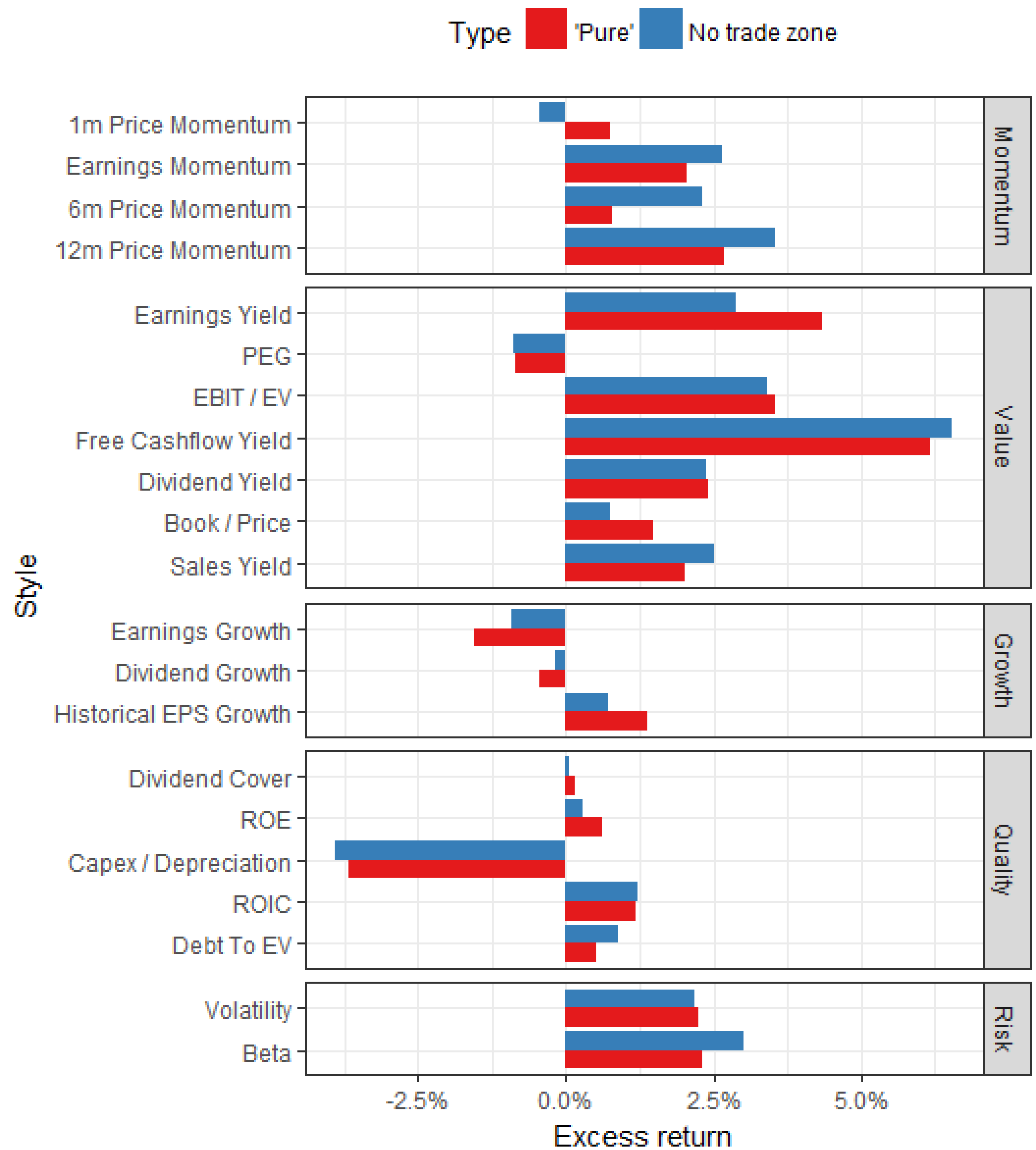
- By construction the no-trade-zone portfolios have a reasonable average factor score.

Turnover

- Turnover falls by roughly half for the risk and quality styles, and by between 20%-40% for other styles.

Return

- The annualised return changes by between -1% and +1% but is not consistently positive or negative.



Source: UBS Quants

Effect of no trade zone (3)

Average factor score

– By construction the no-trade-zone portfolios have a reasonable average factor score.

Turnover

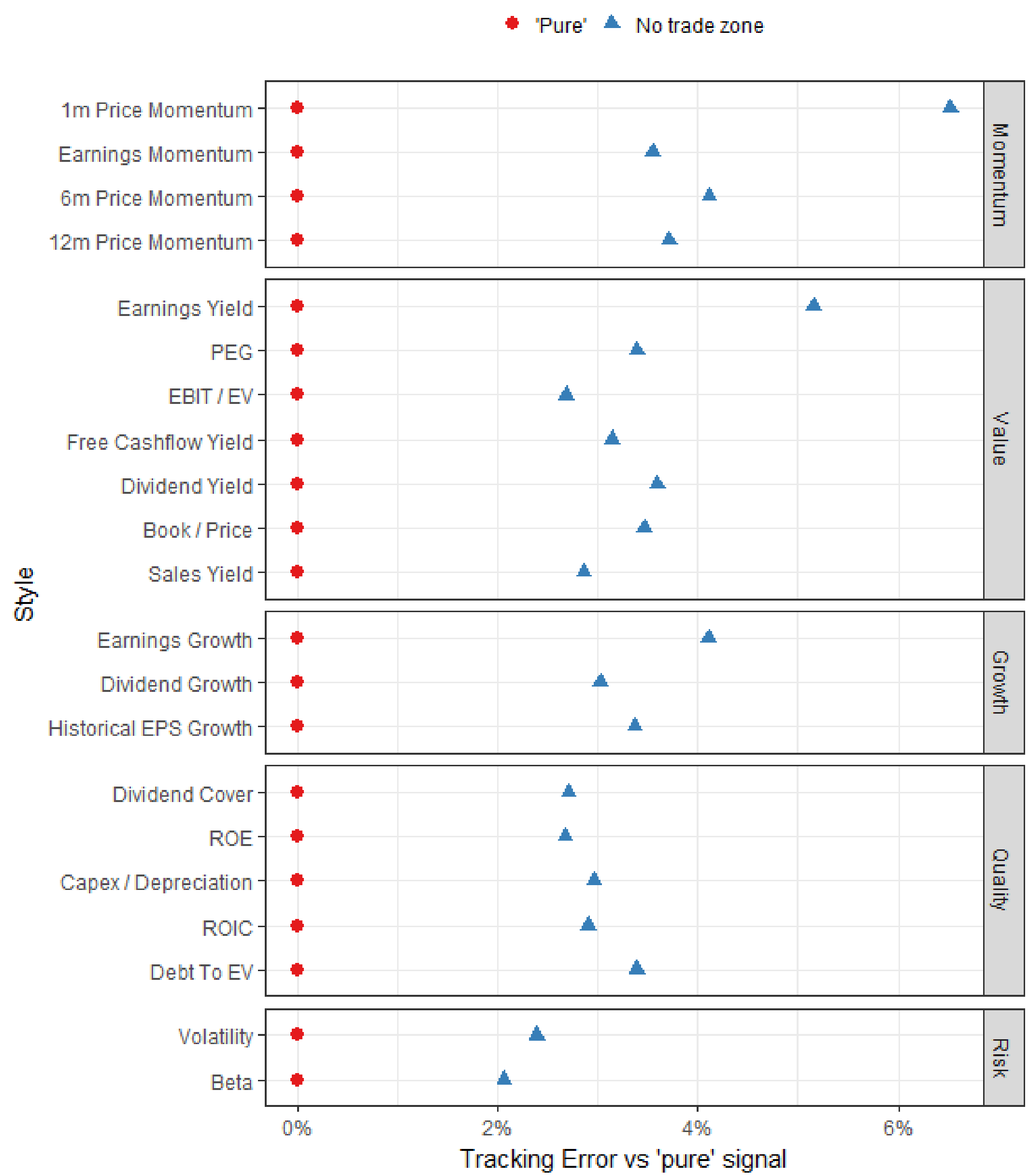
– Turnover falls by roughly half for the risk and quality styles, and by between 20%-40% for other styles.

Return

– The annualised return changes by between -1% and +1% but is not consistently positive or negative.

Tracking Error

– However, the tracking error is very high for all but the risk styles.



Source: UBS Quants

Section 3

Full optimisation

Full optimisation (1)

- The third approach is to run a full optimisation.
- Use your favourite risk model to minimise the tracking error of your portfolio to the "pure" factor portfolio, subject to a turnover constraint.
- We have specified our risk model as the PAS default for Europe, using two years of weekly data.

Full optimisation (2)

What is a reasonable turnover constraint?

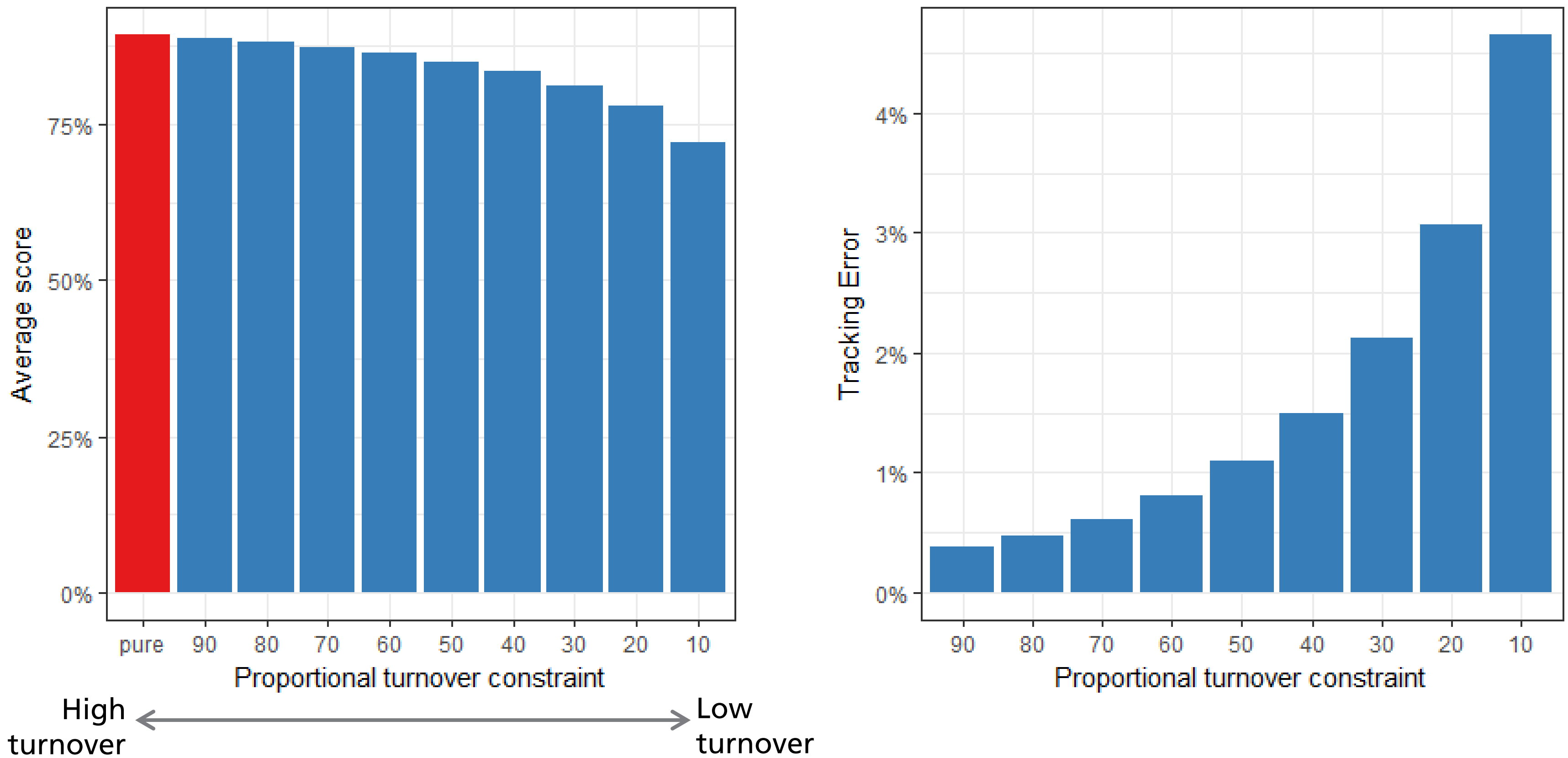
- We compute what the turnover would be between the current portfolio and the ideal holdings. Our turnover constraint is a fixed proportion of that figure
  - i.e. you can move e.g. half-way towards the ideal portfolio, and the optimiser will give you the best trade schedule.

- This turnover constraint will vary through time
  - At some points in the year more turnover may be necessary e.g. at quarter ends there is genuinely new information which should trigger more turnover.

- And it will vary from style to style
  - Some styles have naturally much higher turnover than others e.g. fast moving signals like price reversal vs slow moving signals like ROIC

Full optimisation: 12 mth price momentum style (1)

- All but the very low turnover variants are still momentum factor portfolios in the sense that their average factor score is high.
- However the tracking error increases drastically as we require lower turnover.
- The portfolio which lets you move "half-way" towards the original factor weights has a TE of 1.1% vs the "pure" 12 mth price momentum style.



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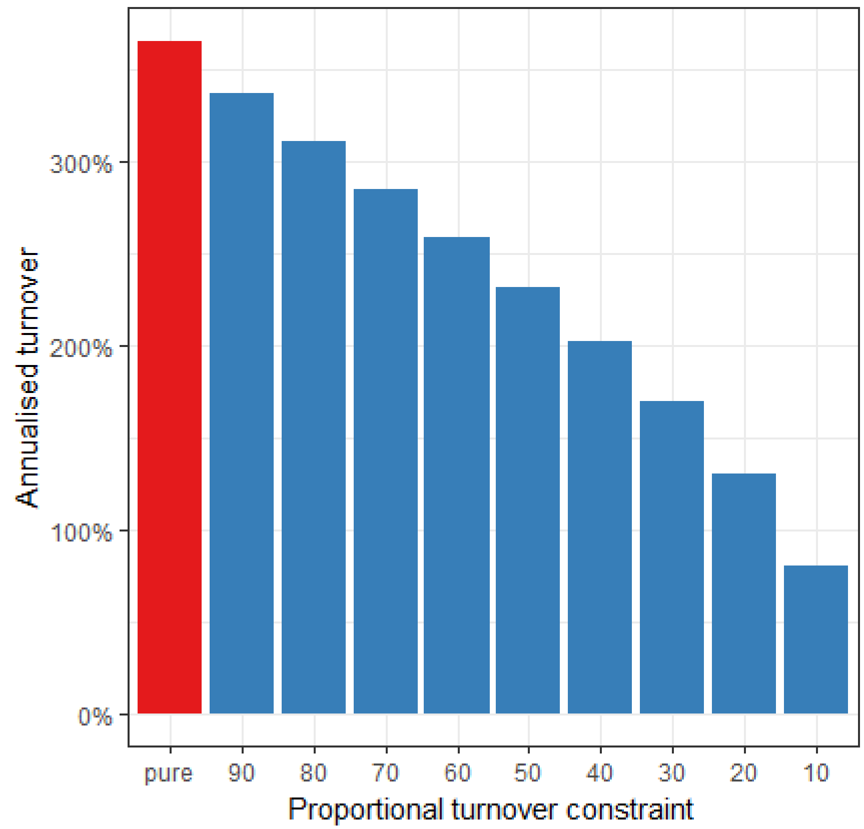
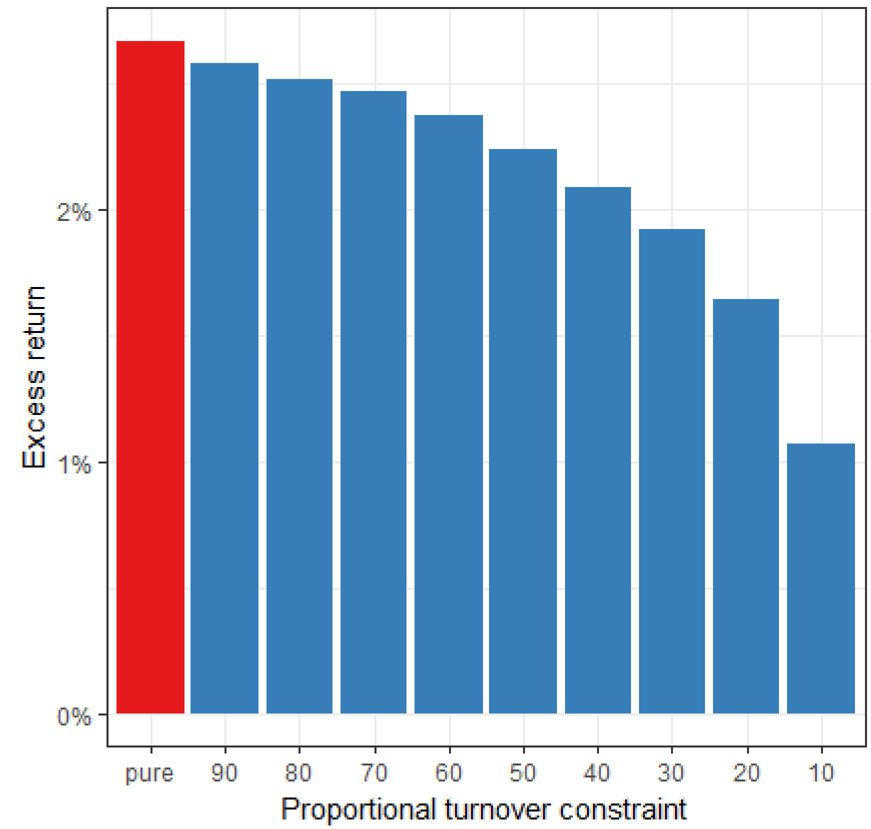
Source: UBS Quants

Full optimisation: 12 mth price momentum style (2)

- The construction method works. Portfolios with lower proportional turnover constraints see lower turnover.
- However, there is a price for this lower turnover - lower excess returns.





High turnover ⟷ Low turnover

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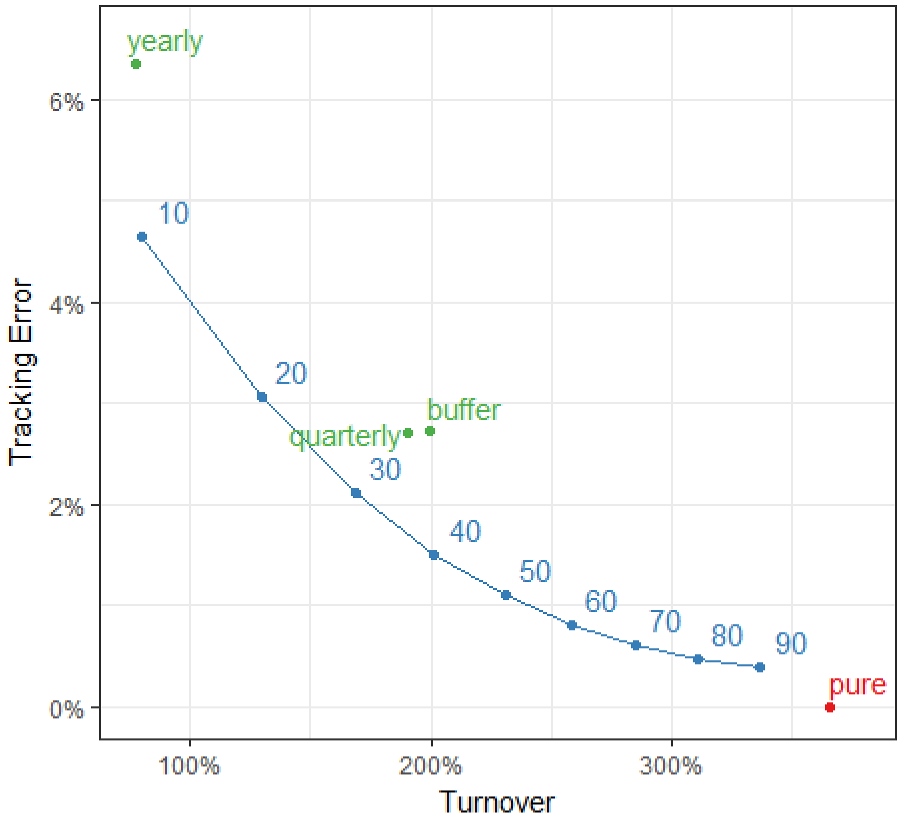
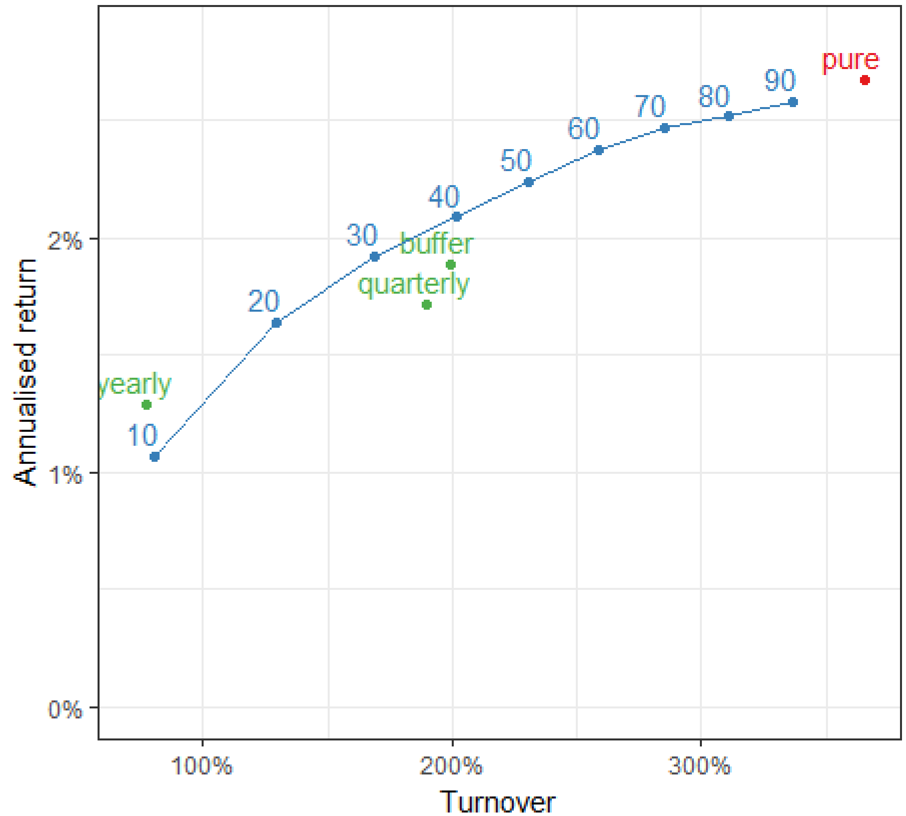
Source: UBS Quants

Full optimisation: 12 mth price momentum style (3)

- With half the turnover you can get a tracking error of between 1.5% and 2%, and you can capture roughly three quarters of the price momentum premia.
- Are these trade-offs worthwhile for you?





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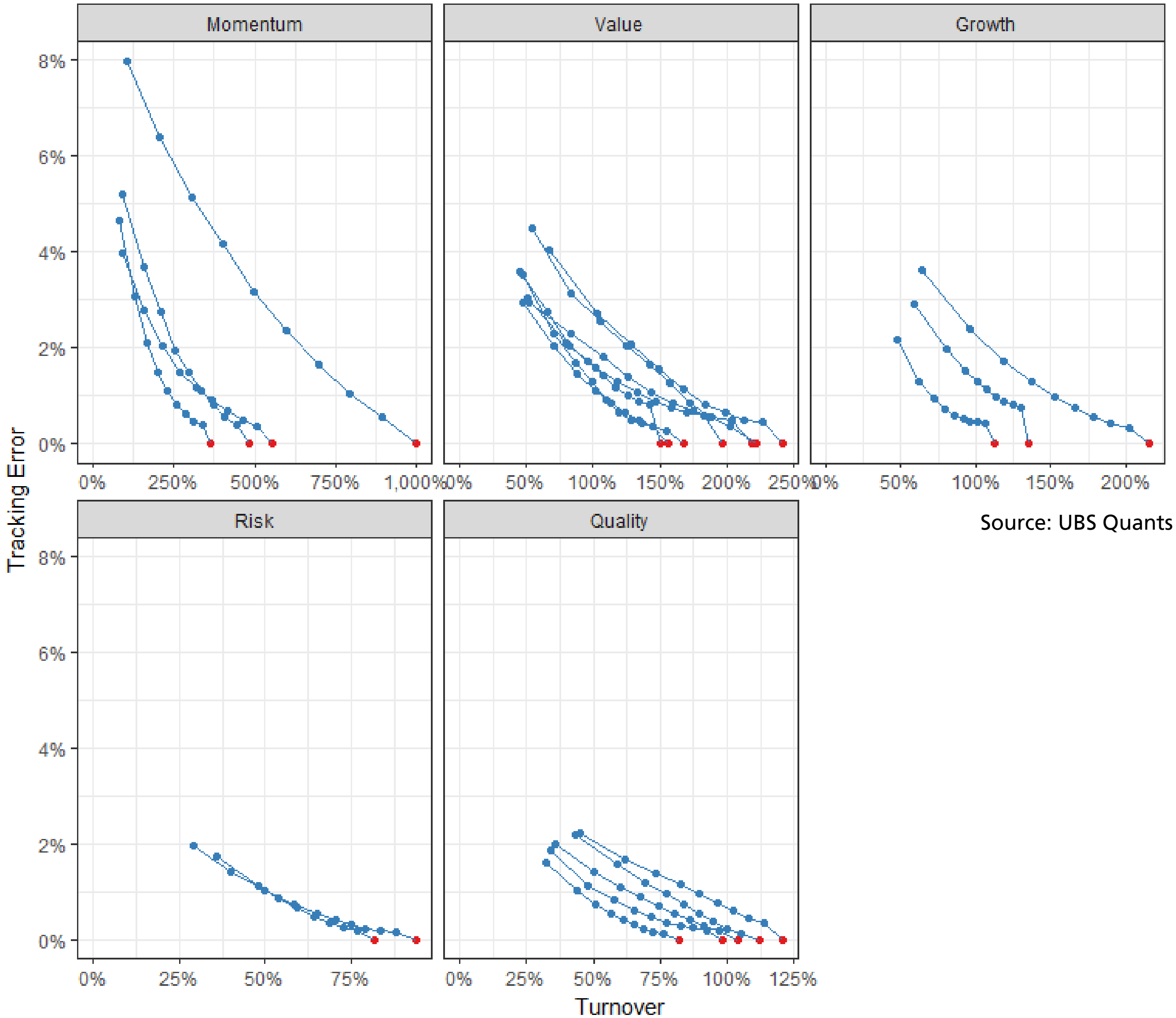
Full optimisation: All trade-offs (1)

- In all cases, lower turnover means higher tracking errors, but this is particularly acute for momentum styles.



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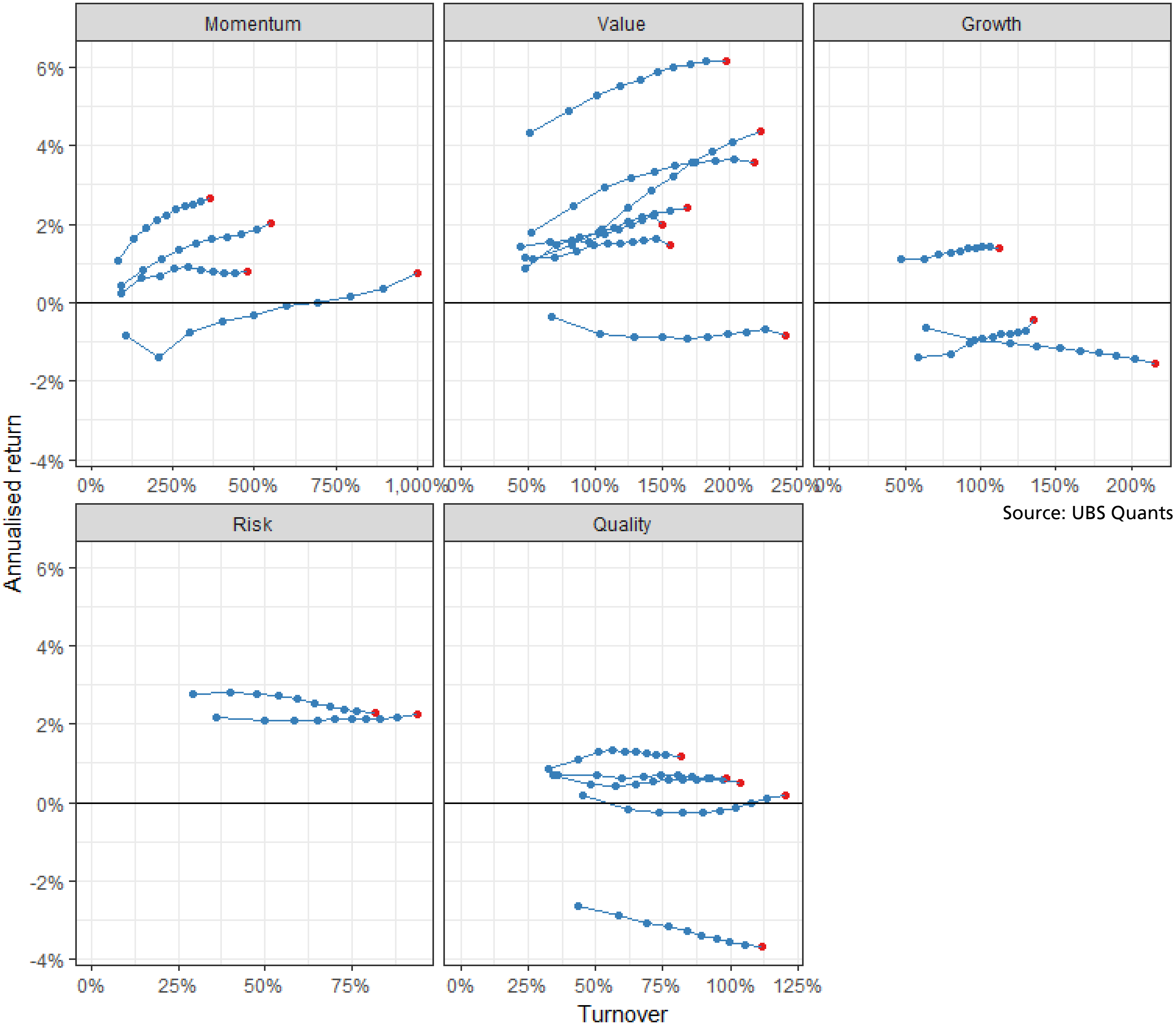
Full optimisation: All trade-offs (2)

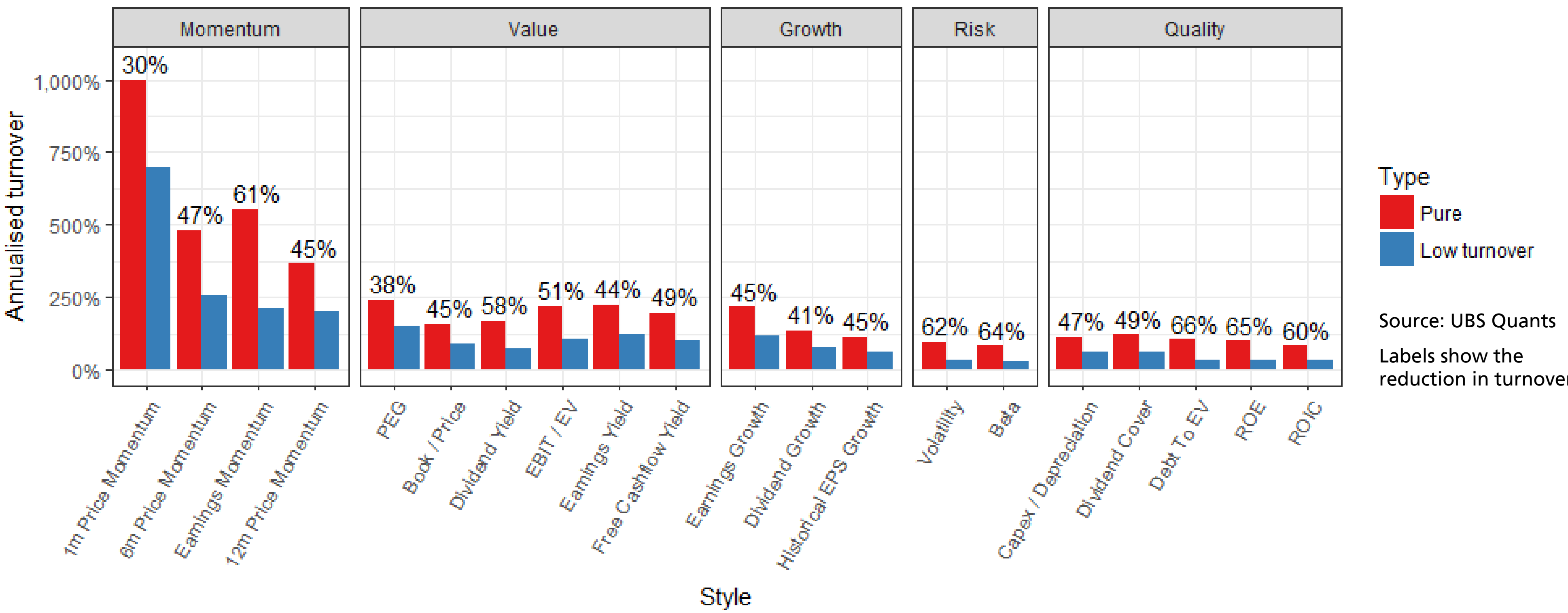


Source: UBS Quants

- There is a striking division here:
- For growth, risk and quality styles, lower turnover doesn't seem to imply a lower return – high turnover is simply wasteful.
- For value and momentum styles, there is a clear trade-off.

Full optimisation: results for TE < 2% (1)

- For each style, we choose the smallest proportional turnover constraint such that the tracking error is at most 2%, and examine these results in more detail.
- For the risk styles and some of the quality styles, it appears that you can cut turnover by more than 60%.
- For value, growth and (most) momentum styles, we find that you can cut turnover by around 40%-60% before you breach the 2% tracking error.



Source: UBS Quants

Labels show the reduction in turnover

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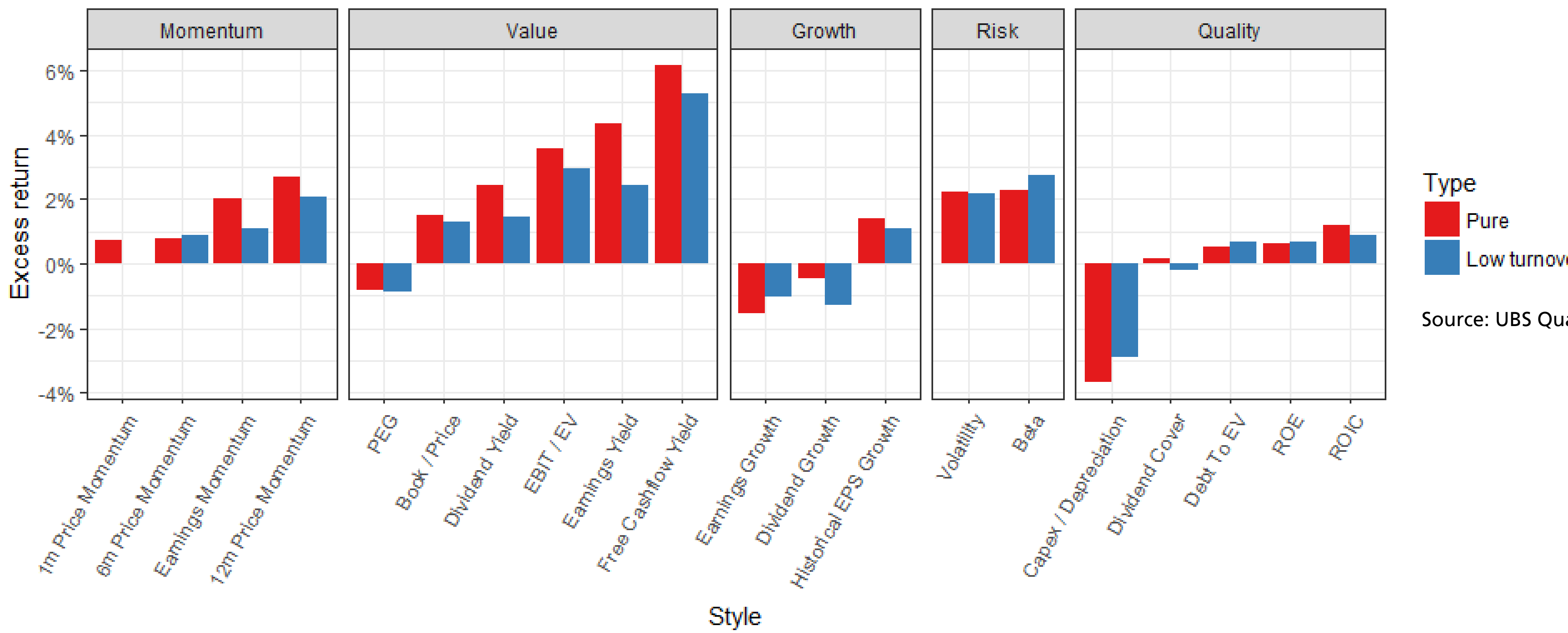
Full optimisation: results for TE < 2% (2)

- For 14 of the 20 styles, the low turnover portfolio underperforms the "pure" factor portfolio, so there is usually some cost to reducing the turnover.
- For the risk and quality styles the difference in returns is typically very small.
- The cost is highest for earnings momentum and 1 mth price momentum, and for some of the value styles (dividend yield, earnings yield and free cash flow yield).



Source: UBS Quants

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Conclusions

- Low turnover strategies are desirable to investors, both for their lower costs and higher capacities.
- Both rules of thumb and the "no trade zone" approach are effective at cutting turnover, but appear to increase the tracking error to the original style portfolio unreasonably for most styles. It is worthwhile using an optimiser.
- Turnover constraints should be time varying.
- Using the optimiser, we can reduce turnover by more than 60% for quality and risk styles, and between 40% and 60% for other styles, whilst still keeping the tracking error below 2%.
- It appears that you should be using low turnover variants for growth, risk and quality styles. For value and momentum styles, there is more of a trade-off.

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