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Smart Portfolios

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Northfield Asia Seminars

The Problem with Active Management

- Very large funds typically hire a number of active managers, but this can often become self-defeating, as the effects of the managers' stock selection skills diversify away very rapidly, effectively leaving a very expensive index fund overlaid with a small number of Style tilts

- A 2009 performance evaluation study done for the Norwegian sovereign wealth fund came to the conclusion that the fund would be better off simply building a set of Style Factor portfolios themselves

- In recent years, this conclusion has resulted in the enormous growth of so-called 'Smart Beta' funds and ETFs.

Smart Beta funds . . .

- Finance academics and practitioners have identified a number of Style Factors that seem to out-perform the broad equity market, on average, over time

    - Examples include Value, Momentum, Quality

- The underlying idea is that each of these Style Factors has a corresponding factor risk premium, or return, that can be harvested for investors

- Smart Beta funds purport to deliver these returns to investors: they can be thought of as index funds with Style tilts; to a quant, they are Factor portfolios

- A recent internet search in the US market found over 40 Value indices, and 28 Value ETFs

. . . or Not-so-Smart Beta funds?

- The problem with most of them is that the way in which they are constructed means that they do a very poor job of capturing the Style Factor premia

- 'Smart' Beta funds are often capitalisation-weighted or equal-weighted

- The S&P (so-called) 'Pure Style' ETFs have portfolio weights in proportion to the appropriate style metric; for Value, this is a combination of BV/P, E/P and S/P

- All that is happening here is that some simplistic, arbitrary weighting scheme is being applied to a set of stocks with high exposures to a particular Style

The KISS Principle at Work

- At best, these various weighting schemes simply give a Style tilt to the portfolios, when what they <u>should</u> be doing is trading off each stock's (Style-related) expected return against its risk

- Without any serious attempt to optimise these Factor portfolios, their performance will be driven mainly by their exposure to market, industry and other factors

- **The marketing imperative to have a simple story seems to be more important than having an efficient Style tilt**

- The consequence is that these funds capture only a small fraction of the Style premia, and often have a higher risk than the market itself

Digression on Style Factor Returns

- It is not possible to measure Style Factor returns directly.

- In practice, they are estimated, either by creating long-short Factor-Mimicking Portfolios (FMPs), or by running cross-sectional regressions on stock returns

- The difficulty with using FMPs lies in trying to make the portfolios independent of other factor effects

- On the other hand, using cross-sectional regressions means the Style Factor returns will be conditioned on all the other factors included in the regression

- Style Factor returns are usually conditioned on each other; however, they are often conditioned on market, industry or currency factors as well

US Style Factor Returns - 1
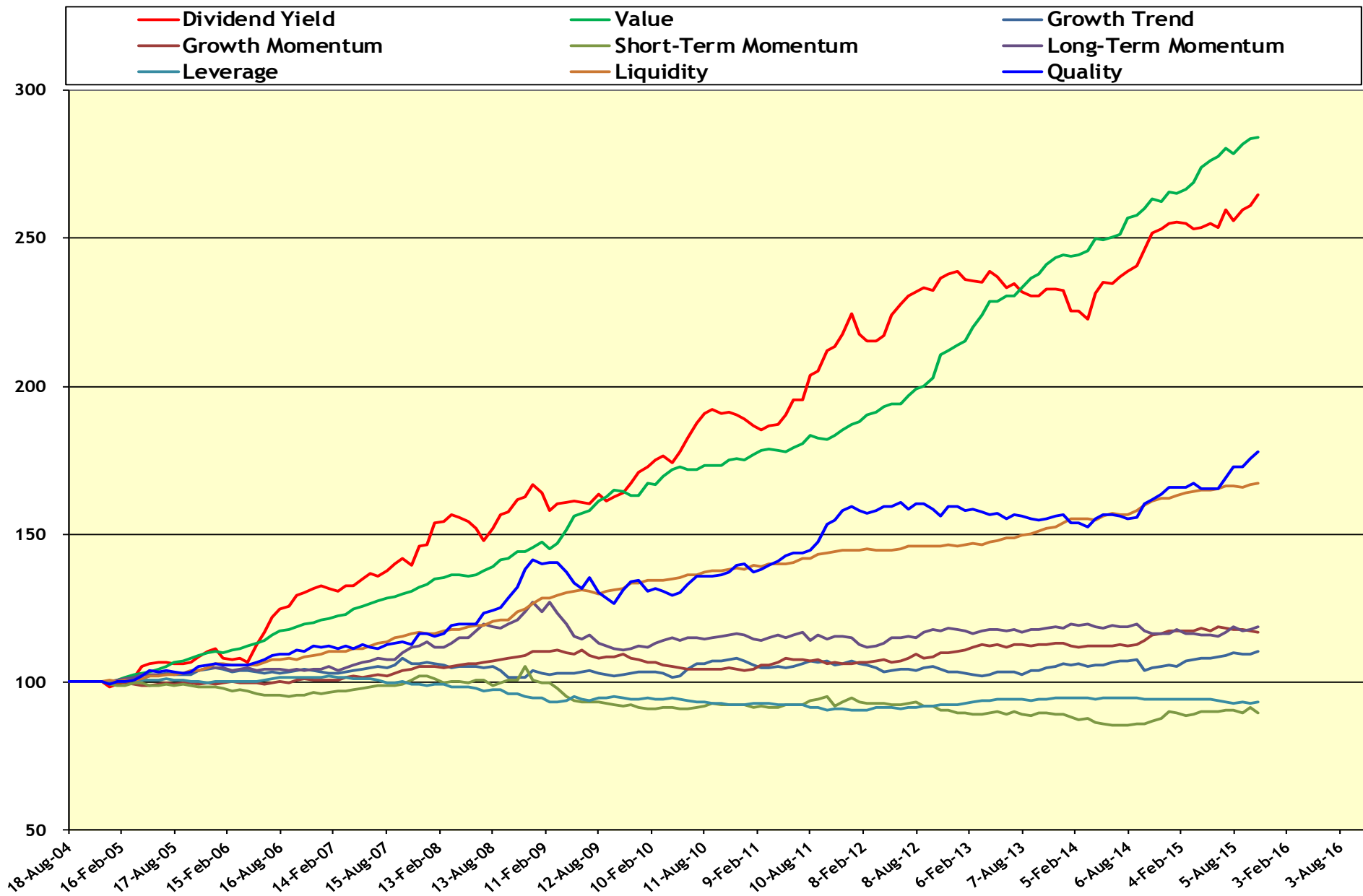
US Style Factor Returns - 2

	Dividend Yield	Value	Growth Trend	Growth Momentum	Short-Term Momentum	Long-Term Momentum	Leverage	Liquidity	Quality
Mean	8.92	9.57	0.88	1.42	-1.02	1.58	-0.66	4.71	5.27
S. D.	5.80	2.71	2.74	1.98	3.52	3.65	1.48	1.63	4.72
Skewness	0.20	0.77	-0.75	0.03	0.01	-0.80	-0.14	0.43	0.22
t-statistic	0.97	3.73	-3.67	0.17	0.05	-3.89	-0.67	2.07	1.08
Kurtosis	0.55	2.85	4.35	0.19	6.62	1.82	1.37	0.56	1.04
t-statistic	1.34	6.94	10.58	0.45	16.10	4.43	3.33	1.36	2.52
Serial Corr	0.16	0.07	0.06	0.10	-0.10	0.10	-0.00	0.02	0.18
t-statistic	1.91	0.80	0.72	1.22	-1.19	1.25	-0.03	0.20	2.18

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US Style Factor Returns - 3

CORRELATION MATRIX of FACTOR RETURNS								
	Dividend Yield	Value	Growth Trend	Growth Momentum	Short-Term Momentum	Long-Term Momentum	Leverage	Liquidity	Quality
Dividend Yield	1.000	0.219	0.201	-0.074	0.066	-0.097	0.042	0.051	0.346
Value	0.219	1.000	-0.149	0.028	-0.162	-0.434	0.432	-0.037	-0.425
Growth Trend	0.201	-0.149	1.000	-0.106	-0.030	0.211	0.002	0.082	0.108
Growth Momentum	-0.074	0.028	-0.106	1.000	0.072	0.040	0.023	0.075	0.067
S-T Momentum	0.066	-0.162	-0.030	0.072	1.000	0.225	-0.319	-0.052	0.291
L-T Momentum	-0.097	-0.434	0.211	0.040	0.225	1.000	-0.372	0.051	0.403
Leverage	0.042	0.432	0.002	0.023	-0.319	-0.372	1.000	-0.030	-0.514
Liquidity	0.051	-0.037	0.082	0.075	-0.052	0.051	-0.030	1.000	0.092
Quality	0.346	-0.425	0.108	0.067	0.291	0.403	-0.514	0.092	1.000

Not-so-Smart Portfolio construction

- Harry Markowitz won his Nobel prize for proposing that the most efficient way to manage portfolios was to have holdings whose contribution to portfolio expected return matched their contribution to risk

- This idea was first published in 1952, and no-one has yet come up with a better idea; however, **most Smart Beta funds don't do this**

- In fact, their construction method often disregards risk completely, except for having lots of holdings, which is presumed to give greater diversification

- This makes them inefficient, and . . .
    it should therefore be easy to improve their performance

Smart Portfolio construction

- We first design an optimal portfolio construction process to create an efficient Style Factor portfolio, using Dividend Yield as our test case

- This portfolio significantly outperforms the usual market benchmarks and similar Smart Beta funds

- We then apply **exactly the same portfolio construction methodology** to other Style Factors

- The results show that building Smart Portfolios can generate significant improvements in performance over Naïve Portfolios

- We will also show that Smart Portfolios do a much better job of capturing the Style Factor premia

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The US YIELD Strategy - 1

- A long-only US Dividend Yield factor portfolio

- Target Portfolio Yield = Universe average yield + 3%

- Maximum Initial Stock holding = 3%

- Maximum Cash holding = 2%   (to cover expenses, fees, etc.)

- Only uses top 1,000 stocks by market capitalisation

- US Domicile stocks only (no ADRs, GDRs etc)

- Minimum price per share = $5 : this avoids penny stocks, and is a common restriction for mutual funds

The US Yield Strategy - 2

- Expected return = Trailing Annual Dividend Yield

    = Last 12 months dividends / Current price

- Risk = NIS XRD US multi-factor risk model

    – 6 Currency factors (only relevant for foreign stocks)

    – 9 Style factors   :   (the usual suspects)

        - **Div Yield**   **Value**   **Quality**   **Leverage**   **Liquidity**

        - **Growth Trend**   **Growth Momentum**   **S-T Momentum**   **L-T Momentum**

    – 2 US Market factors (US Large – like S&P 500   and   US Small – like Russell 2000)

    – 20 US Industry factors (based on GICS classifications)

    – 4 Statistical factors

    – For the Style factors, we estimate the factor returns from cross-sectional regressions; for all other factors, we estimate stock betas from time series regressions of stock returns against factor returns

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The US YIELD Strategy - 3

- Optimisers are notoriously prone to error maximisation

- In order to be useful, we need to have as much confidence in our return and risk estimates as we can

- In the case of Style Factor portfolios, the expected return proxy is actually a sensitivity to the Style factor

- We hope that the Style Factor premium is positive, but at least we are sure about the stock beta to the factor

- In this case, all we are really forecasting is that the next 12 months dividends will be like the last 12

- Using Style betas as the expected return proxy ensures that the portfolios have a significant Style Factor tilt
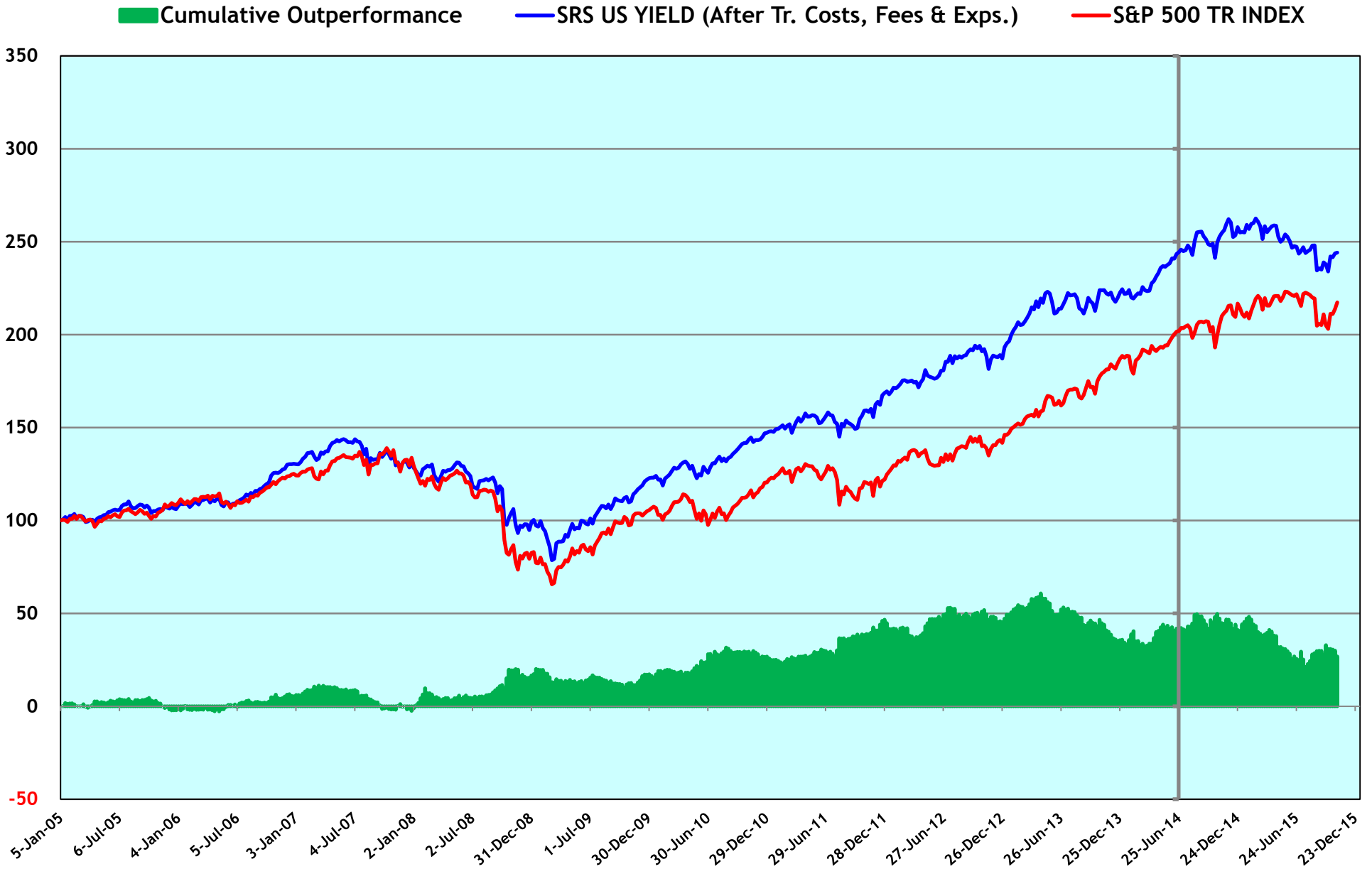
The US YIELD Strategy - 4

- We also need to be confident about the risk numbers

- In practice, this means that we need to be sure that the risk model has done a good job of estimating the sensitivities of each stock to the each factor, and of capturing its systematic common factor risks

- To achieve this, we filter the candidate universe to screen out stocks with low R-Squareds

- The risk characteristics of very high risk stocks are more likely to be biased estimates of their true risk, and may also appear to offer (spurious) diversification

- We therefore also filter out these stocks, to avoid them having a disproportionate effect on portfolio risk

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The US YIELD Strategy - 5

- Liquidity control : the maximum we buy of any stock must be less than 5 times 20% of the average daily volume over the past 60 trading days, so we should be able to close any position within a week

- The portfolio is rebalanced every 12 weeks

- For the purposes of illustration, we assume :

    – Estimated transaction costs : Buy 0.15%, Sell 0.15%

    – Estimated management fees : 0.10% + 0.10% expenses

- However, these assumptions are not material to the relative performance of these Style Factor portfolios
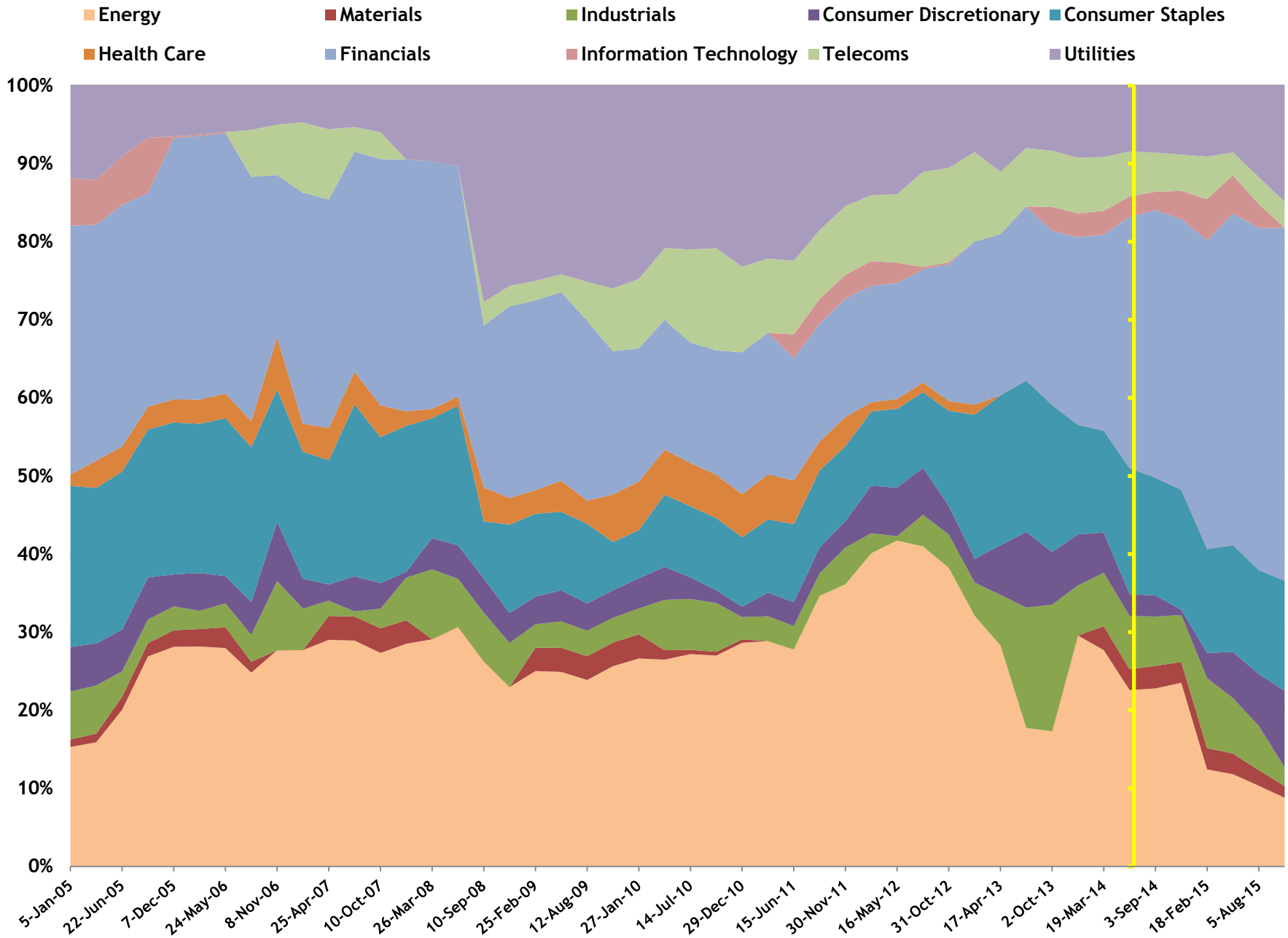
US Yield Smart Portfolio

Cumulative Outperformance — SRS US YIELD (After Tr. Costs, Fees & Exps.) — S&P 500 TR INDEX

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US Yield Smart Portfolio from 5-Jan-05

From	5-Jan-05	to	28-Oct-15

Annualised Performance since Inception*

	Return	Risk	I. R.
Portfolio*	8.6%	13.3%	0.65
Benchmark	7.4%	16.7%	0.44
Relative*	1.1%	8.1%	0.14

Beta to S&P 500 = 0.70   **Beta to Yield =** 1.40

Performance Attribution

	Target Style	Other Styles	Other Factors	Portfolio Alpha
Return	12.7%	2.3%	0.3%	-6.3%
Pct	141%	25%	3%	-69%

Average Number of Holdings & Annualised Turnover

Holdings :	38	Turnover :	39%

US Yield Smart Portfolio – Worst Drawdowns

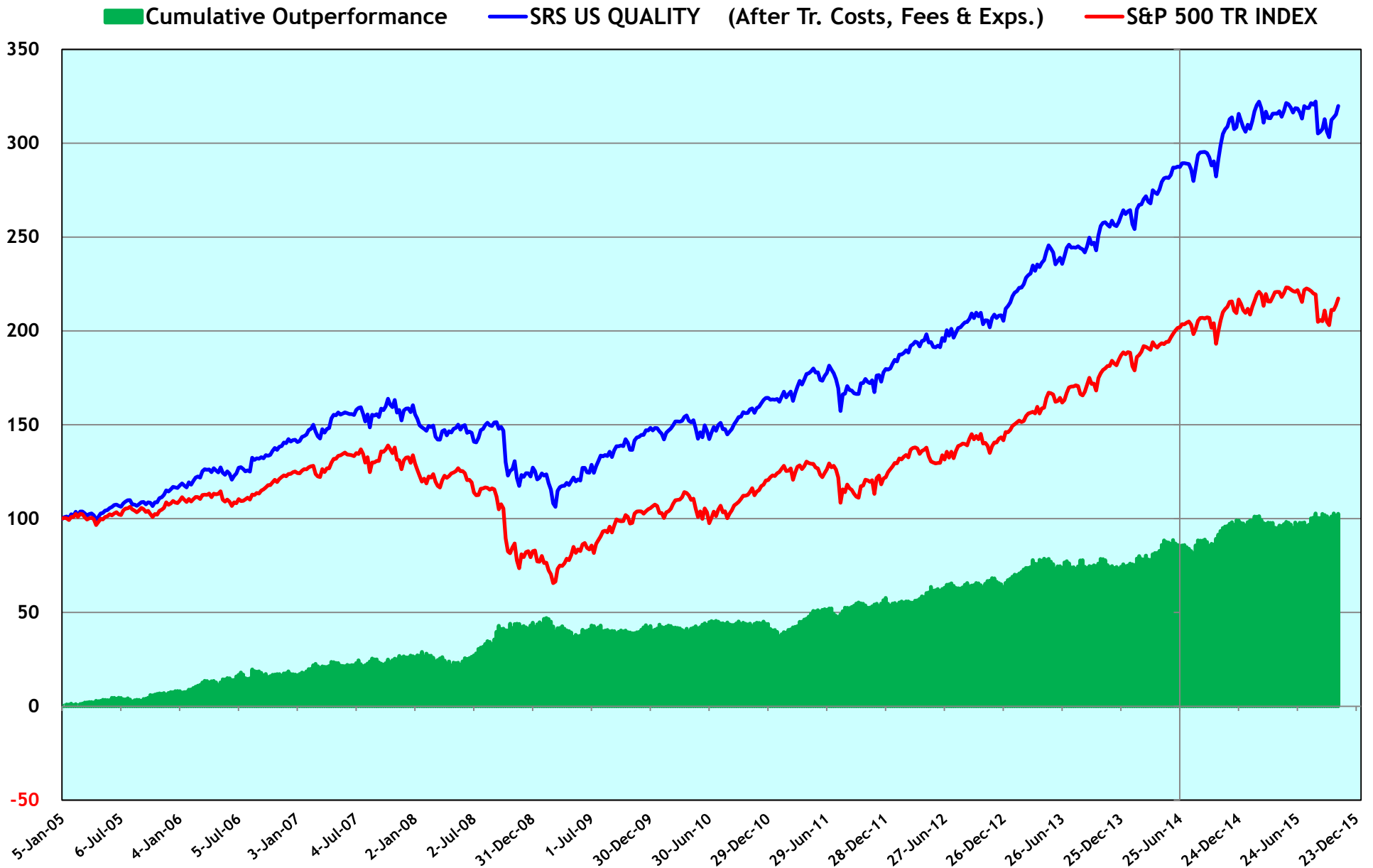| ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10/May/06	114.6	14/Jun/06	106.7	5	-6.8%	2.9%
Portfolio		111.7		107.3		-3.9%	
Benchmark	10/Oct/07	139.0	4/Mar/09	65.6	73	-52.8%	9.6%
Portfolio		138.0		78.5		-43.1%	
Benchmark	14/Apr/10	114.1	30/Jun/10	97.6	11	-14.5%	10.3%
Portfolio		131.0		125.5		-4.2%	
Benchmark	27/Apr/11	130.4	10/Aug/11	108.4	15	-16.8%	8.8%
Portfolio		157.4		144.8		-8.0%	
Benchmark	19/Sep/12	144.9	14/Nov/12	135.0	8	-6.9%	1.4%
Portfolio		191.8		181.3		-5.5%	
Benchmark	1/Jan/14	188.6	5/Feb/14	179.0	5	-5.1%	2.9%
Portfolio		224.1		219.1		-2.2%	
Benchmark	17/Sep/14	207.2	15/Oct/14	193.1	4	-6.8%	2.8%
Portfolio		251.0		240.9		-4.0%	

US Yield Smart Portfolio Sector Weights

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Now Repeat for other US Styles

- We now apply EXACTLY the same Smart Portfolio construction process to other Style Factors

- **To emphasise, we use exactly**
  - **The same constraints**
  - **The same risk filters**
  - **The same factor model**
  - **The same optimisation**

- We change ONLY the expected return proxy

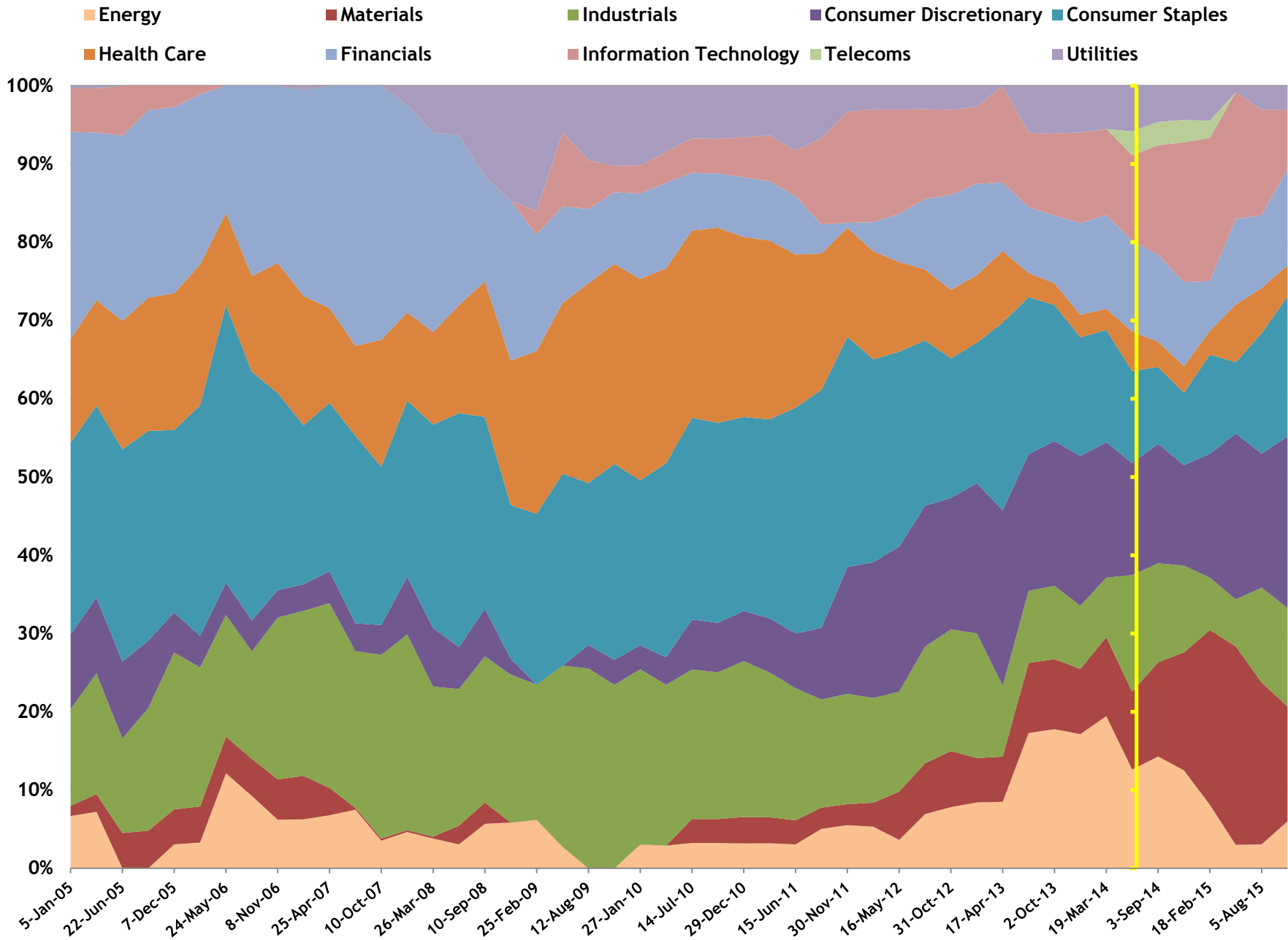**NORTHFIELD** | modeling financial markets worldwide

US Quality Smart Portfolio

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US Quality Smart Portfolio from 5-Jan-05

From	5/Jan/05	to	28/Oct/15

Annualised Performance since Inception*			
	Return	**Risk**	**I. R.**
Portfolio*	11.3%	12.7%	0.89
Benchmark	7.4%	16.7%	0.44
Relative*	3.9%	7.3%	0.53

Beta to S&P 500 =	0.69	Beta to Quality =	1.21

Performance Attribution			
	Target Style	**Other Styles**	**Other Factors**	**Portfolio Alpha**
Return	6.8%	6.6%	1.5%	-3.3%
Pct	59%	57%	13%	-29%

Average Number of Holdings & Annualised Turnover	
Holdings : 36	Turnover : 62%

US Quality Smart Portfolio – Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10/May/06	114.6	14/Jun/06	106.7	5	-6.8%	1.7%
Portfolio		127.3		120.7		-5.1%	
Benchmark	10/Oct/07	139.0	4/Mar/09	65.6	73	-52.8%	18.8%
Portfolio		163.8		108.2		-34.0%	
Benchmark	14/Apr/10	114.1	30/Jun/10	97.6	11	-14.5%	6.8%
Portfolio		154.2		142.4		-7.7%	
Benchmark	27/Apr/11	130.4	10/Aug/11	108.4	15	-16.8%	5.7%
Portfolio		177.1		157.3		-11.1%	
Benchmark	19/Sep/12	144.9	14/Nov/12	135.0	8	-6.9%	3.4%
Portfolio		209.3		201.9		-3.5%	
Benchmark	1/Jan/14	188.6	5/Feb/14	179.0	5	-5.1%	1.3%
Portfolio		264.3		254.3		-3.8%	
Benchmark	17/Sep/14	207.2	15/Oct/14	193.1	4	-6.8%	2.6%
Portfolio		294.8		282.3		-4.2%	

US Quality Smart Portfolio Sector Weights

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US S-T Price Momentum Smart Portfolio

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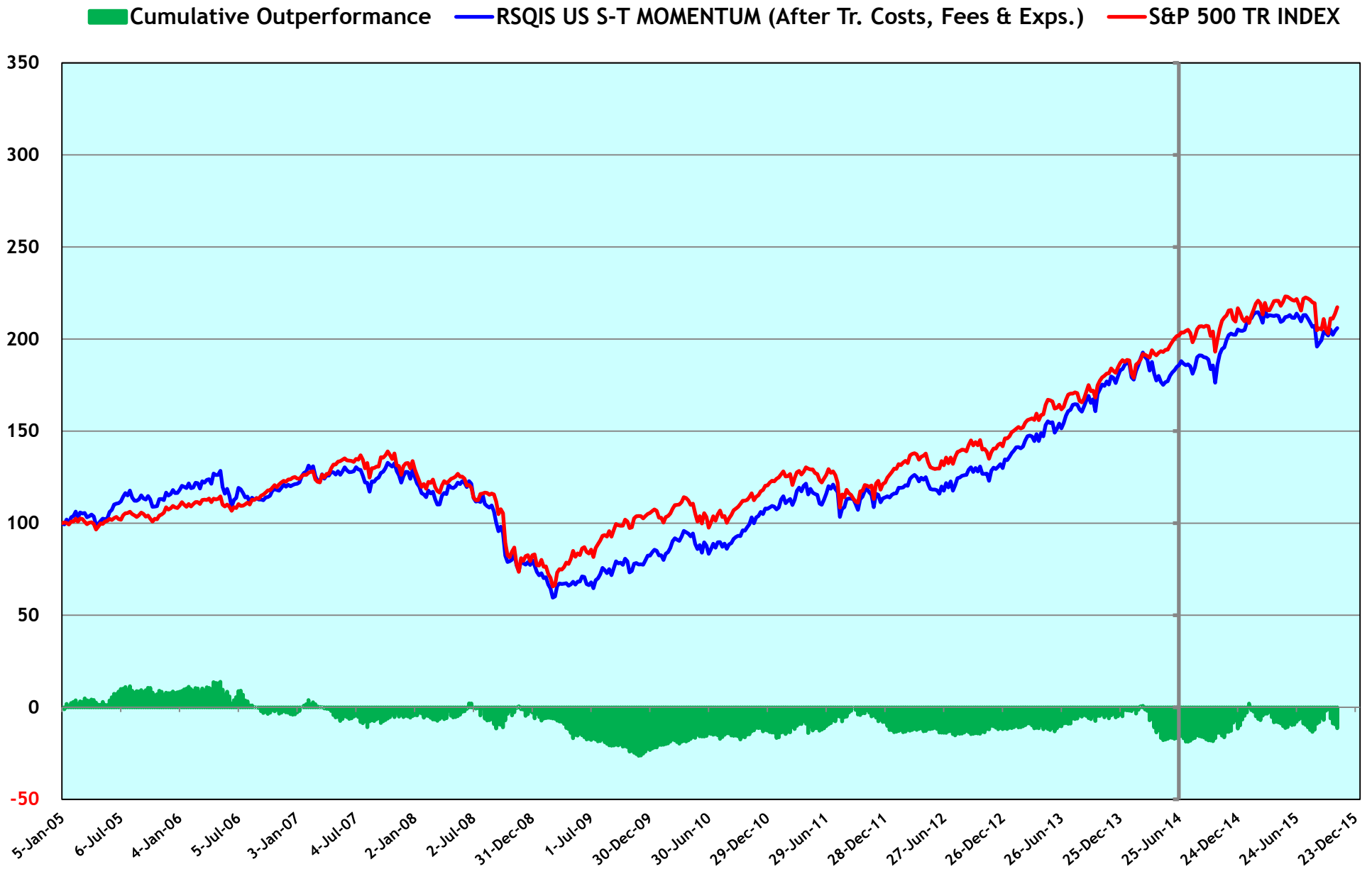
US S-T Price Momentum Smart Portfolio from 5-Jan-05

From	5/Jan/05	to	28/Oct/15

Annualised Performance since Inception*

	Return	Risk	I. R.
Portfolio*	6.9%	17.9%	0.39
Benchmark	7.4%	16.7%	0.44
Relative*	-0.5%	8.7%	-0.06

Beta to S&P 500 = 0.94   **Beta to S-T Mom =** 0.97

Performance Attribution

	Target Style	Other Styles	Other Factors	Portfolio Alpha
Return	-0.9%	6.6%	1.5%	-0.1%
Pct	-12%	92%	21%	-1%

Average Number of Holdings & Annualised Turnover

Holdings :	33	Turnover :	202%

US S-T Price Mom. Smart Portfolio – Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10/May/06	114.6	14/Jun/06	106.7	5	-6.8%	-8.4%
Portfolio		128.4		108.9		-15.2%	
Benchmark	10/Oct/07	139.0	4/Mar/09	65.6	73	-52.8%	-2.4%
Portfolio		132.8		59.6		-55.2%	
Benchmark	14/Apr/10	114.1	30/Jun/10	97.6	11	-14.5%	1.5%
Portfolio		95.8		83.3		-13.0%	
Benchmark	27/Apr/11	130.4	10/Aug/11	108.4	15	-16.8%	2.0%
Portfolio		121.5		103.4		-14.9%	
Benchmark	19/Sep/12	144.9	14/Nov/12	135.0	8	-6.9%	1.2%
Portfolio		130.4		123.0		-5.6%	
Benchmark	1/Jan/14	188.6	5/Feb/14	179.0	5	-5.1%	2.0%
Portfolio		183.7		177.9		-3.1%	
Benchmark	17/Sep/14	207.2	15/Oct/14	193.1	4	-6.8%	-0.3%
Portfolio		189.9		176.3		-7.2%	

US S-T Price Momentum Smart Portfolio Sector Weights

Legend: Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecoms, Utilities

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US Value Smart Portfolio

Slide 29
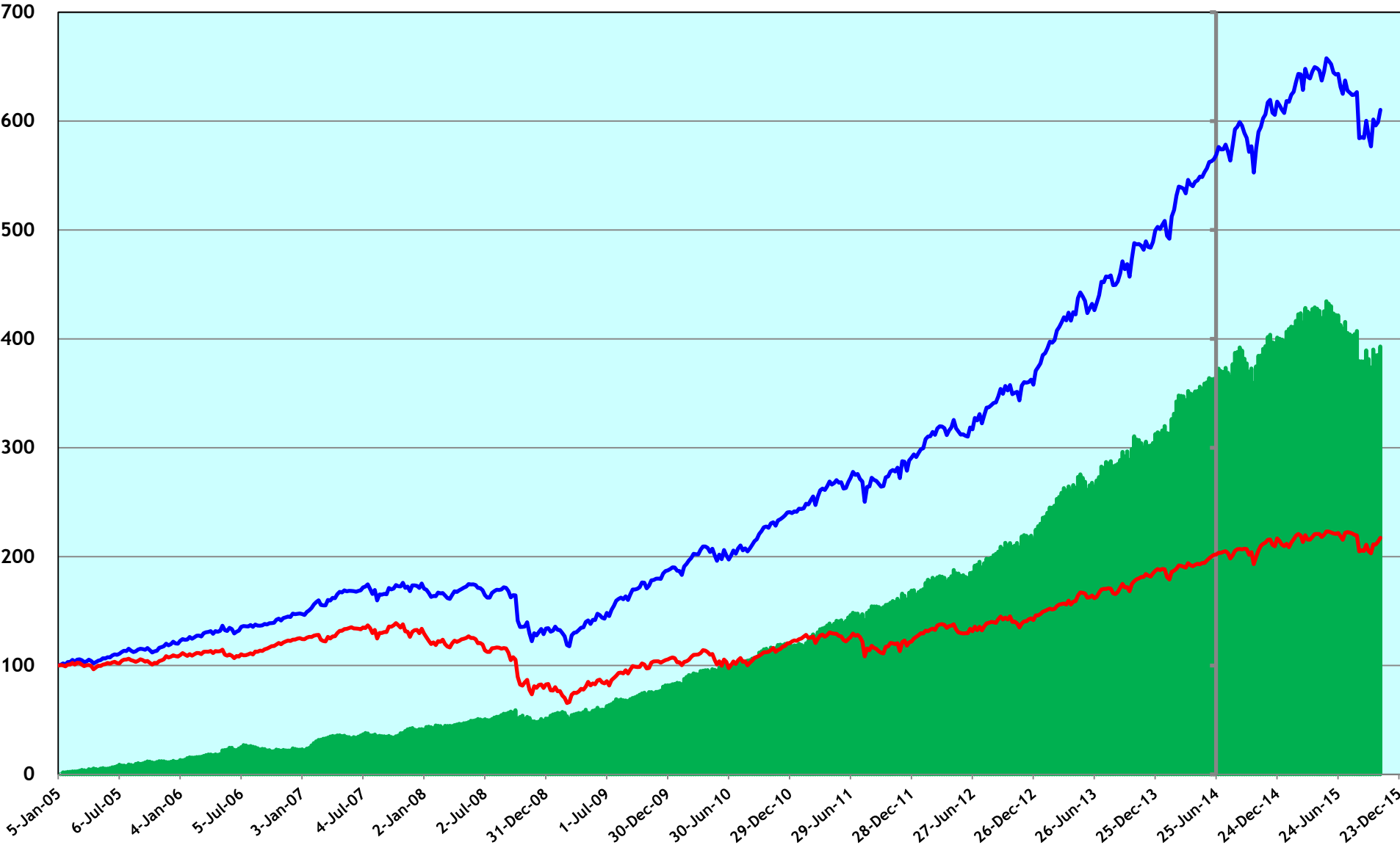
US Value Smart Portfolio from 5-Jan-05

From	5/Jan/05	to	28/Oct/15

Annualised Performance since Inception*

	Return	Risk	I. R.
Portfolio*	18.1%	13.4%	1.35
Benchmark	7.4%	16.7%	0.44
Relative*	10.7%	6.8%	1.57

Beta to S&P 500 = 0.74   Beta to Value = 1.20

Performance Attribution

	Target Style	Other Styles	Other Factors	Portfolio Alpha
Return	12.4%	7.8%	1.9%	-3.7%
Pct	67%	42%	11%	-20%

Average Number of Holdings & Annualised Turnover

Holdings :	38	Turnover :	52%

US Value Smart Portfolio – Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10/May/06	114.6	14/Jun/06	106.7	5	-6.8%	1.5%
Portfolio		136.4		129.2		-5.3%	
Benchmark	10/Oct/07	139.0	4/Mar/09	65.6	73	-52.8%	21.2%
Portfolio		173.7		118.7		-31.6%	
Benchmark	14/Apr/10	114.1	30/Jun/10	97.6	11	-14.5%	8.8%
Portfolio		209.0		197.0		-5.7%	
Benchmark	27/Apr/11	130.4	10/Aug/11	108.4	15	-16.8%	9.9%
Portfolio		268.6		250.0		-6.9%	
Benchmark	19/Sep/12	144.9	14/Nov/12	135.0	8	-6.9%	3.9%
Portfolio		353.5		343.0		-3.0%	
Benchmark	1/Jan/14	188.6	5/Feb/14	179.0	5	-5.1%	2.9%
Portfolio		502.1		491.2		-2.2%	
Benchmark	17/Sep/14	207.2	15/Oct/14	193.1	4	-6.8%	0.7%
Portfolio		588.2		551.9		-6.2%	

US Value Smart Portfolio Sector Weights

Legend: Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecoms, Utilities
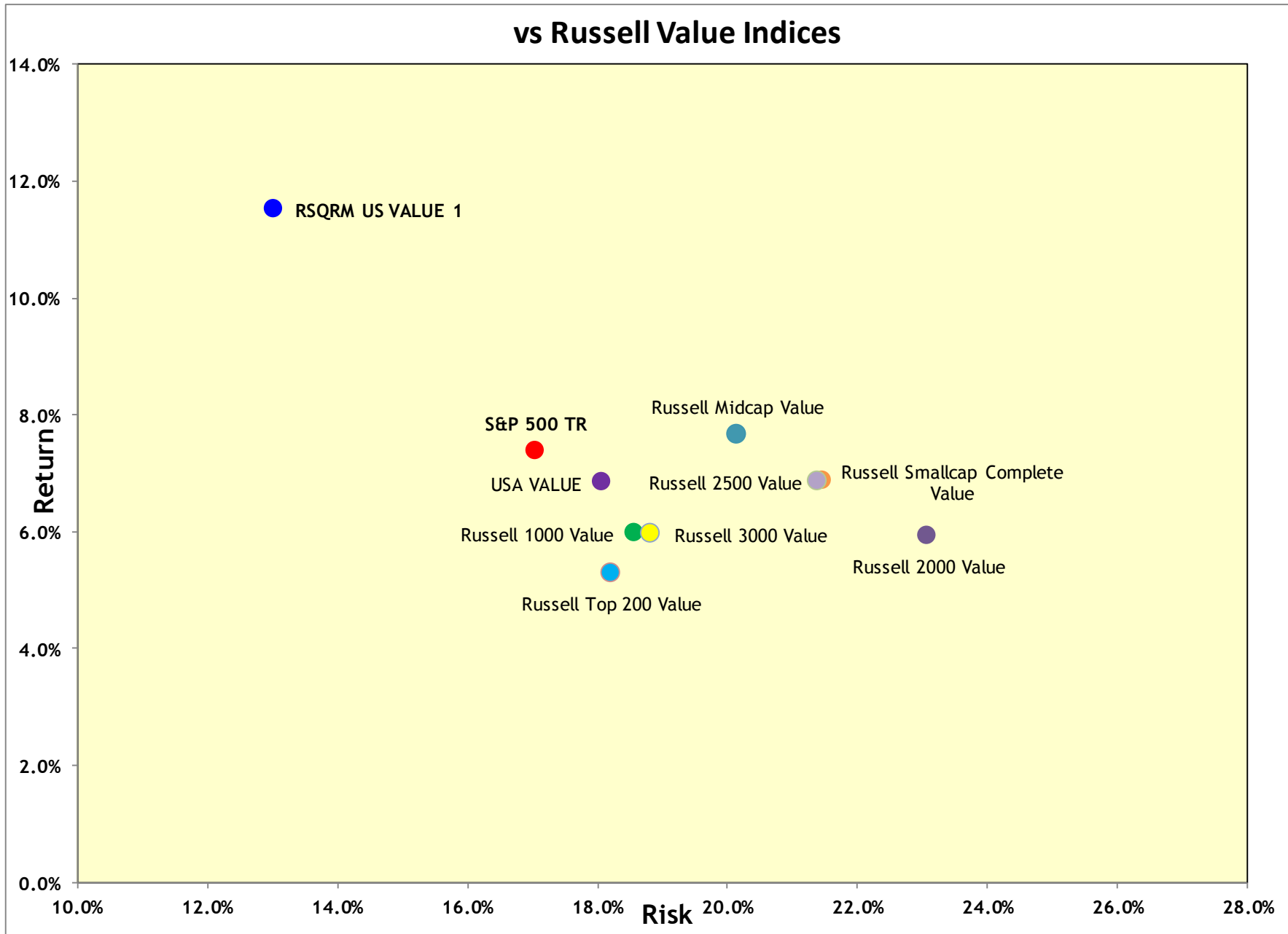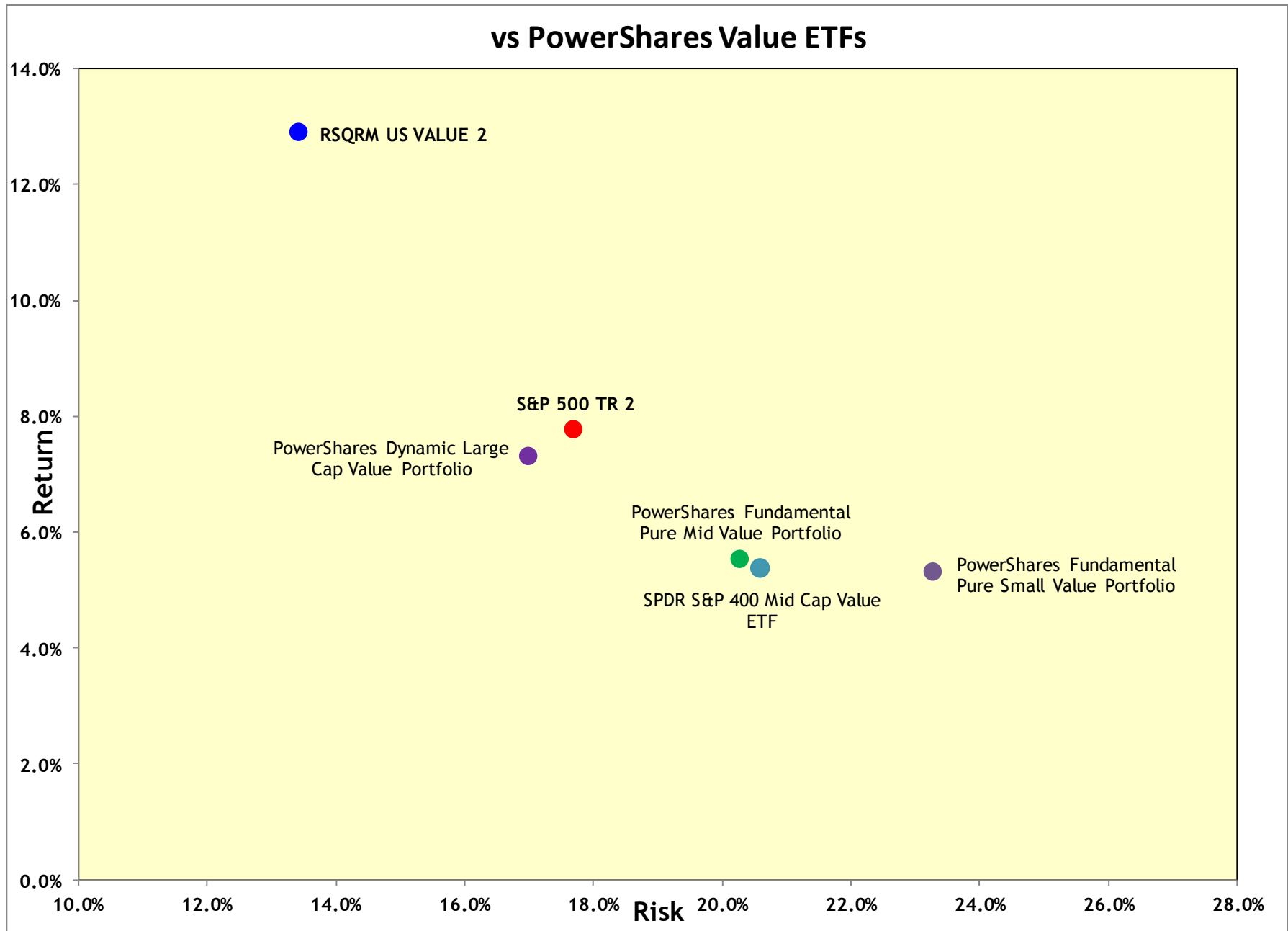
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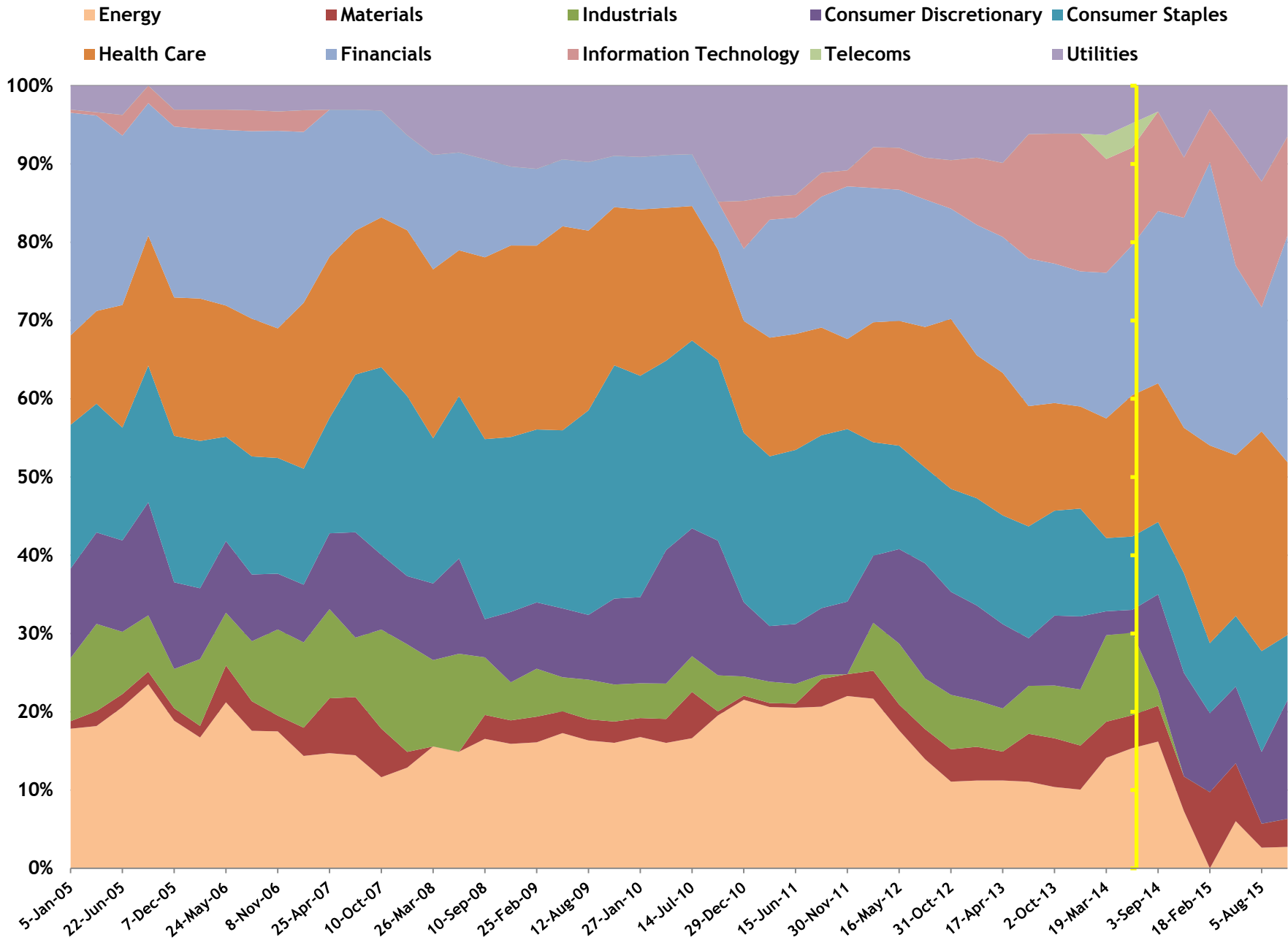
Smart Portfolios - Summary

- Smart Portfolios generally have higher return and/or lower risk than the market benchmarks, and higher I.R.s than both capitalisation-weighted and equal-weighted Style Factor portfolios

- The Performance Attribution analyses show that each of these Smart Portfolios did a good job of delivering the corresponding Style Factor return, albeit with contributions from other factors and alpha

- We would need to create Long-Short Smart Portfolios to minimise the other return contributions

- Finally, we can compare the US Value Smart Portfolio to some of the US Value ETFs actually being traded . . .
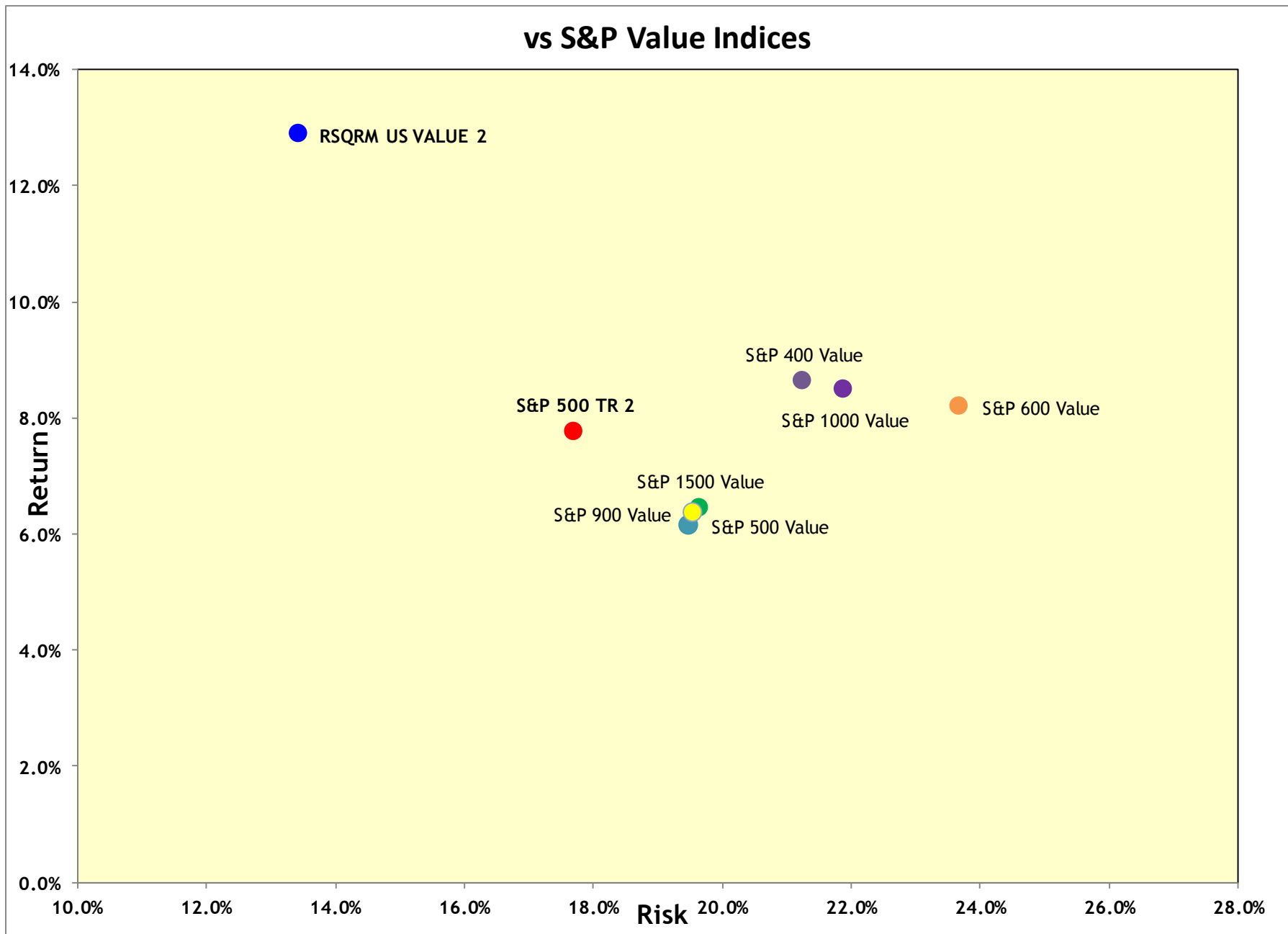
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US Value Smart Portfolio vs Value Indices

vs Russell Value Indices

US Value Smart Portfolio vs Powershares Value ETFs

vs PowerShares Value ETFs

Return (y-axis): 0.0%, 2.0%, 4.0%, 6.0%, 8.0%, 10.0%, 12.0%, 14.0%

Risk (x-axis): 10.0%, 12.0%, 14.0%, 16.0%, 18.0%, 20.0%, 22.0%, 24.0%, 26.0%, 28.0%

- RSQRM US VALUE 2
- S&P 500 TR 2
- PowerShares Dynamic Large Cap Value Portfolio
- PowerShares Fundamental Pure Mid Value Portfolio
- SPDR S&P 400 Mid Cap Value ETF
- PowerShares Fundamental Pure Small Value Portfolio

US Value Smart Portfolio vs S&P Value ETFs

vs S&P Value Indices

US Value Smart Portfolio vs S&P Pure Value ETFs
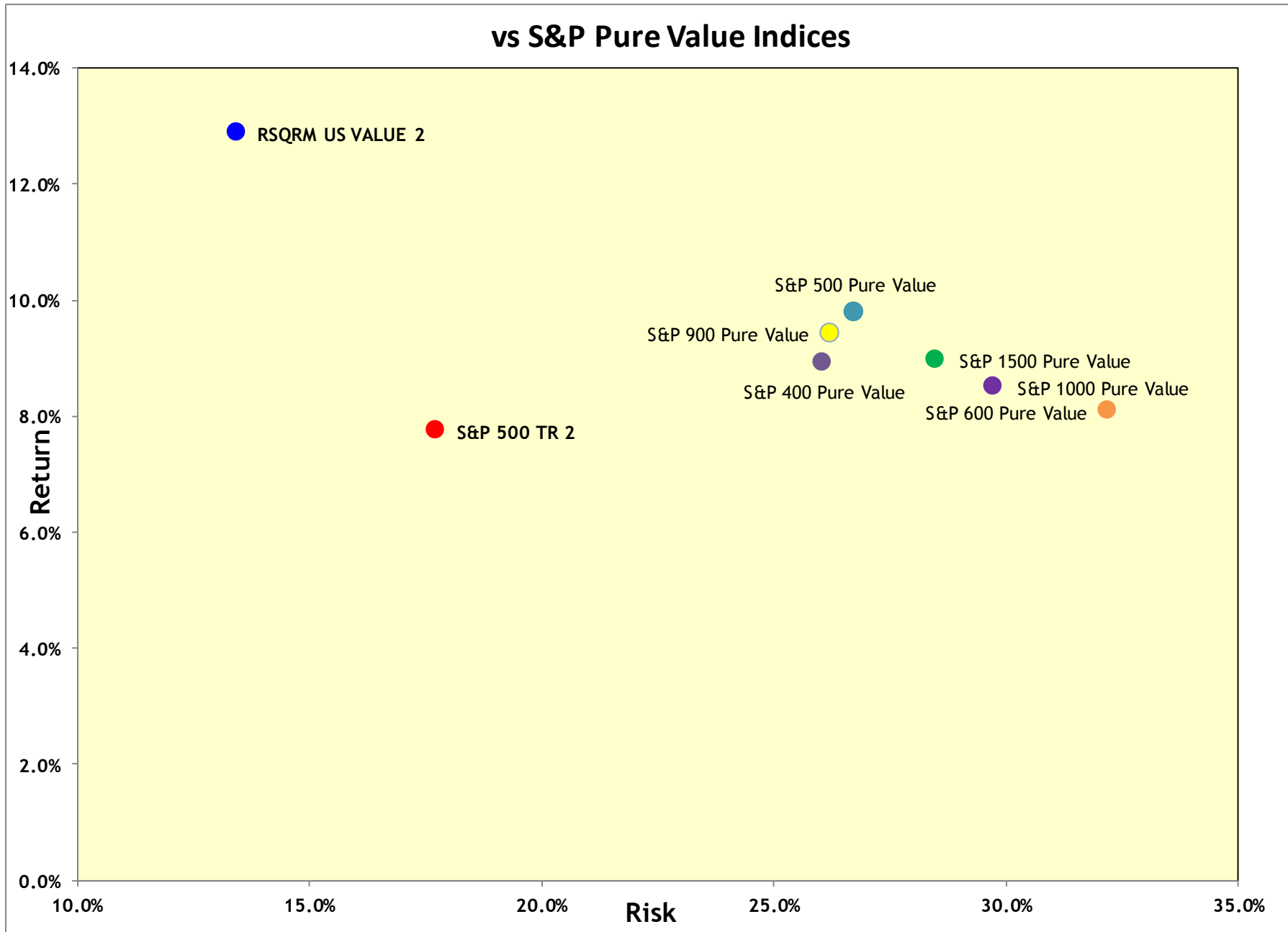
Smart Portfolios - Conclusions

- The idea of Smart Beta funds makes a lot of sense

- Their basic purpose is to deliver Style Factor returns to investors as cheaply and easily as possible

- Unfortunately, the way in which most Smart Beta funds are created is . . well, just plain dumb!

- They have a Style tilt, but don't give the Style return, and they have much higher risk than necessary, mainly due to significant exposures to other factors

- Smart Portfolios can do a much better job of delivering the Style Factor return, with lower overall risk, and much less exposure to other factors