



building
shock resistant
portfolios



Diversification

Are we managing away too much return?

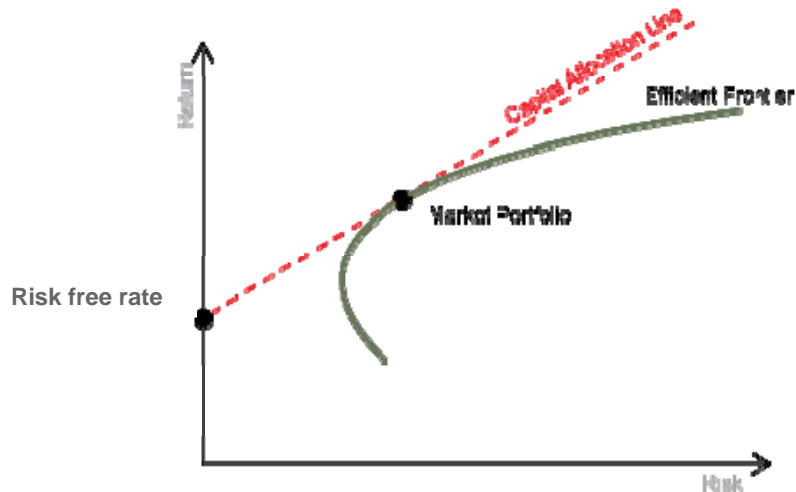


Richard Keary
FRM (Australia) Pty Ltd

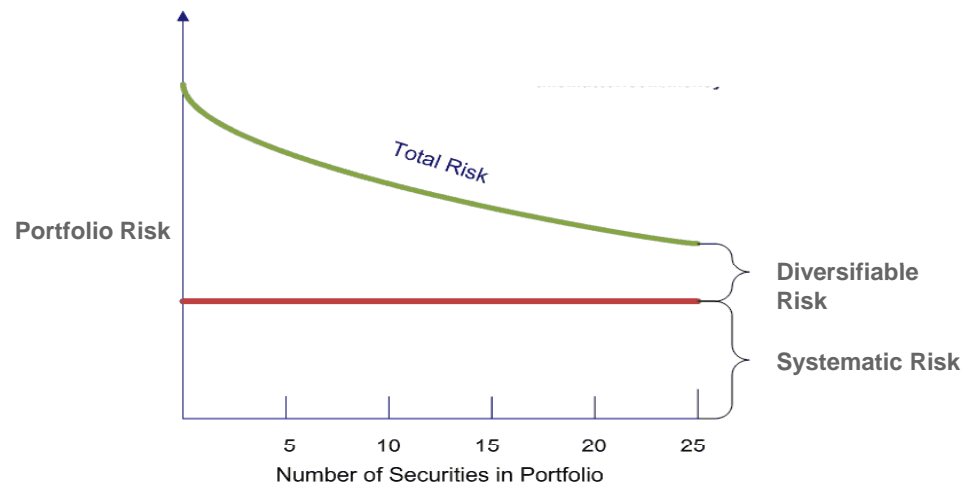
A story in three parts

- Models to be used but never believed
 - MPT and CAPM have been blamed for a lot
 - If we throw them out, how do we ground our beliefs
- Good portfolio construction – a micro view
 - Building a specific portfolio to maximise the diversification benefit before return degradation sets in
- Good portfolio construction – a macro view
 - Good portfolio construction allows the less than perfect correlation between risky assets manage the overall risk
 - Lazy portfolio construction tries to manage risk by diversifying every component

MPT and CAPM – ‘models to be used but never believed’



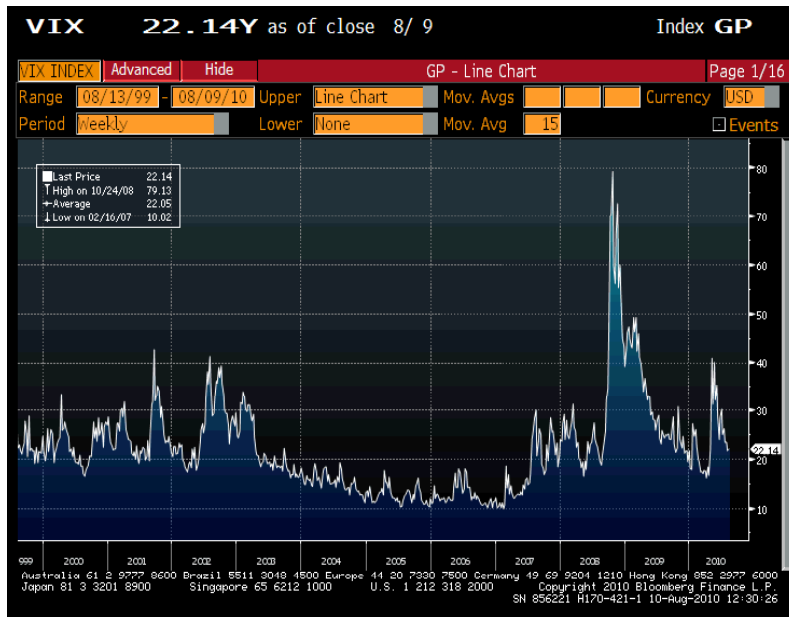
- The major legacy of MPT is that portfolio diversification can reduce investment risk



- The diversification of idiosyncratic risks that is required by CAPM has left portfolios under-diversified
- The concentration has been to the equity market risk factor

Source: FRM, stylized examples

Estimating the variables is a limitation.....



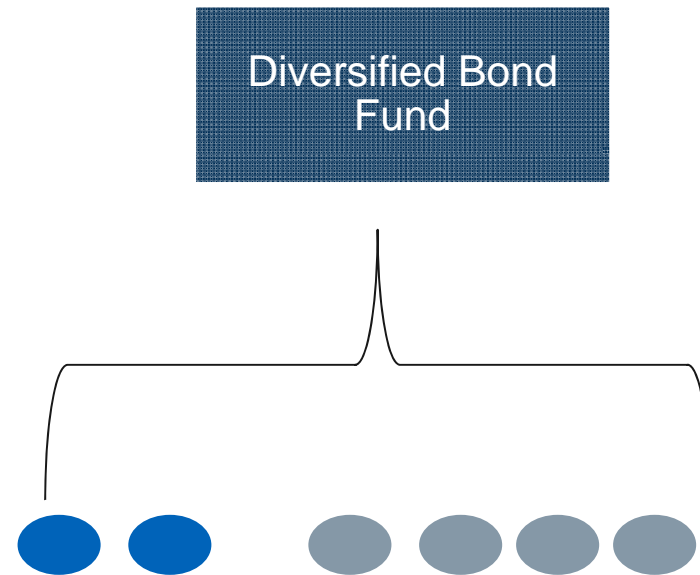
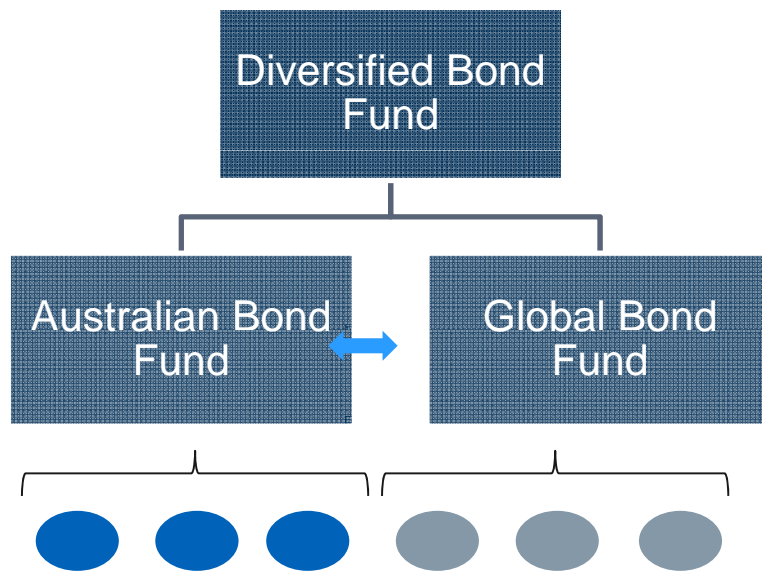
- Volatility is assumed to be fairly stable – the VIX index is the market’s best bet on volatility in the coming thirty days
- Five and ten years ago did any model estimate close to zero return on the S&P 500 index?
- Correlations do converge
 - We can make a case that is a good thing under certain circumstances

S&P500	Total Return %	Compounded % pa
3 years	-26.62	-9.79
5 years	-3.90	-0.79
10 years	-14.77	-1.59

Source: Bloomberg, periods ending June 2010.

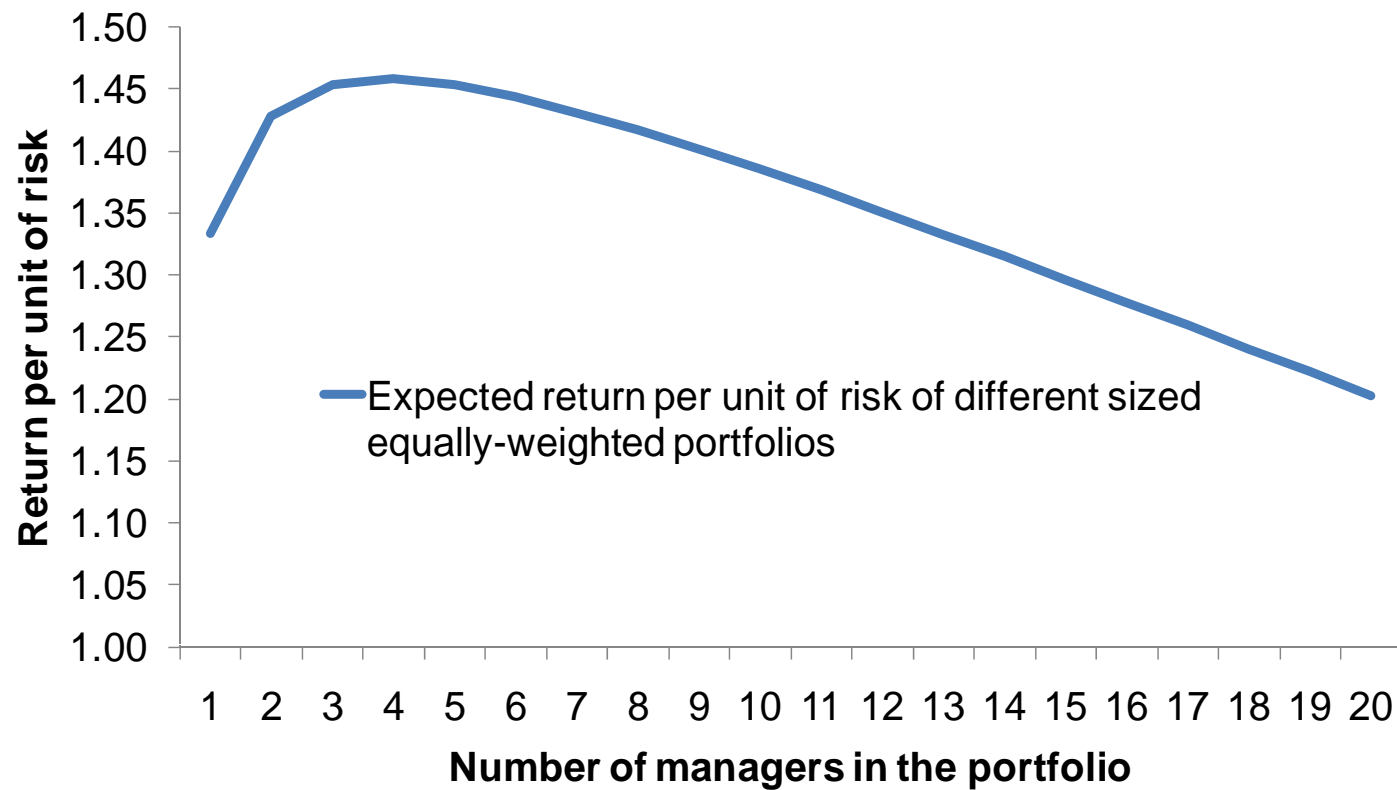
.....then we impose real limitations on ourselves

The use of benchmarks and sloppy product origination means these two Diversified Fixed Income funds are NOT the same – one is clearly inferior



There is a real cost to over diversification

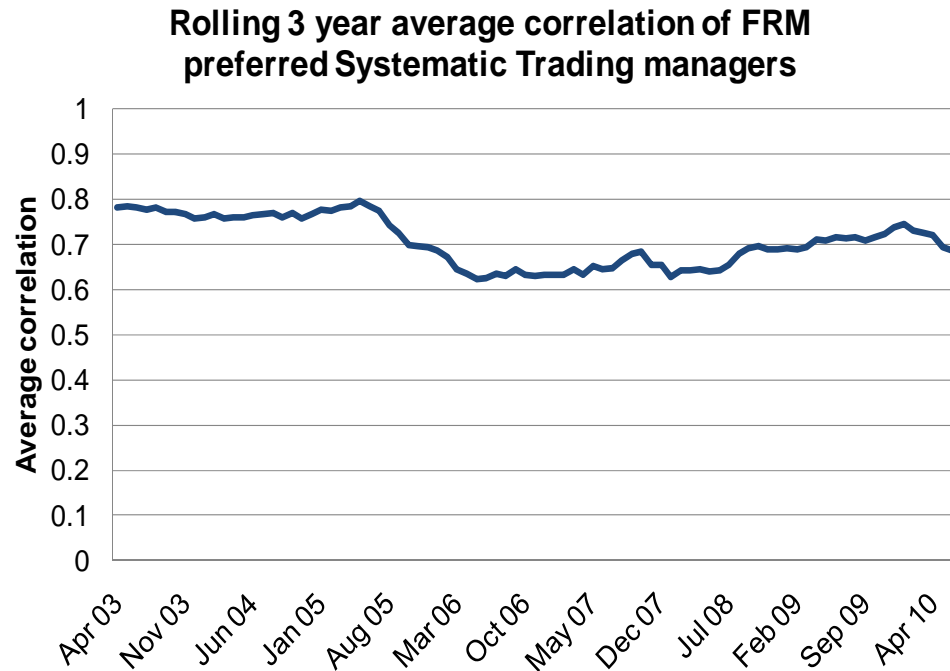
Diversification and Expected Return



Source: FRM, stylized examples



When does the 'free lunch' of diversification cost us?

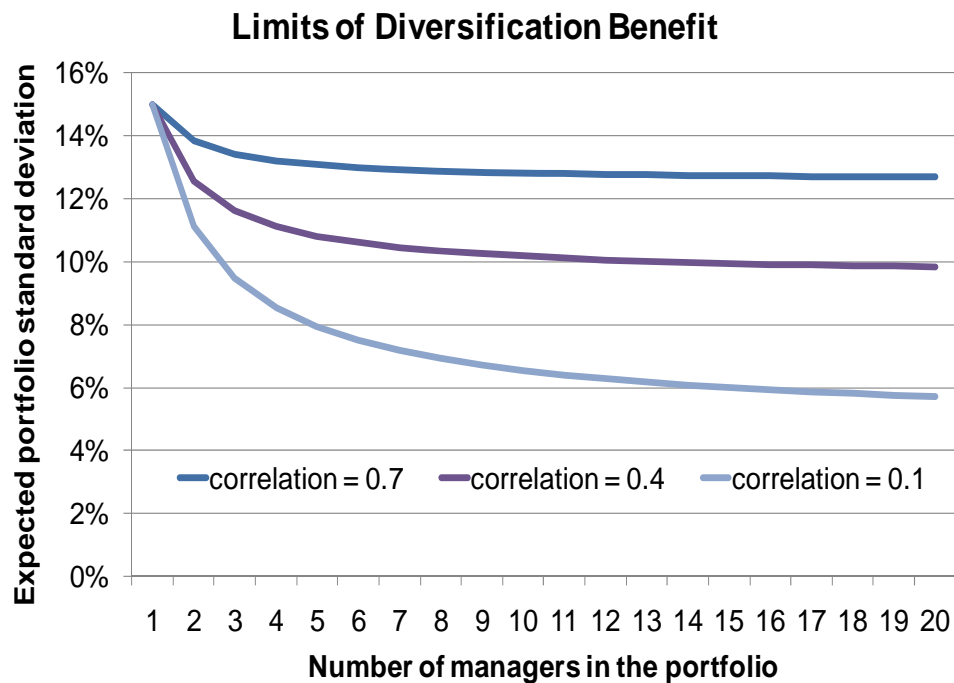


- Correlation

- Rolling three year pair wise correlation for our preferred CTAs is reasonably stable between 0.6 and 0.8
- Correlation converges when P&L is positive and breaks down in drawdown

Source: FRM - Rolling 3 year correlation of FRM's selected Systematic Trading managers when FRM Sigma was first built. There are six major managers in the data.

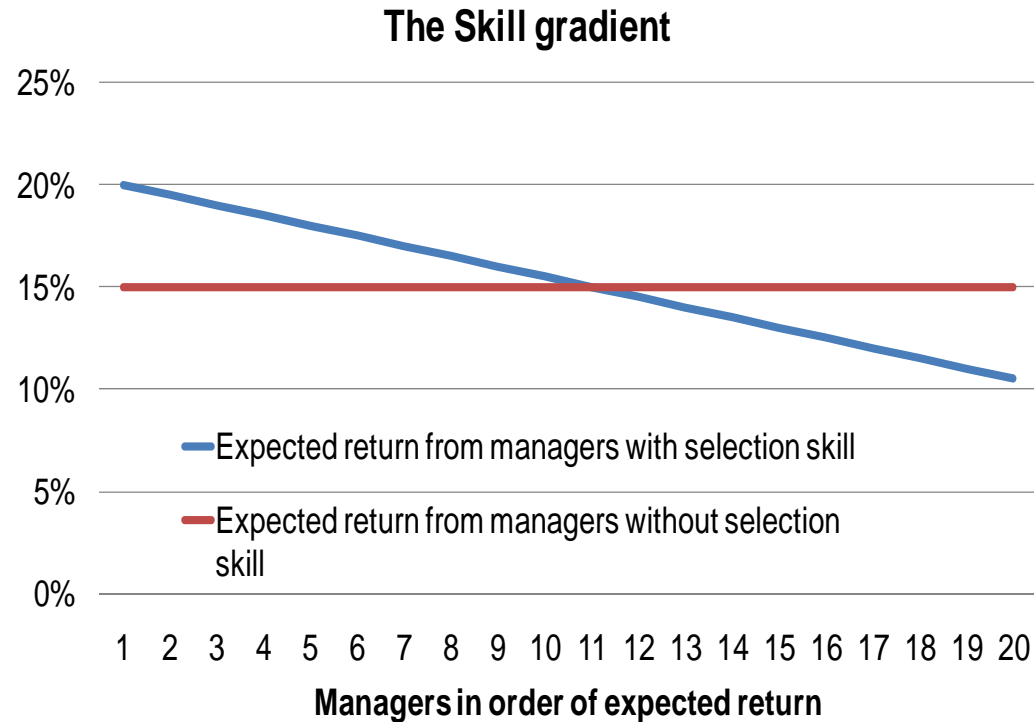
The limits of diversification



- Limit of diversification
 - Under different assumptions of correlation the diversification benefits are achieved at a different number of managers
 - With CTAs, the correlation is quite high and stable
 - At correlation of 0.7, there seems to be little additional benefit beyond a handful of managers

Source: FRM - Expected standard deviation of equally weighted portfolios of different sizes when the correlation of each manager to each other is 0.1, 0.4 and 0.7.

In the presence of some skill the game changes

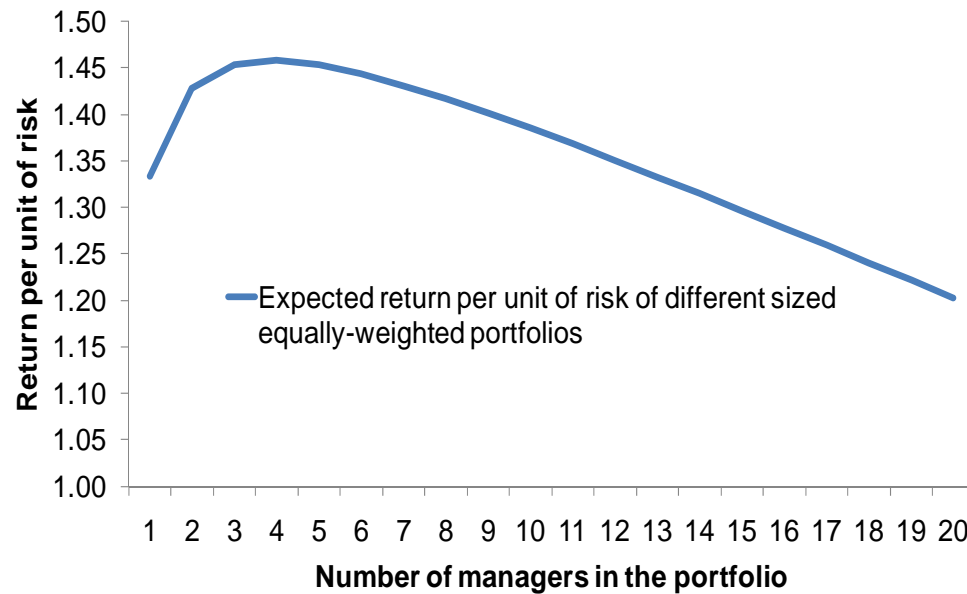


- Differentiating between managers
 - Having skill should allow the selector of the hedge funds to build portfolios from the blue line rather than the red
 - Red line is no skill so every manager assumed to deliver the same level of return
- Assuming all managers have been normalised to 15% volatility, the gradient in returns can also be thought of as a gradient in Sharpe ratio

Source: FRM, stylized examples, We believe there is a gradient of quality in CTAs, the blue line allows the skilled selector to differentiate performance. On the red line every manager assumed to deliver the same level of return.

There is a real cost to over diversification

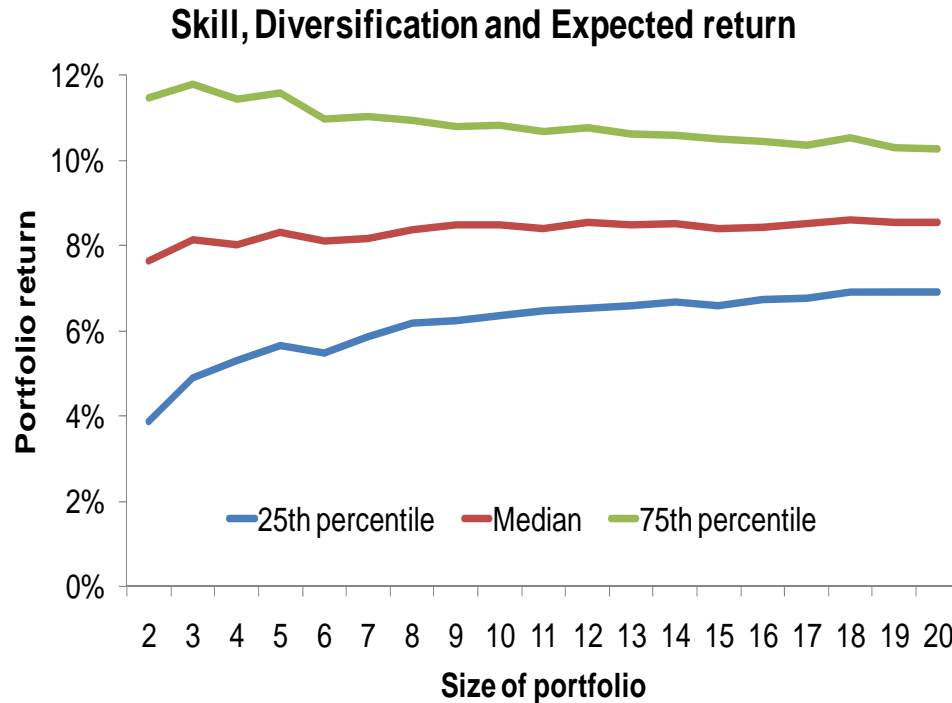
Diversification and Expected Return



- The expected return per unit of risk decays after a relatively small number of managers
- Combining
 - 0.7 correlation that we observe between CTAs and
 - expected return from a skill gradient
- Build equally weighted portfolios of different sizes, and then use MPT to calculate the return/risk

Source: FRM

Expected return and the number of managers



- The lines on the chart represent the upper-quartile, median and lower quartile manager for each simulation based on performance over the past 5 years.
- So even if your skill in picking managers is the same (i.e. you always build the upper quartile portfolio), your expected return is lower with bigger portfolios.

Source: FRM. Shows output of a monte carlo simulation using the FRM database of long-term trend following managers. Builds 10,000 random portfolios comprised of two managers (equally weighted), then 10,000 random portfolios of three managers and so on up to 20 managers. We show upper-quartile, median and lower quartile manager for each set of 10,000 - based on performance over the past 5 years.



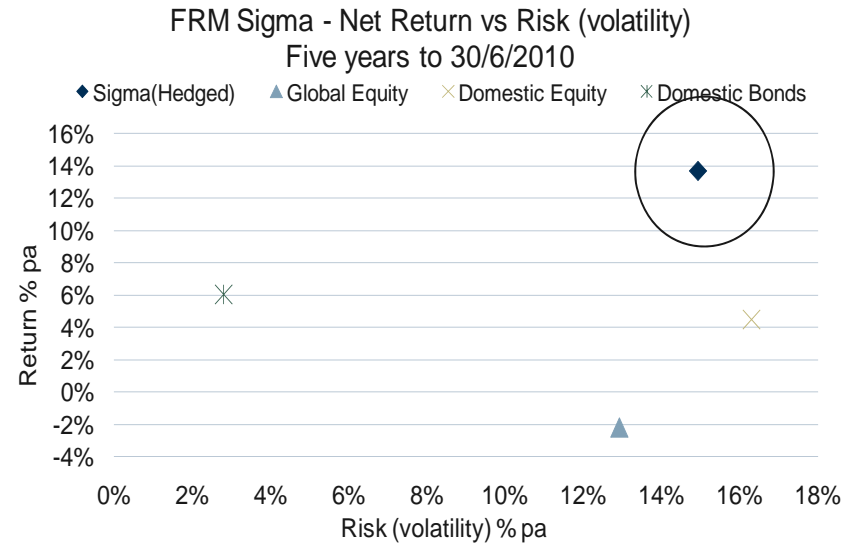
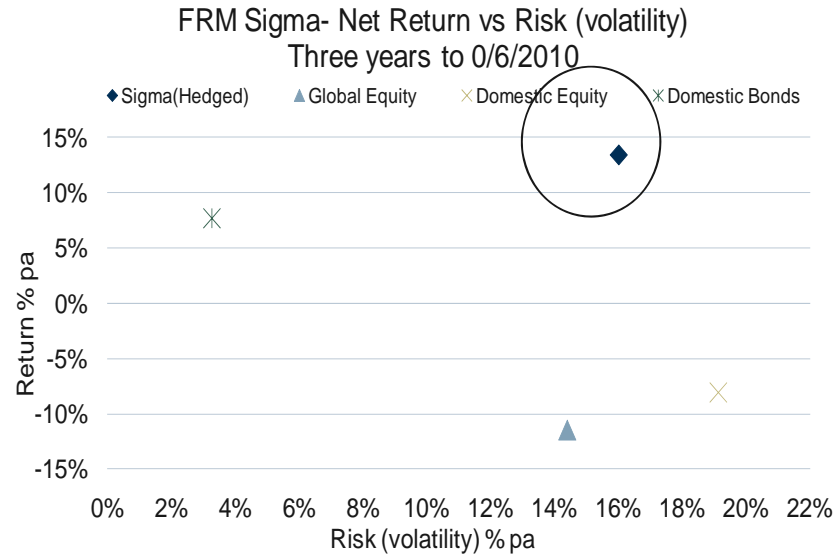
Risky assets can be very good for portfolios

	S&P 500 %	US High Yield %	Barclay CTA Index %
Sep - Nov 87	-29.58	-2.58	9.74
Aug - Oct 90	-13.83	-11.18	10.92
Aug 98	-14.48	-5.05	5.92
Sep - Nov 00	-13.13	-7.7	2.1
Feb – Mar 01	-14.88	-0.51	3.76
Aug – Sep 01	-13.83	-6.18	3.31
Jun – Jul 02	-14.32	-11.32	9.56
Sep 02	-10.87	-1.56	2.42
Aug 07 – Dec 08	-35.87	-24.64	21.36

Source: FRM. Past performance is not indicative of future performance, September 1987 – December 2008
S&P 500 TR Index (USD), ML US High Yield Master Index (USD), Barclay CTA Index (USD)



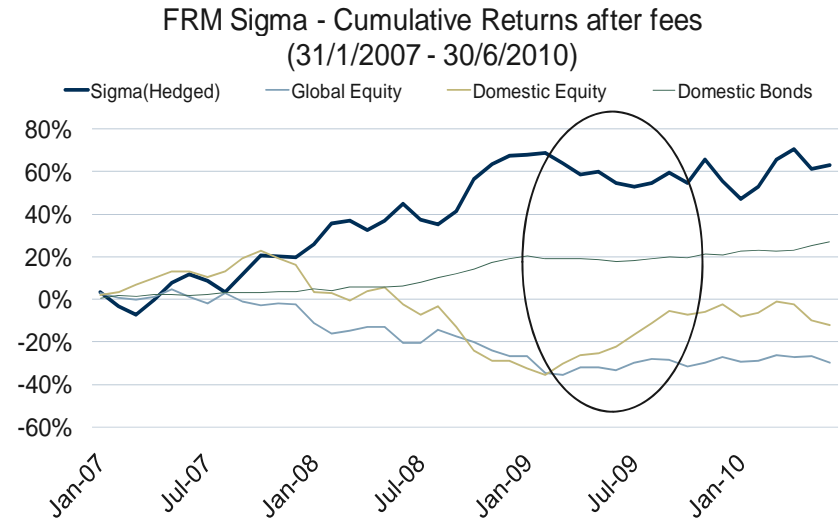
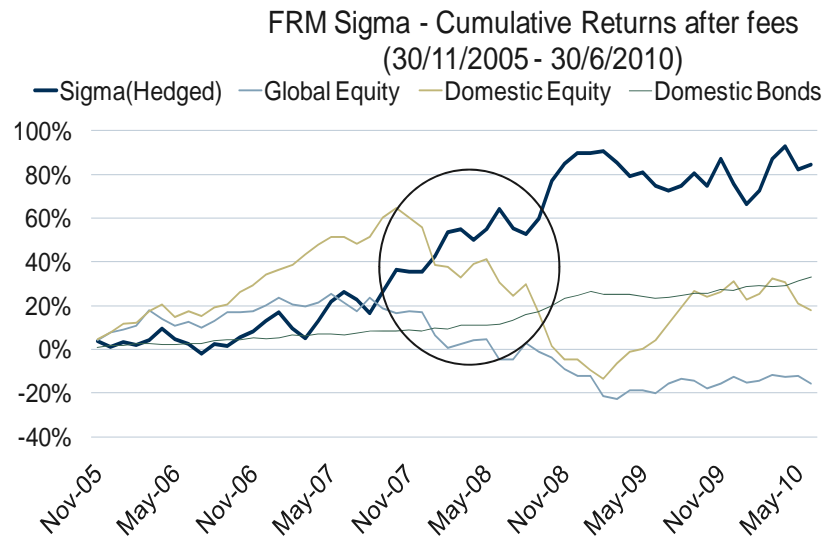
FRM Sigma looks risky – would it be discarded?



Source: FRM – see important notes at the end of this presentation



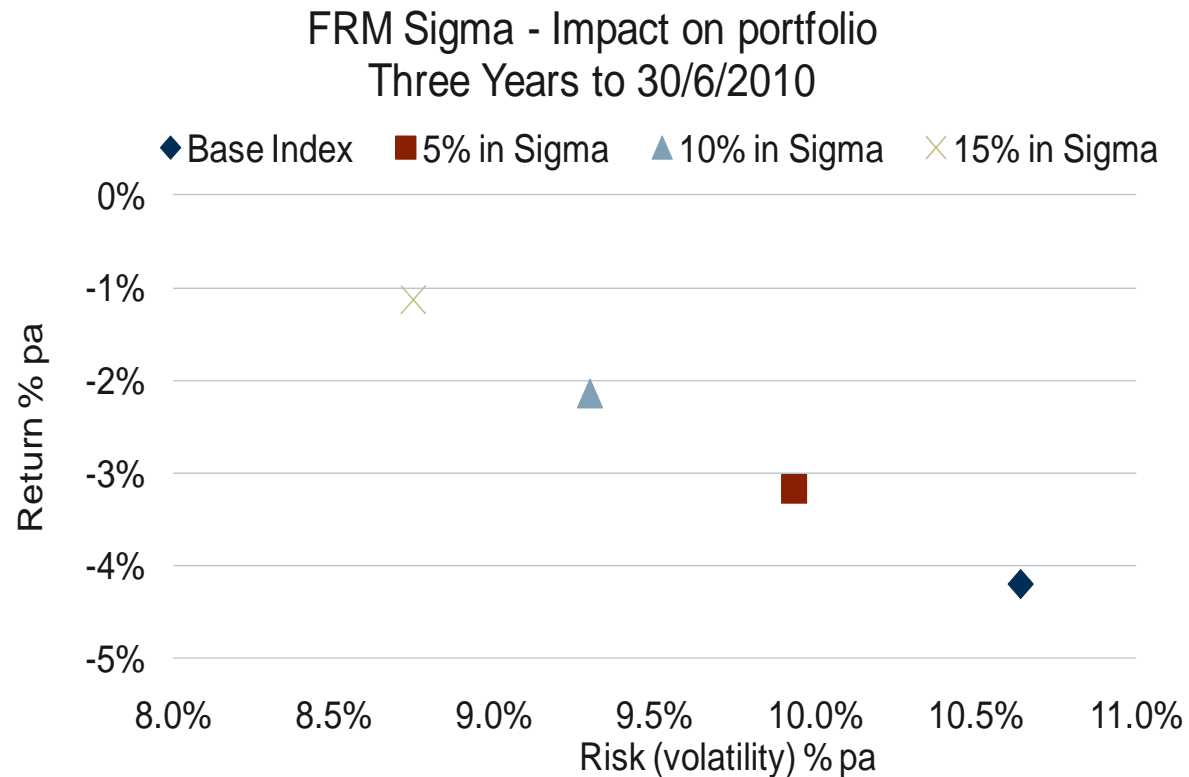
FRM Sigma returns have been strong



Source: FRM – see important notes at the end of this presentation



FRM Sigma reduces portfolio risk despite apparent risk



Source: FRM – see important notes at the end of this presentation

Conclusion

- Models
 - Models should be used but never believed
- Portfolio construction
 - Shock proof?? How long is a piece of string?
 - Good portfolio construction is the combination of risky assets allowing the correlation between the assets to manage the portfolio risk
 - Lazy portfolio construction is combining already over diversified assets – risk reduction comes at the expense of return, and maybe does not come at all
- Look at what an asset does to the portfolio – not the asset in isolation
 - Managed futures have a long history of adding something to a traditional portfolio in times of stress
 - FRM Sigma is designed to look like a single manager but without the single manager risk
 - It is volatile
 - It has low performance correlation with shares



Important Notes

Typical balanced fund	Referred to as the 'base index' in charts is comprised 40% Australian shares, 30% international shares, 5% global fixed income, 20% Australian fixed income, 5% cash
Indices used	S&P ASX 300 accumulation Index, MSCI World ex Australia net div reinvested in AUD, Barclays Capital Global Aggregate (AUD hedged), UBS Australia Composite Bond Index, UBS Australian Bank Bill Index
FRM Sigma	FRM Sigma Limited (FRM Sigma) is a Cayman Islands Registered Mutual Fund managed by FRM Investment Management Limited, based in Guernsey. FRM Sigma will be offered in Australia via registered managed investment scheme called FRM Sigma Fund. FRM Sigma Fund will launch on 1st September 2010 and so does not exist at the time of writing. FRM Sigma Fund will own shares in FRM Sigma. Any performance of FRM Sigma shown here is the USD performance net of fees hedged to the AUD.
Rolling 3-year correlation (page 7)	Actual average rolling 36 month correlation of the six preferred Systemic Trading managers when Sigma was built. For any point in time the trailing 36-month correlation between manager 1 and managers 2,3,4,5 and 6 are calculated. Repeat for manger 2, 3, 4, 5 and 6. The average for each of these correlation numbers is the data point for that month.
Limits of Diversification Benefit (page 8)	Portfolio variance is calculated by the formula below. Managers are equal weighted. Standard deviation for each manger is fixed at 15% [sigma(i) and sigma(j)]. Correlation is 0.7, 0.4 or 0.1. Each point on the x axis represents a certain number of managers in the portfolio; we can do this equation for each of the three lines to get the data points. Do this for all N from 1 to 20 to derive the three curves
Diversification and Expected Return (page 10)	We have assumed that of the 20 managers, manager 1 makes 20% with 15% vol, manager 2 makes 19.5% with 15% vol, manager 3 makes 19% with 15% vol and so on with each manager dropping their expected return by 0.5% to represent a quality gradient. We are assuming constant covariance between managers of 0.7. Therefore, when managers are equally weighted we know the expected standard deviation of the portfolios of different sizes. Expected return is the average of all the managers in the portfolio since it is equally weighted. The y-axis on the chart then shows expected portfolio return / expected portfolio standard deviation; i.e. return per unit of risk, the higher the better. We can see that under these assumptions the most efficient portfolio is about 5 or 6 managers.
On our assumptions	<ul style="list-style-type: none"> • Correlation – chart 2 shows that 0.7 is a very sensible assumption based on the historic performance of the managers • Standard Deviation – we can force managers to target 15% in the managed account framework. • Return is the most subjective, but strongly believe there is a quality gradient.
Portfolio variance	$\sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \sigma_i \sigma_j \rho_{ij}$

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