



SMART PORTFOLIOS

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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 'Smart Beta' funds and ETFs.

Smart Beta funds . . .

- Finance academics and practitioners have long since identified a number of Style Factors that out-perform the broad equity market, on average, over time
- Examples include Value, Growth, 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

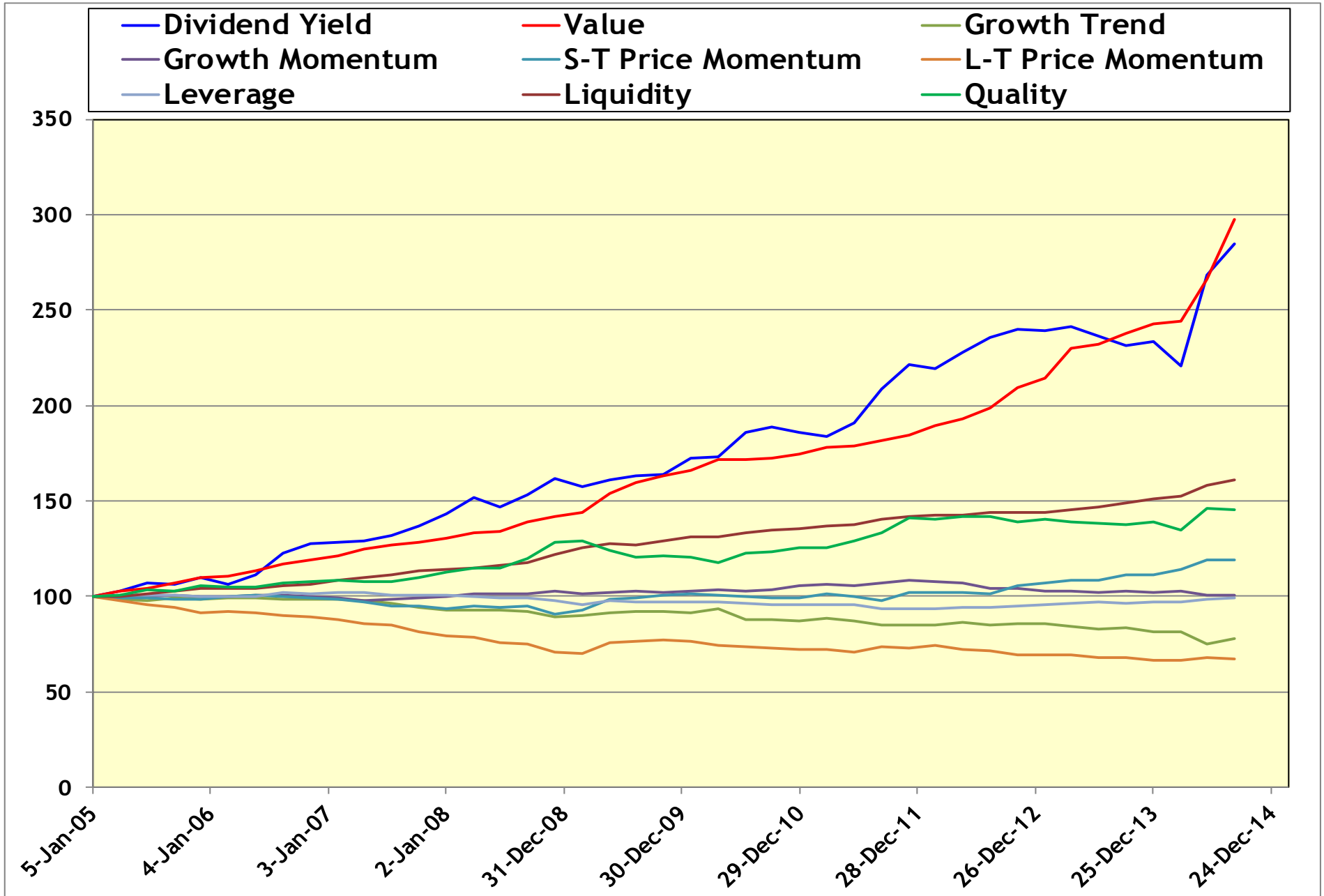
The KISS Principle at Work

- At best, these various weighting schemes will simply give a Style tilt to the portfolios
- What they should 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
- It seems the marketing imperative to have a simple story is more important than 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 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

- The chart shows Style Factor returns since Jan-2005
- Dividend Yield and Value have done best over this period, with total returns of around 190%
- Liquidity and Quality have total gains of around 50%
- Short-term Momentum had a total gain of around 20%
- Growth Momentum, and Leverage have been fairly flat, with factor premia close to zero
- Long-Term Price Momentum and Growth Trend have both had negative total returns of around -30%
- All these Style Factors are defined using historic data only, in very standard ways

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

The RSQRM US YIELD Strategy - 1

- A long-only Dividend Yield factor portfolio
- Target Portfolio Yield = Universe average yield + 3%
- Maximum Stock holding = 3%
- Maximum Cash holding = 2%
 - Standard practice 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 RSQRM US YIELD Strategy - 2

- Expected return = Trailing Annual Dividend Yield
 - = Last 12 months dividends / Current price
- Risk = RSQRM 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 price momentum L-T Price 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

The RSQRM 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

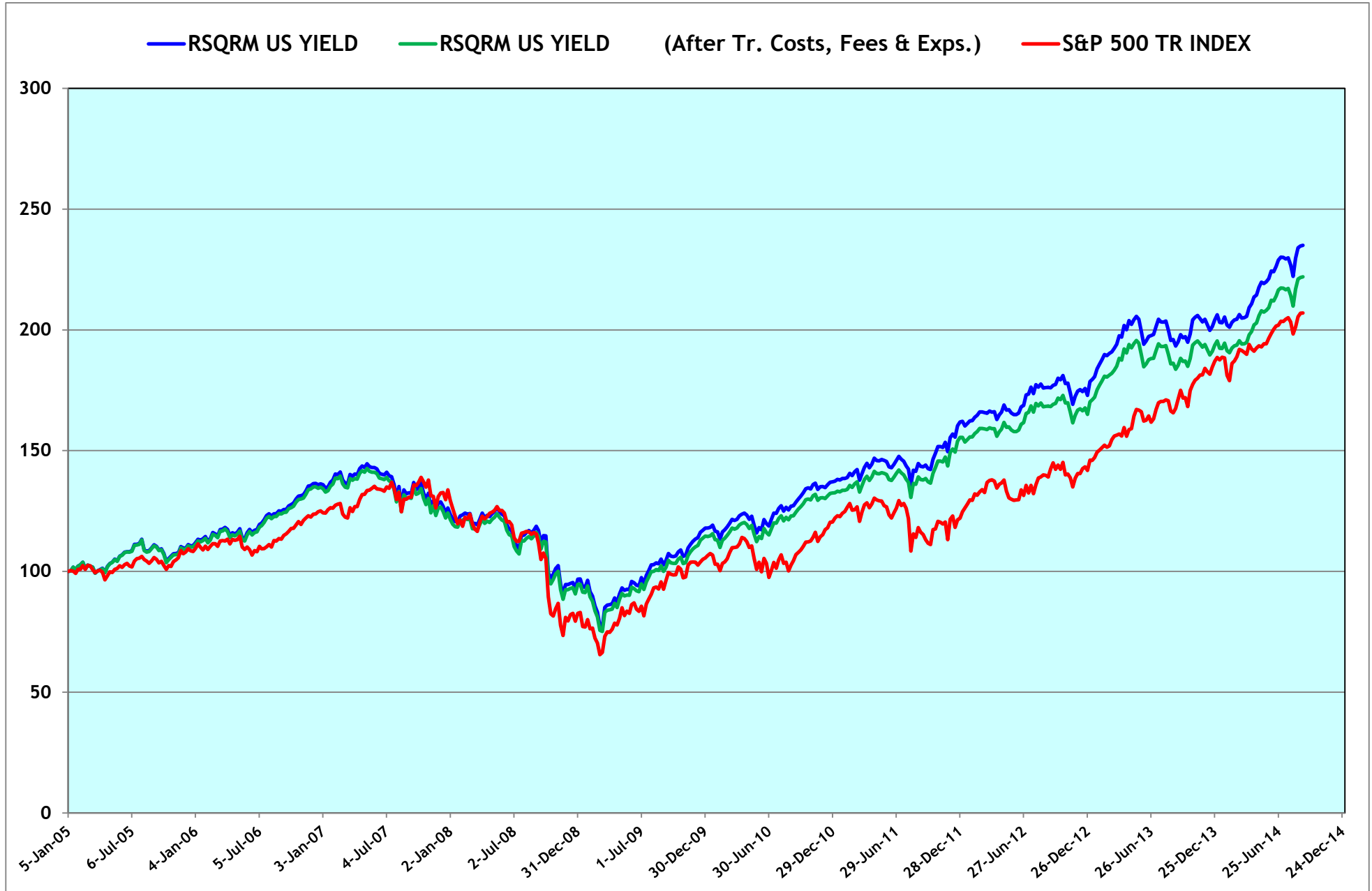
The RSQRM US YIELD Strategy - 4

- 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 identifying the sensitivities of each stock to the various factors, 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

The RSQRM 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 : 0.5% + 0.1% expenses
- However, these assumptions are not material to the relative performance of these Style Factor portfolios

US Yield Smart Portfolio



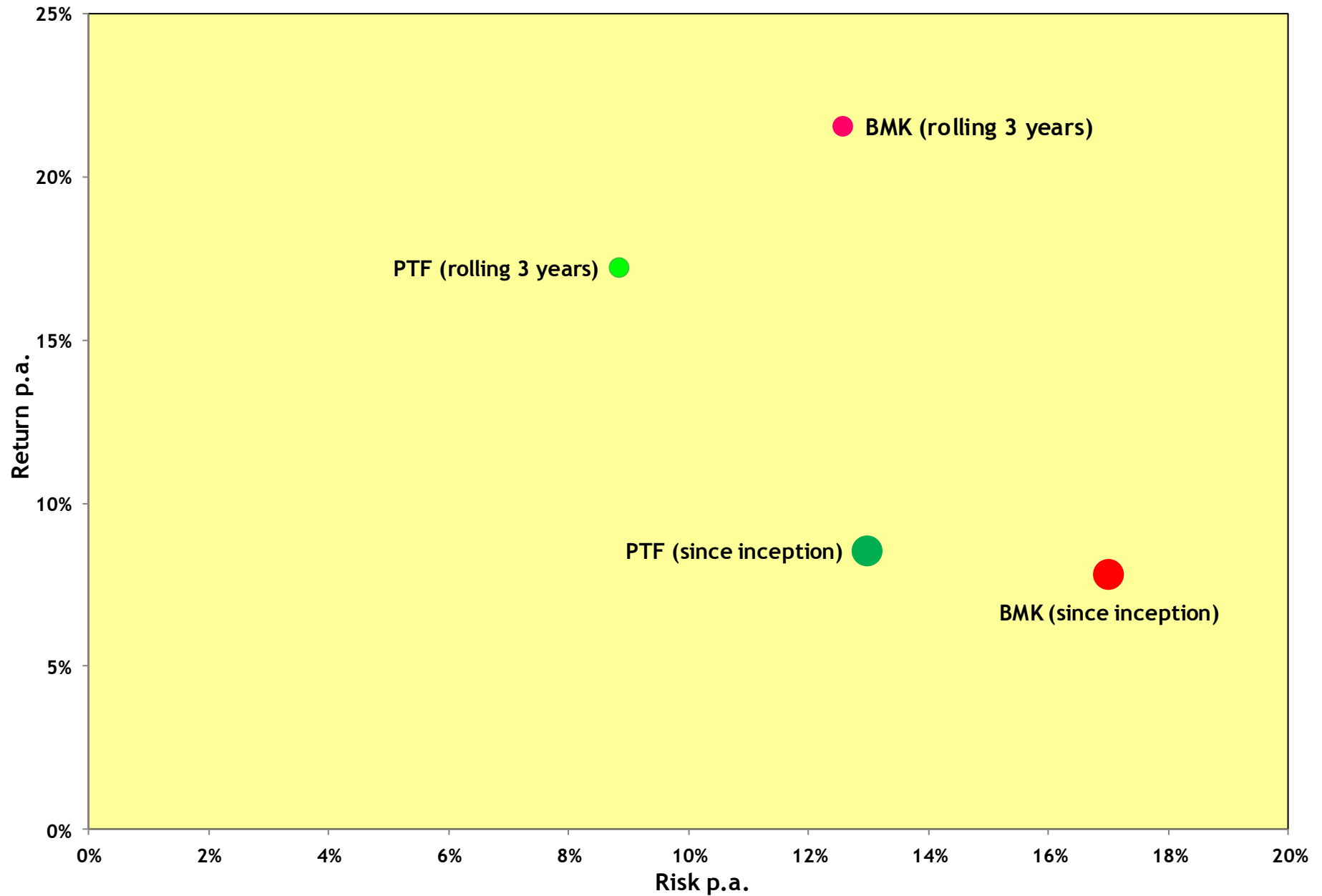
US Yield Smart Portfolio from 5-Jan-05

From 5-Jan-05 to 3-Sep-14				
Annualised Performance since Inception*				
	<u>Return</u>	<u>Risk</u>	<u>I. R.</u>	
Portfolio*	8.56%	13.0%	0.659	
Benchmark	7.80%	17.0%	0.459	
Relative*	0.76%	8.9%	0.086	
Beta to S&P 500 TR index = 0.655				
Performance Attribution				
	<u>Target Style</u>	<u>Other Styles</u>	<u>Other Factors</u>	<u>Portfolio Alpha</u>
Return	10.2%	1.5%	1.6%	-4.2%
Pct	111%	17%	18%	-46%
Average Number of Holdings & Annualised Turnover				
Holdings :	41	Turnover :	22%	

US Yield Smart Portfolio - Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10-May-06	2,014.0	14-Jun-06	1,876.7	5	-6.8%	5.4%
Portfolio		116.8		115.1		-1.4%	
Benchmark	10-Oct-07	2,443.0	4-Mar-09	1,153.3	73	-52.8%	9.1%
Portfolio		134.3		75.7		-43.7%	
Benchmark	14-Apr-10	2,006.1	30-Jun-10	1,715.2	11	-14.5%	10.5%
Portfolio		119.9		115.1		-4.0%	
Benchmark	27-Apr-11	2,292.1	10-Aug-11	1,906.5	15	-16.8%	9.1%
Portfolio		141.5		130.6		-7.7%	
Benchmark	19-Sep-12	2,548.1	14-Nov-12	2,372.9	8	-6.9%	2.3%
Portfolio		169.2		161.5		-4.6%	
Benchmark	1-Jan-14	3,315.6	5-Feb-14	3,146.5	5	-5.1%	2.6%
Portfolio		195.4		190.5		-2.5%	

Portfolio & Benchmark Return and Risk



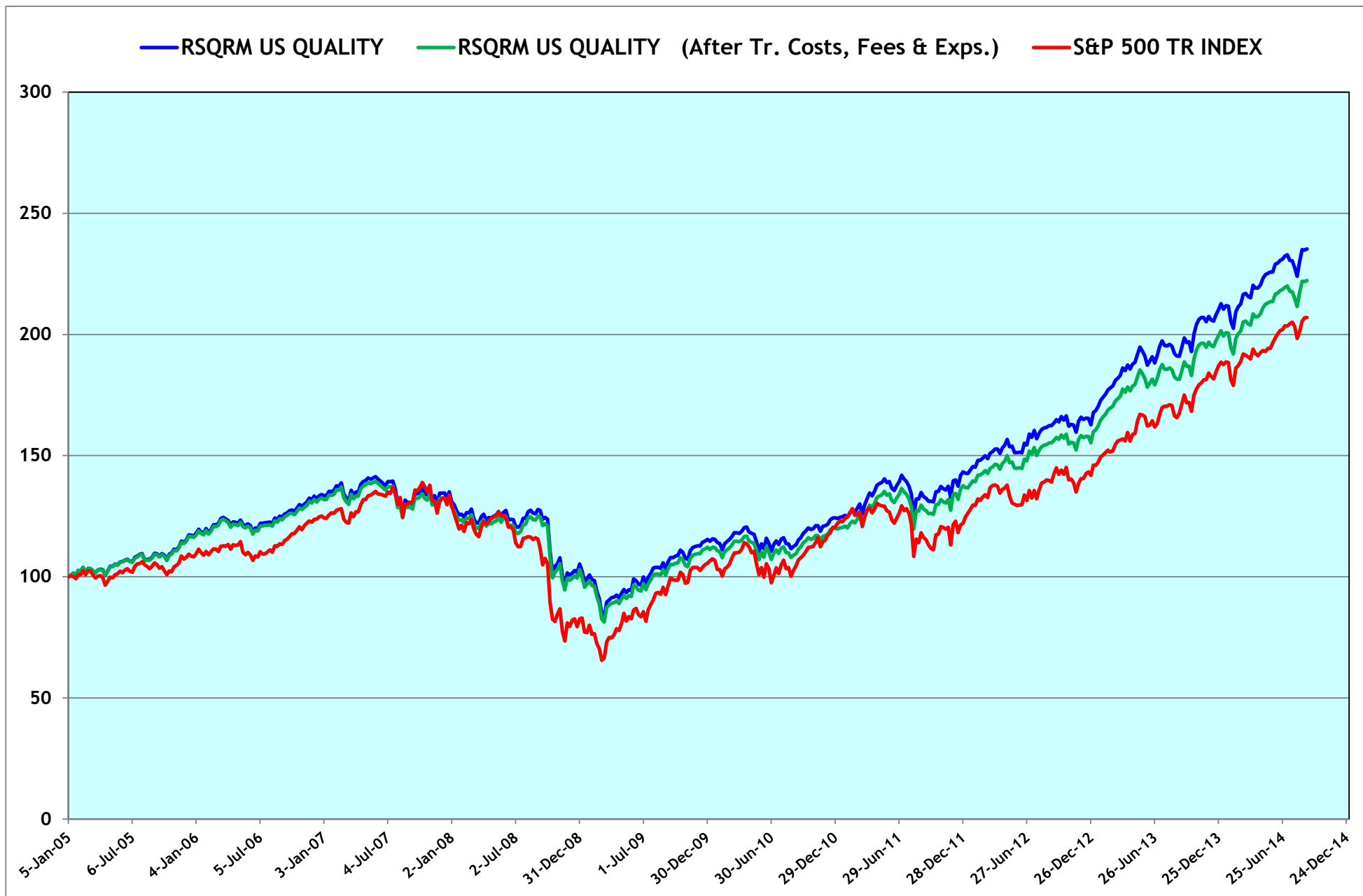
Now Repeat for other US Styles

- 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

Other US Styles for Smart Portfolios

- **YIELD** = Trailing 12 month Dividend Yield
Annualised Factor return = 11.4%
- **QUALITY** = Sustainable Growth, Cash Flow to Sales, Return on Equity and Return on Assets
Annualised Factor return = 3.93%
- **GROWTH TREND** = Earnings Growth, Sales Growth, and Book Value Growth
Annualised Factor return = -2.54%
- **VALUE** = Book to Price, Cash-flow to Price, and Earnings to Price
Annualised Factor return = 11.9%

US Quality Smart Portfolio



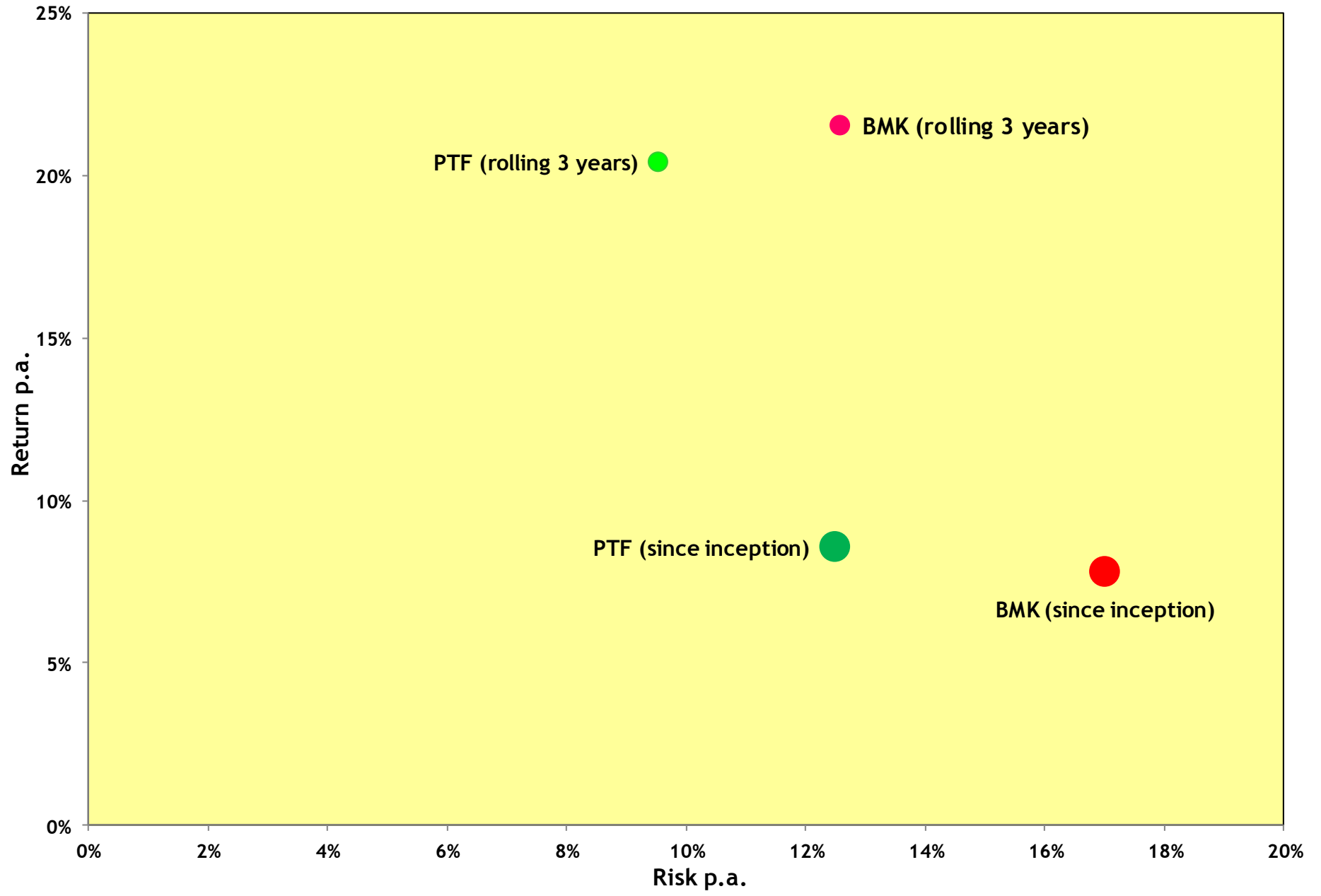
US Quality Smart Portfolio from 5-Jan-05

From 5-Jan-05 to 3-Sep-14				
Annualised Performance since Inception*				
	<u>Return</u>	<u>Risk</u>	<u>I. R.</u>	
Portfolio*	8.57%	12.5%	0.687	
Benchmark	7.80%	17.0%	0.459	
Relative*	0.77%	7.7%	0.101	
Beta to S&P 500 TR index = 0.668				
Performance Attribution				
	<u>Target Style</u>	<u>Other Styles</u>	<u>Other Factors</u>	<u>Portfolio Alpha</u>
Return	4.1%	7.6%	2.6%	-5.1%
Pct	44%	83%	28%	-55%
Average Number of Holdings & Annualised Turnover				
Holdings :	42	Turnover :	52%	

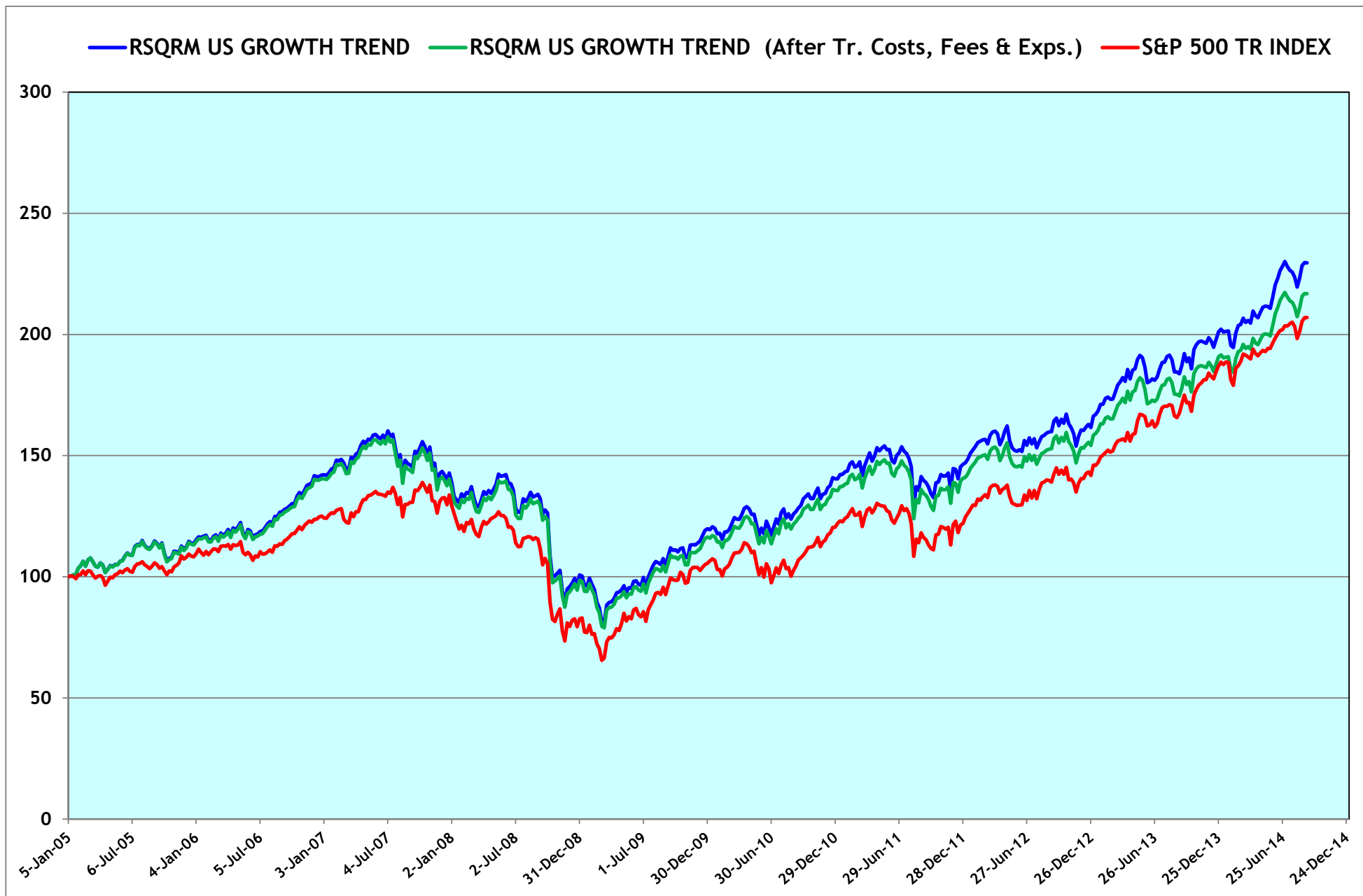
US Quality Smart Portfolio - Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10-May-06	2,014.0	14-Jun-06	1,876.7	5	-6.8%	2.9%
Portfolio		122.5		117.6		-4.0%	
Benchmark	10-Oct-07	2,443.0	4-Mar-09	1,153.3	73	-52.8%	14.3%
Portfolio		134.3		82.6		-38.5%	
Benchmark	14-Apr-10	2,006.1	30-Jun-10	1,715.2	11	-14.5%	6.4%
Portfolio		116.6		107.1		-8.1%	
Benchmark	27-Apr-11	2,292.1	10-Aug-11	1,906.5	15	-16.8%	7.0%
Portfolio		132.8		119.7		-9.8%	
Benchmark	19-Sep-12	2,548.1	14-Nov-12	2,372.9	8	-6.9%	3.6%
Portfolio		157.6		152.4		-3.3%	
Benchmark	1-Jan-14	3,315.6	5-Feb-14	3,146.5	5	-5.1%	0.3%
Portfolio		201.5		191.9		-4.8%	

Portfolio & Benchmark Return and Risk



US Growth Trend Smart Portfolio



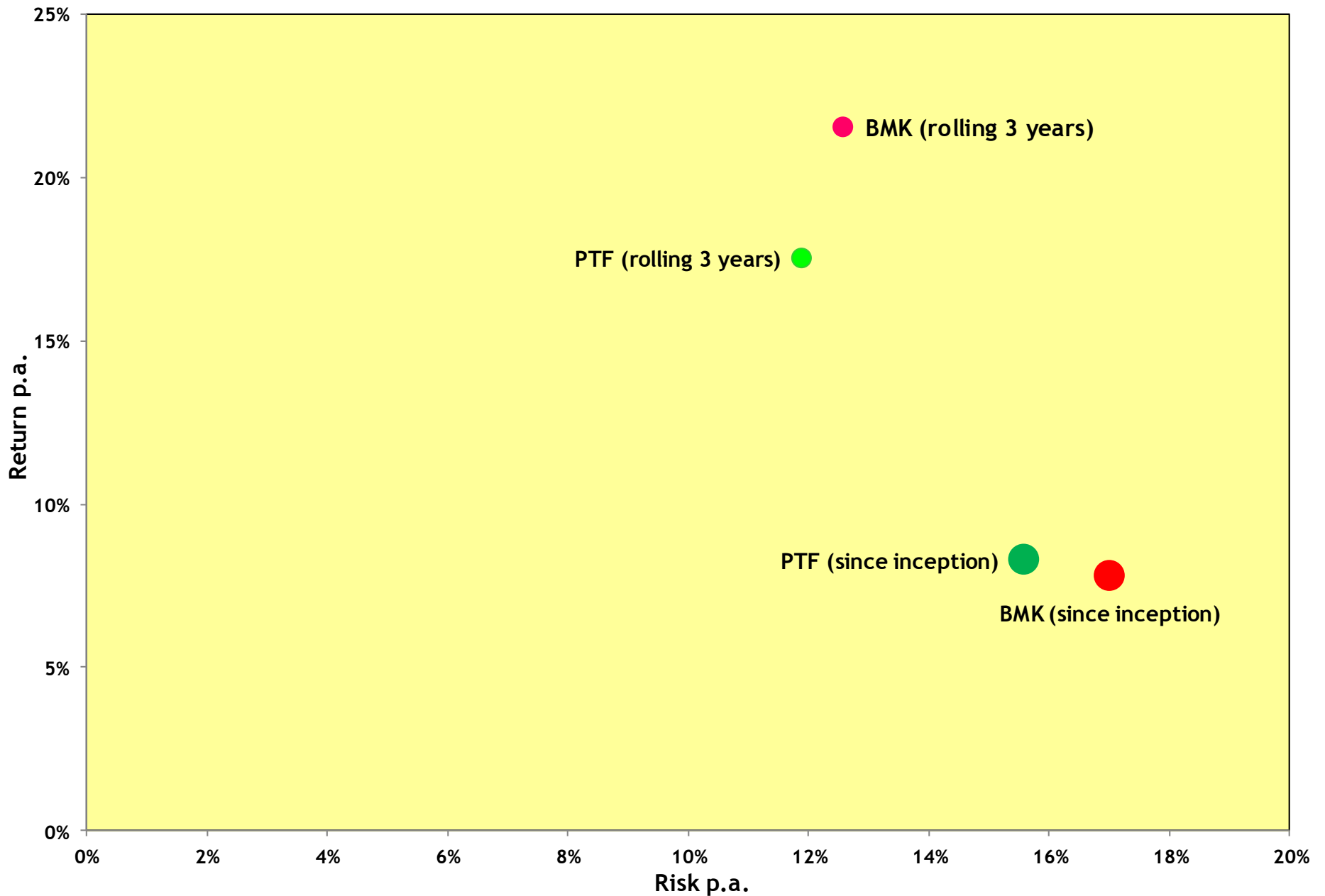
US Growth Smart Portfolio from 5-Jan-05

From 5-Jan-05 to 3-Sep-14				
Annualised Performance since Inception*				
	<u>Return</u>	<u>Risk</u>	<u>I. R.</u>	
Portfolio*	8.29%	15.6%	0.533	
Benchmark	7.80%	17.0%	0.459	
Relative*	0.50%	6.3%	0.079	
Beta to S&P 500 TR index = 0.852				
Performance Attribution				
	<u>Target Style</u>	<u>Other Styles</u>	<u>Other Factors</u>	<u>Portfolio Alpha</u>
Return	-2.3%	7.1%	2.9%	1.3%
Pct	-26%	79%	32%	15%
Average Number of Holdings & Annualised Turnover				
Holdings :	36	Turnover :	78%	

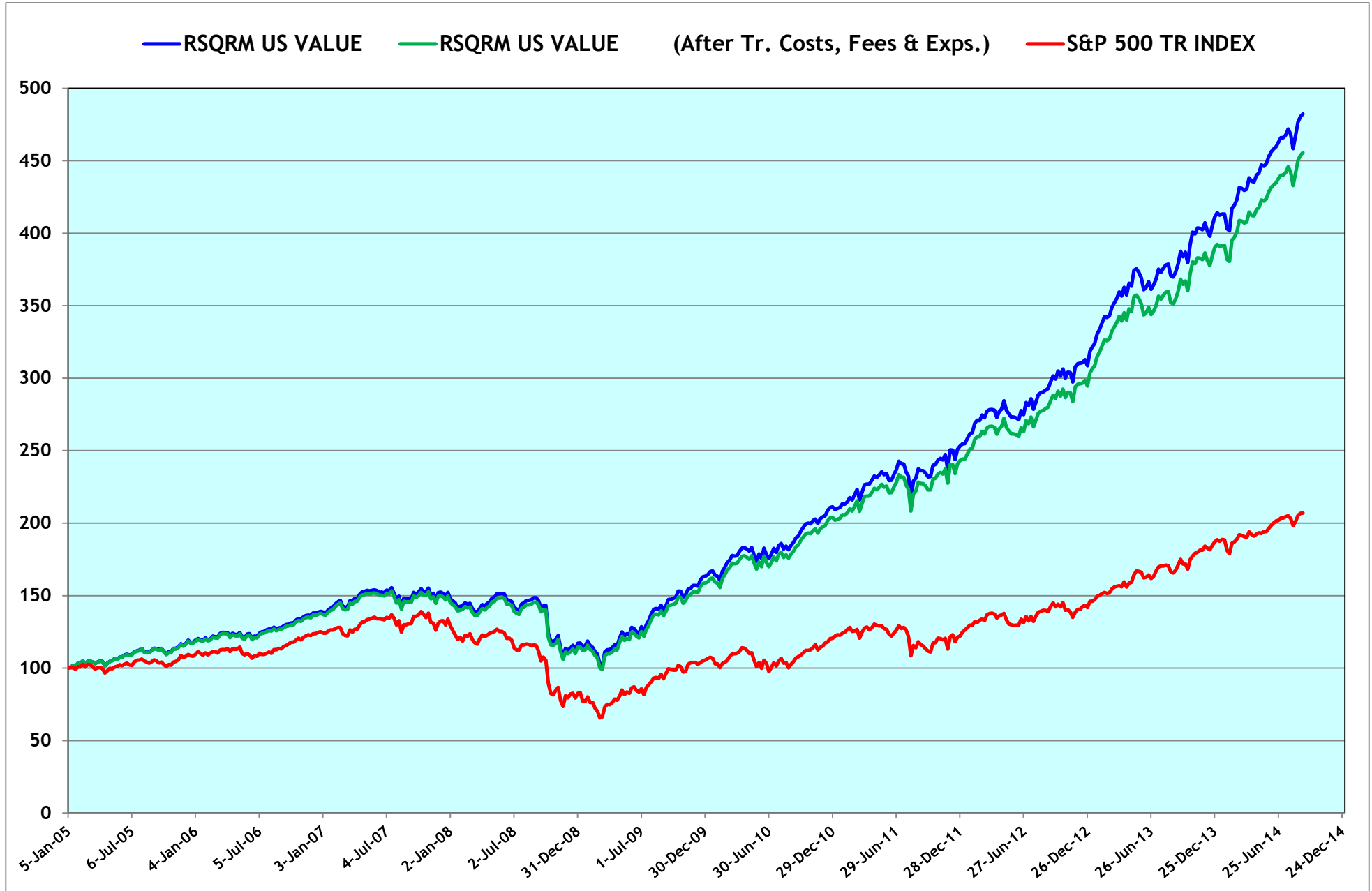
US Growth Smart Portfolio - Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10-May-06	2,014.0	14-Jun-06	1,876.7	5	-6.8%	1.7%
Portfolio		121.5		115.3		-5.1%	
Benchmark	10-Oct-07	2,443.0	4-Mar-09	1,153.3	73	-52.8%	4.7%
Portfolio		153.2		79.6		-48.1%	
Benchmark	14-Apr-10	2,006.1	30-Jun-10	1,715.2	11	-14.5%	5.9%
Portfolio		124.3		113.6		-8.6%	
Benchmark	27-Apr-11	2,292.1	10-Aug-11	1,906.5	15	-16.8%	0.8%
Portfolio		147.6		123.9		-16.0%	
Benchmark	19-Sep-12	2,548.1	14-Nov-12	2,372.9	8	-6.9%	-0.2%
Portfolio		158.2		146.9		-7.1%	
Benchmark	1-Jan-14	3,315.6	5-Feb-14	3,146.5	5	-5.1%	1.4%
Portfolio		191.5		184.4		-3.7%	

Portfolio & Benchmark Return and Risk



US Value Smart Portfolio



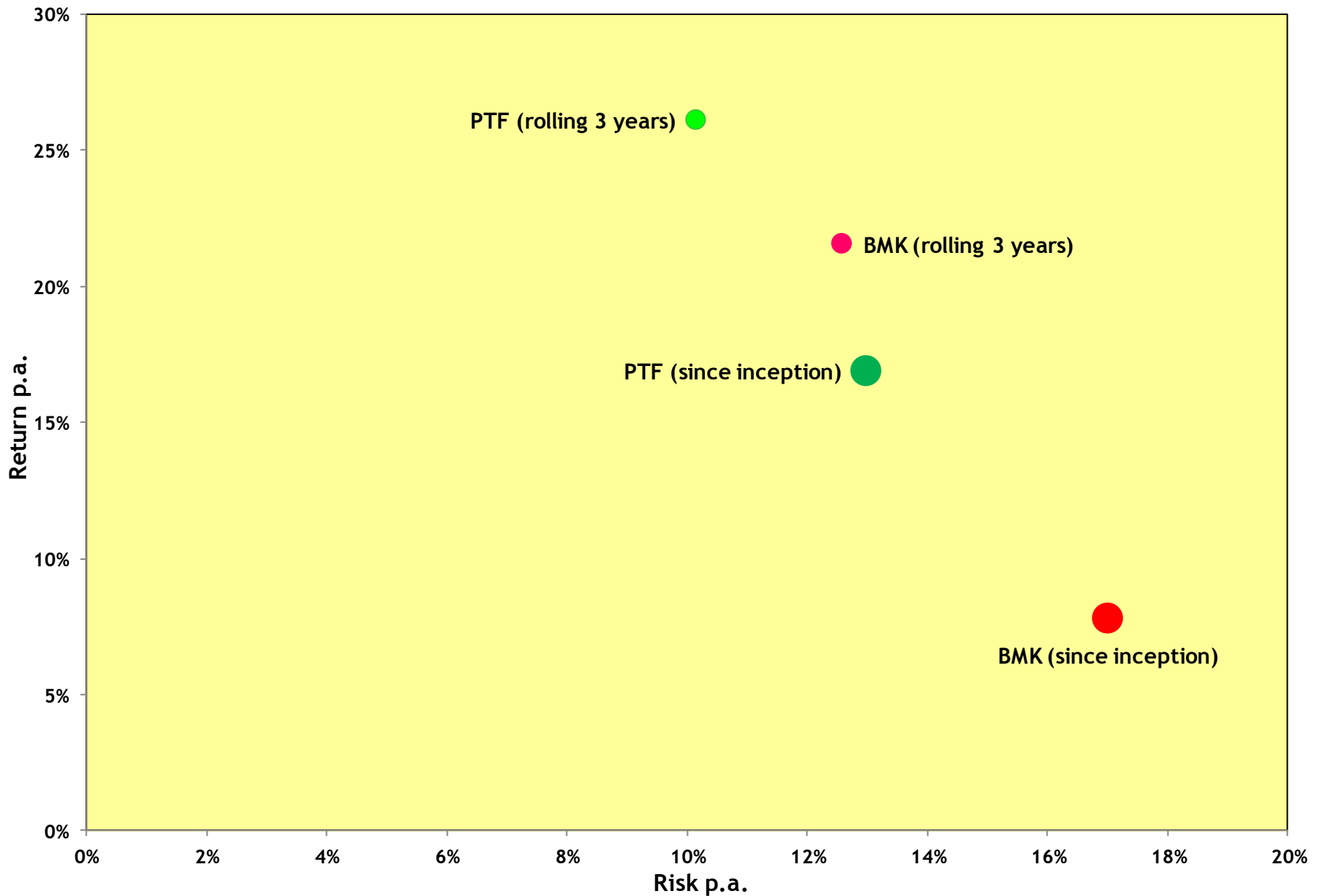
US Value Smart Portfolio from 5-Jan-05

From 5-Jan-05 to 3-Sep-14				
Annualised Performance since Inception*				
	<u>Return</u>	<u>Risk</u>	<u>I. R.</u>	
Portfolio*	16.90%	13.0%	1.302	
Benchmark	7.80%	17.0%	0.459	
Relative*	9.10%	6.9%	1.312	
Beta to S&P 500 TR index = 0.709				
Performance Attribution				
	<u>Target Style</u>	<u>Other Styles</u>	<u>Other Factors</u>	<u>Portfolio Alpha</u>
Return	11.0%	9.1%	2.9%	-5.8%
Pct	64%	53%	17%	-34%
Average Number of Holdings & Annualised Turnover				
Holdings :	42	Turnover :	50%	

US Value Smart Portfolio - Worst Drawdowns

ABSOLUTE DRAWDOWNS	PEAK	VALUE	VALLEY	VALUE	WEEKS	RETURNS	RELATIVE RETURN
Benchmark	10-May-06	2,014.0	14-Jun-06	1,876.7	5	-6.8%	3.6%
Portfolio		123.6		119.6		-3.2%	
Benchmark	10-Oct-07	2,443.0	4-Mar-09	1,153.3	73	-52.8%	18.5%
Portfolio		152.2		100.0		-34.3%	
Benchmark	14-Apr-10	2,006.1	30-Jun-10	1,715.2	11	-14.5%	10.5%
Portfolio		177.1		170.0		-4.0%	
Benchmark	27-Apr-11	2,292.1	10-Aug-11	1,906.5	15	-16.8%	9.8%
Portfolio		224.0		208.3		-7.0%	
Benchmark	19-Sep-12	2,548.1	14-Nov-12	2,372.9	8	-6.9%	5.3%
Portfolio		288.3		283.8		-1.5%	
Benchmark	1-Jan-14	3,315.6	5-Feb-14	3,146.5	5	-5.1%	2.1%
Portfolio		392.3		380.6		-3.0%	

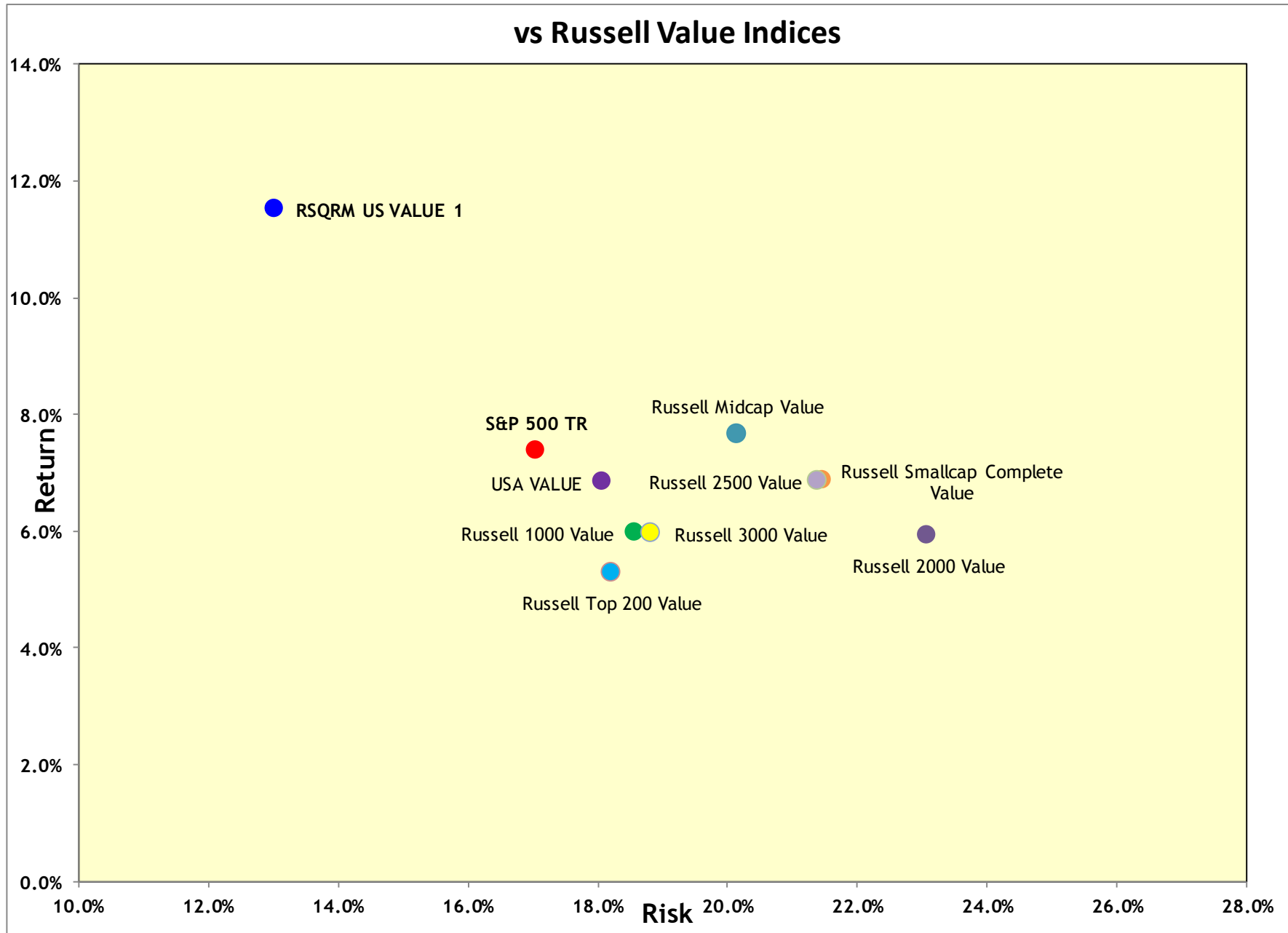
Portfolio & Benchmark Return and Risk



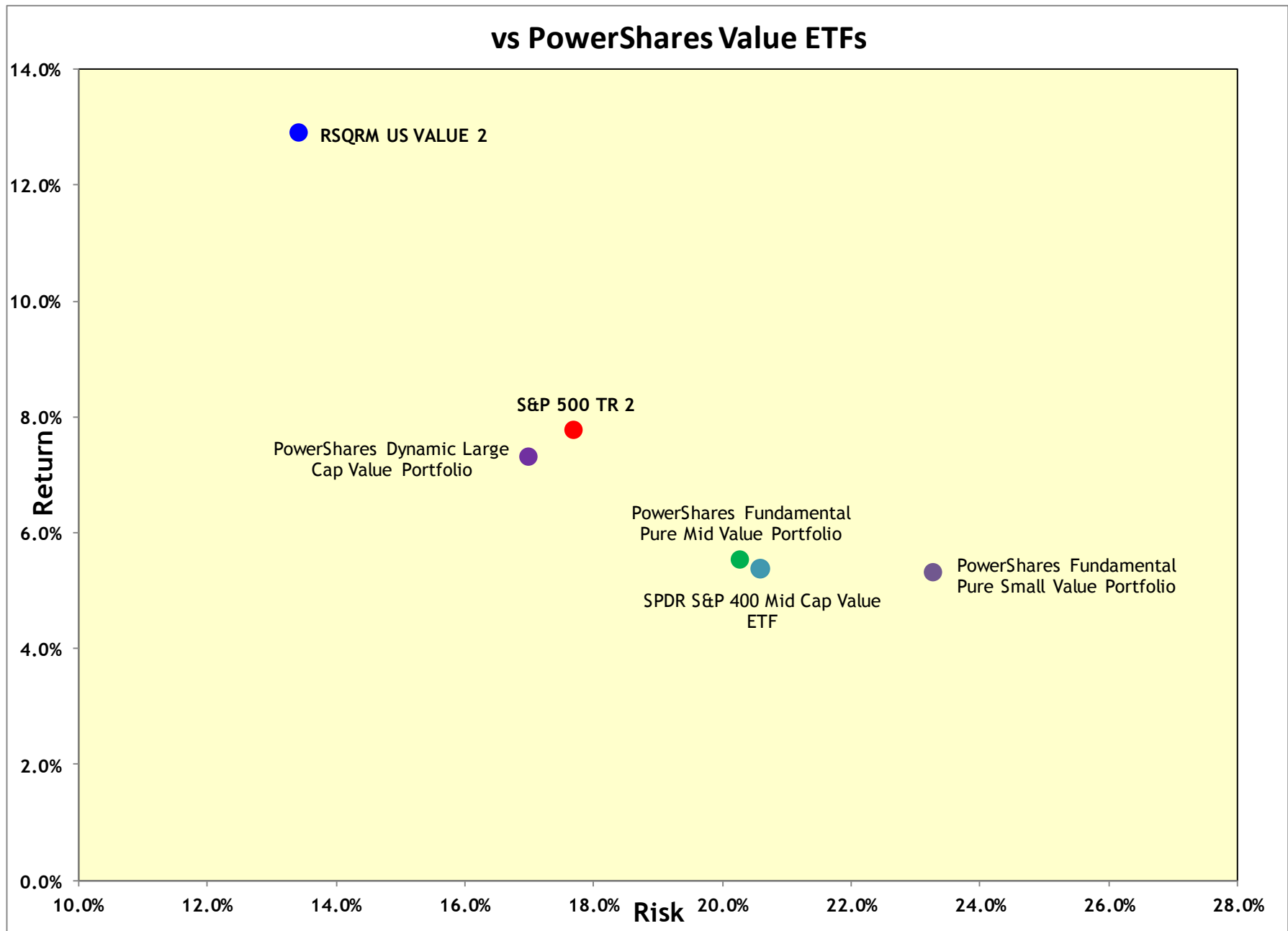
Smart Portfolios - Summary

- Smart Portfolios have higher return and/or lower risk than the market benchmarks
- They also have 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. .

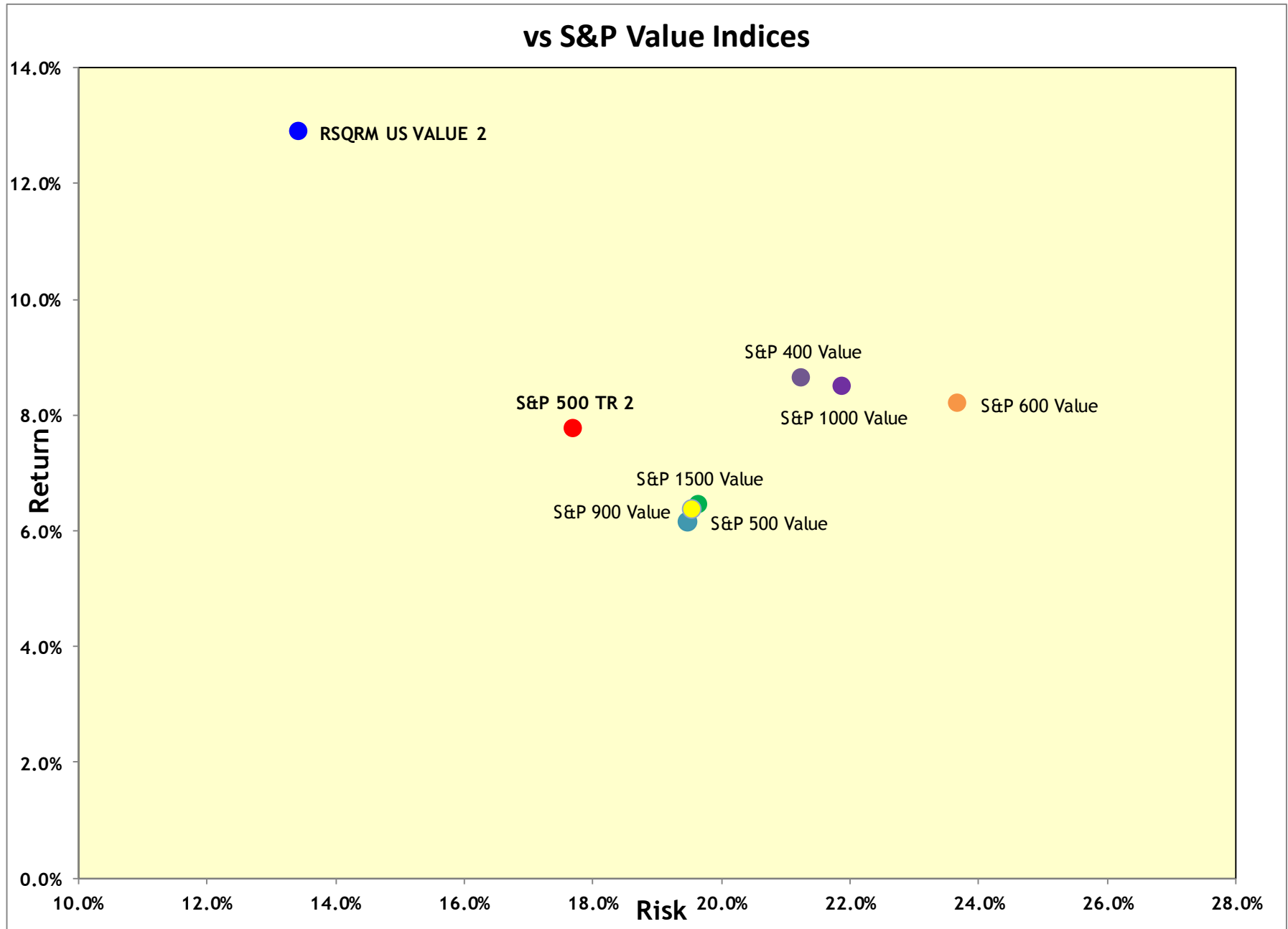
US Value Smart Portfolio vs Value Indices



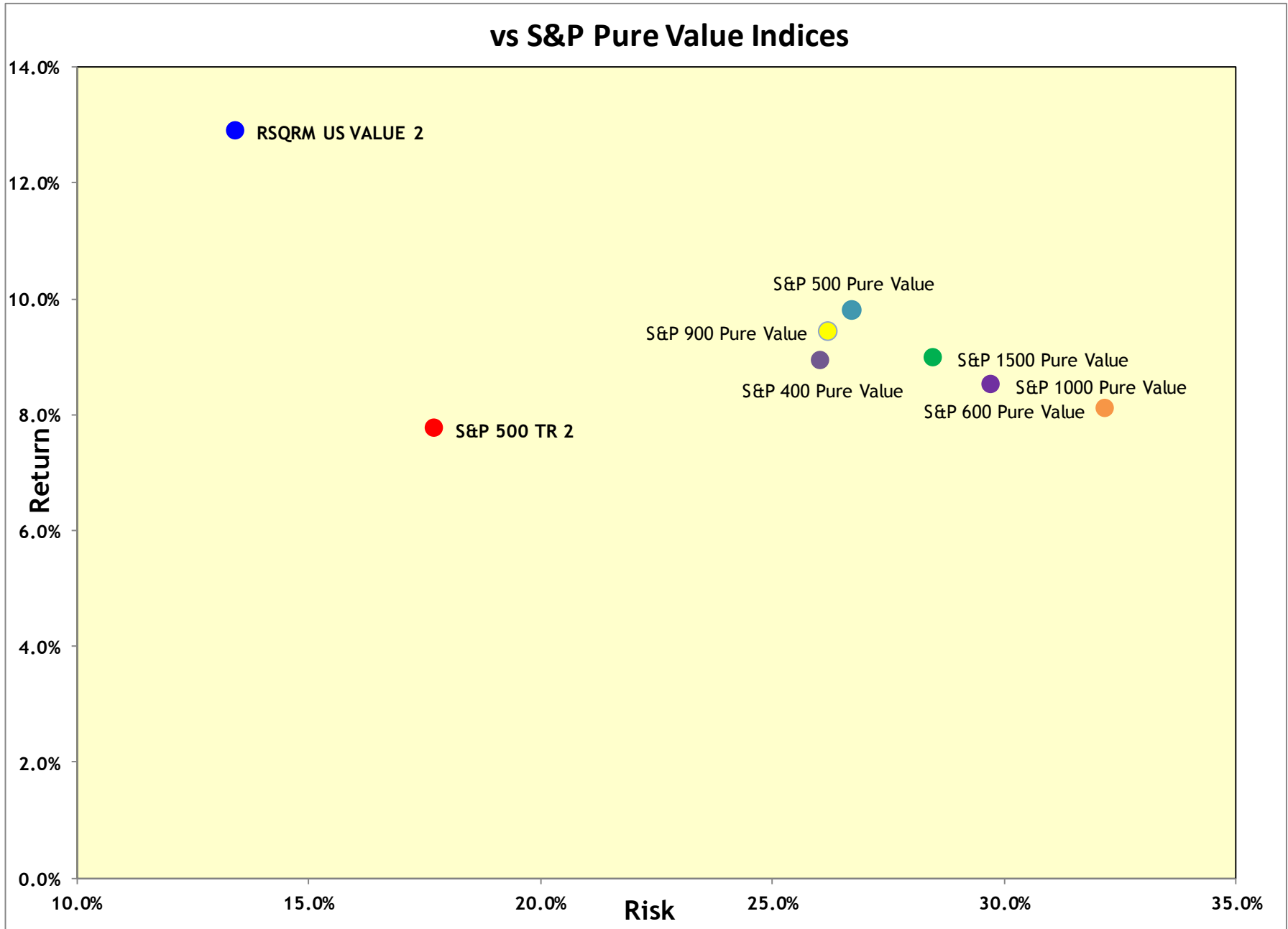
US Value Smart Portfolio vs Powershares Value ETFs



US Value Smart Portfolio vs S&P Value ETFs



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
- They usually have much higher risk than necessary, as well as 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

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