portfolio construction forum

Does higher non-market risk produce higher alpha? The possible introduction of the Furey Ratio

Michael Furey | Delta Research & Advisory | 01 December 2015 |

There's a widely held belief that in order to create alpha – that is, positive returns after adjusting for risk, call it market risk – a manager needs to make meaningful bets away from the market... Stop being a so-called benchmark hugger, concentrate the portfolio with best ideas, and/or move the portfolio holdings away from the benchmark and (possibly) be more absolute-return oriented. We have all seen numerous strategies that meet these criteria and claim to have generated strong alpha. But is this the reality? Or, is this belief lacking in evidence, save for a handful of strategies that just so happen to tell us it is so. This paper seeks to look at whether greater non-market risk does produce higher alpha.

NON-MARKET RISK... AND A FEW TECHNICAL BITS

Firstly, let's define non-market risk.

Possibly the most frequently used measure is tracking error (standard deviation of the difference between a portfolio's returns and that of its benchmark). While tracking error is a good measure of non-market risk, it can be a little misleading. Take, for example, the case of a geared index fund. It is not taking any bets away from the market given it's an index fund, but gearing results in a high tracking error. Therefore I believe tracking error has a potentially inaccurate bias when it comes to comparing non-market risk to alpha generation.

A more popular statistic recently is active share (the percentage of a portfolio's holdings that are different to that of its market benchmark). High active share suggests a large difference between the portfolio holdings and its benchmark. However, because this statistic is a holdings-based measure, it is quite difficult to measure on a regular basis. Secondly, it is also possible to have a portfolio with a high active share that has returns that are highly correlated with the market benchmark, suggesting that holdings differences do not necessarily translate into performance differences.

My preferred measure of non-market risk is what some call idiosyncratic risk. It is similar to tracking error but is adjusted for exposure to market risk (i.e. market beta) and is defined as the proportion of a total portfolio's risk resulting from non-market bets. To be specific, it is $(1-R^2)$, where R^2 is the goodness of fit of the Capital Asset Pricing Model (CAPM) to the

portfolio in question (refer equation 1 below). A second advantage of using idiosyncratic risk is that Equation 1 is also used to calculate Alpha. So it's a win-win.

Hence, the statistic this paper emphasises is:

$$\alpha/(1-R^2)$$

And, after checking numerous textbooks, I cannot find a name for it - so I'll declare it the "Furey Ratio" until someone corrects me. The Furey Ratio is similar to the Information Ratio (the ratio of excess benchmark return divided by portfolio tracking error) but unlike the Information Ratio, the Furey Ratio adjusts for different levels of market risk. That is, the Furey Ratio is another measure of risk-adjusted return, being Alpha per unit of Idiosyncratic Risk. What we really want to see in an active manager is a high Furey Ratio, meaning they are giving big bang for their non-market risk buck!

Capital Asset Pricing Model (CAPM)

Equation 1: $R_{p.t}-R_{f.t} = \alpha + \beta.(R_{m.t}-R_{f.t}) + \epsilon$

Where:

$R_{p.t}$ = Portfolio performance at month t

$R_{f.t}$ = Risk-free rate at month t (i.e. return of the RBA cash at month t)

$R_{m.t}$ = Market or Benchmark return at month t

α = CAPM Alpha (market adjusted outperformance)

β = Market Beta (market exposure)

ϵ = error term which represents the difference between the portfolio return and the Capital Asset Pricing Model's predicted return

Additional statistics used include:

R-Squared or R^2 = Coefficient of determination of CAPM which indicates the accuracy of the Capital Asset Model in describing performance variability. For example, an R-Squared of 1 means the exposure to the market can describe the fund's performance and variability perfectly and an R-Squared of 0 means a fund's performance variability has no relationship with the market.

$1-R^2$ in the context of this article is regarded as Non-Benchmark Risk or Idiosyncratic Risk.

ANALYSIS (AND A FEW MORE TECHNICAL BITS)

This paper assesses whether managers are more likely to produce higher risk-adjusted Alpha if they have greater Idiosyncratic Risk. To do this, we will test the statistical significance of the Furey Ratio for a sample of fund strategies.

Data Selection

The analysis is based on the returns data from September 2010 to September 2015 for the two largest equity fund classes in the Australian investment landscape - global equities funds and Australian equities funds. Data was sourced from Morningstar Direct. Duplicated strategies, where the only difference was to fee structure, were removed.

1. Global Equities (Sample size = 121)
2. Australian Equities (Sample size = 226)

The five year time-frame to 30 September 2015 was chosen for the following reasons:

- Five years of data provides sufficient numbers of both monthly performance data (i.e. 60 observations per fund) and number of strategies.
- It is after the Global Financial Crisis period of 2008/09.
- It balances survivorship bias that comes with using a longer time-frame with a reasonable overall sample size. That is, survivorship bias would be a real issue if considering the GFC period as well as only the better fund managers and strategies survived through to 2015.

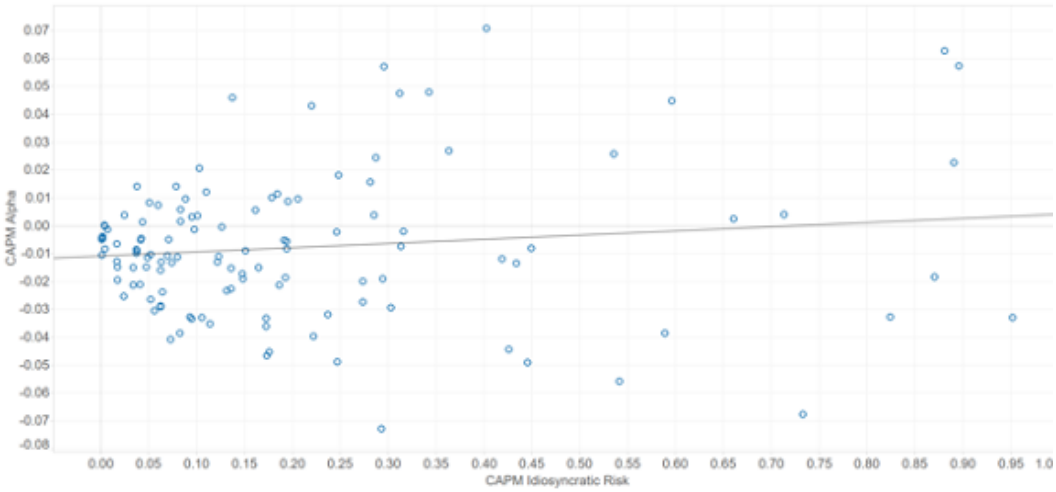
These reasons aside, five years is still a somewhat arbitrary time period. For example, it would probably make little difference to the results if the analysis instead used five years and two months of data.

Global Equities

Figure 1 shows CAPM Alpha vs CAPM Idiosyncratic risk over five years to September 2015 for the 121 Global Equity strategies. All managers chosen have a minimum five-year track record, and are classified by Morningstar as Global Equities managers.

On the positive side, the regression line slopes upwards - suggesting there is a chance that with greater non-benchmark risk comes higher alpha (CAPM Alpha). This trend demonstrates a positive Furey Ratio but, unfortunately, the P-value (0.153793) for the trend line suggests it is not significantly different from zero at the usual required minimum significance levels (i.e. 0.05) - in other words, there is weak evidence that higher alpha is not strongly correlated with greater non-benchmark risk.

Figure 1: CAPM Alpha vs Idiosyncratic Risk – Global Equity Fund Strategies
(Sep 2010 to Sep 2015)
P-value: 0.153793
Equation: CAPM Alpha = 0.0149 * CAPM Idiosyncratic Risk + -0.01097



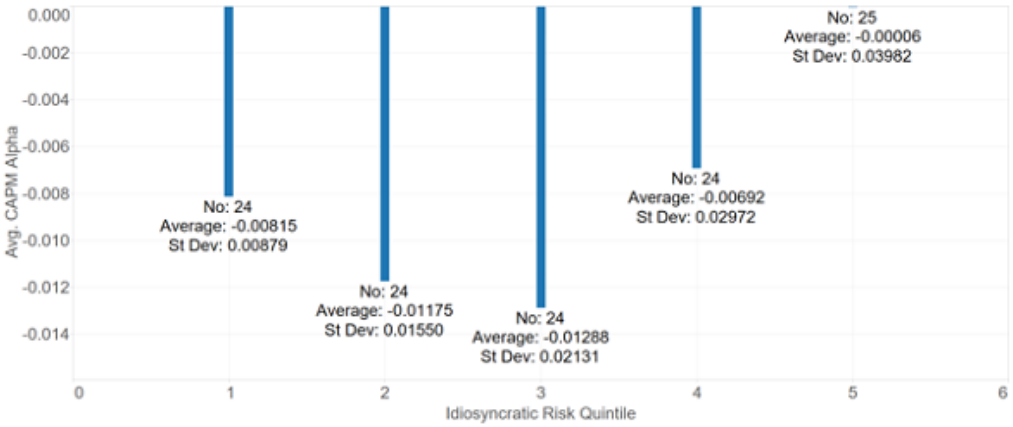
Source: Delta Research & Advisory.

Figure 1 shows significant clustering at the lower end of the x-axis and a fanning out of alpha levels as Idiosyncratic Risk increases. This suggests there may be a reasonable argument that regression analysis of this data may be somewhat inappropriate.

To counteract this, the above CAPM Idiosyncratic Risk measure was divided into 5 quintiles (Figure 2). Once again, there are positive signs - the two two higher Idiosyncratic Risk quintiles achieved higher Alpha. However, the higher values are not statistically different. This is shown in the Hypothesis Test of quintiles 3 and 5.

In other words, there is little evidence to suggest a statistically significant and positive Furey Ratio for Global Equities fund strategies offered in Australia over the last five years. That is, higher Idiosyncratic Risk probably hasn't produced higher Alpha.

Figure 2: CAPM Alpha vs Idiosyncratic Risk – Global Equity Fund Strategies
(Sep 2010 to Sep 2015)



Source: Delta Research & Advisory

Hypothesis test: Difference in population means

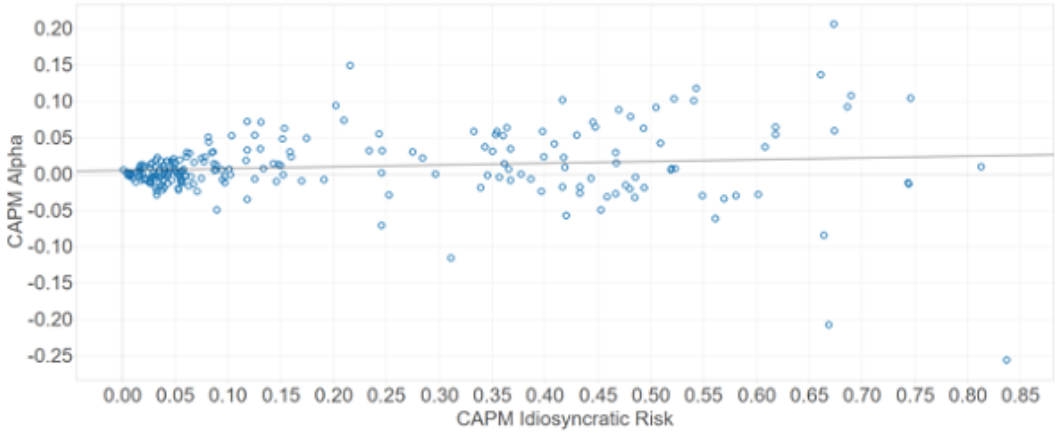
Null Hypothesis:	(Mean of Idio_5) – (Mean of Idio_3) = 0	
Alternative Hypothesis:	(Mean of Idio_5) – (Mean of Idio_3) ≠ 0	
	Idio_5	Idio_3
Sample Size:	25	24
Sample Mean:	-5.74842E-05	-0.01288
Sample Std Dev:	0.03982448	0.021311
Difference in Sample Means:	0.0128	
t-Statistic (d.f. = 37):	1.4125	
Critical Value(s):	± 2.0262	
Alpha:	0.05	
p-Value:	0.1662	
Decision Rule:	Reject the Null Hypothesis if |t-Statistic| > 2.0262 or p-Value < 0.05	
Conclusion:	**Do not reject the Null Hypothesis**	

Australian Equities strategies

As noted above, the sample of Australian Equity fund strategies were chosen from the Morningstar Direct database, duplicated strategies were eliminated, and five years of monthly returns from September 2010 to September 2015 was analysed.

Figure 3 shows that, once again, there is a spread of Alpha as Idiosyncratic Risk increases. The slope of the line (i.e. Furey Ratio) increases. Again, however, the Furey Ratio is not significantly different from zero at the 5% level (P-value = 0.07215 which is greater than 0.05). This does not suggest greater Alpha comes from higher levels of Idiosyncratic Risk, at least using statistical tests.

Figure 3: CAPM Alpha vs Idiosyncratic Risk – Australian Equity Fund Strategies
(Sep 2010 to Sep 2015)
P-value: 0.07215
Equation: CAPM Alpha = 0.0245545 * CAPM Idiosyncratic Risk + -0.00491325

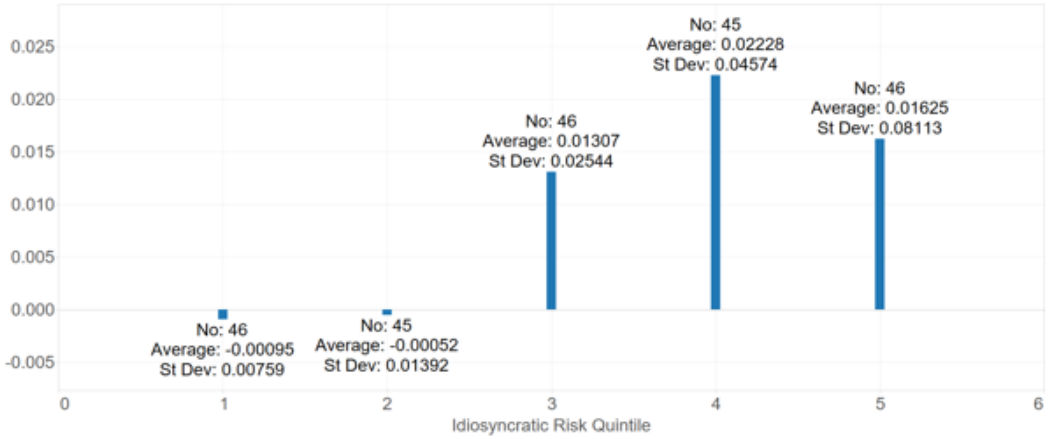


Source: Delta Research & Advisory

However, as with the Global Equities fund strategies, there is a reasonable argument that the regression analysis is not appropriate due to the larger variance of Alpha as Idiosyncratic Risk increases.

Similar group analysis is applied by dividing Idiosyncratic Risk into quintiles (Figure 4). This time there is a statistically significant difference between the Alpha of those managers at the 4th quintile and those in both the first and second quintiles (refer the hypothesis testing results below Figure 4), but not between the others (you'll have to trust me on this as I've not presented the hypothesis test results here).

Figure 4: CAPM Alpha vs Idiosyncratic Risk – Australian Equity Fund Strategies (Sep 2010 to Sep 2015)



Sources: Delta Research & Advisory

Hypothesis test: Difference in population means - 4th vs 1st quintile

Null Hypothesis:	(Mean of AS_Idio_4) - (Mean of AS_Idio_1) = 0	
Alternative Hypothesis:	(Mean of AS_Idio_4) - (Mean of AS_Idio_1) ≠ 0	
	AS_Idio_4	AS_Idio_1
Sample Size:	45	46
Sample Mean:	0.022279	-0.00095
Sample Std Dev:	0.045744	0.007588
Difference in Sample Means:	0.023228	
t-Statistic (d.f. = 46):	3.3614	
Critical Value(s):	± 2.0129	
Alpha:	0.05	
p-Value:	0.0016	
Decision Rule:	Reject the Null Hypothesis if |t-Statistic| > 2.0129 or p-Value < 0.05	
Conclusion:	**Reject the Null Hypothesis**	

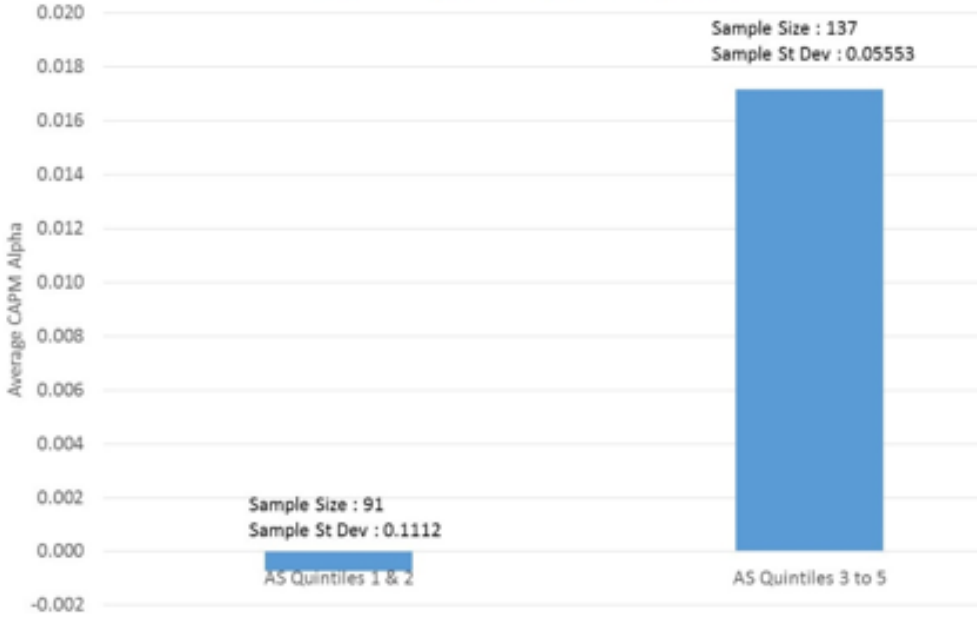
Hypothesis test: Difference in Population Means - 2nd vs 4th quintile

Null Hypothesis:	(Mean of AS_Idio_2) - (Mean of AS_Idio_4) = 0	
Alternative Hypothesis:	(Mean of AS_Idio_2) - (Mean of AS_Idio_4) ≠ 0	
	AS_Idio_2	AS_Idio_4
Sample Size:	45	45
Sample Mean:	-0.00052	0.022279
Sample Std Dev:	0.013925	0.045744
Difference in Sample Means:	-0.0228	
t-Statistic (d.f. = 52):	-3.1987	
Critical Value(s):	± 2.0066	
Alpha:	0.05	
p-Value:	0.0024	
Decision Rule:	Reject the Null Hypothesis if |t-Statistic| > 2.0066 or p-Value < 0.05	
Conclusion:	**Reject the Null Hypothesis**	

Stretching the analysis just that little bit further

Observing Figure 4, it does appear to show two distinct groups where quintiles 1 and 2 have Alpha results around 0 versus quintiles 3 to 5 which have CAPM Alpha of more than 1% on average. I'm sure many active managers would be pleased to hear it. Combining the quintiles into these two groups yields the following results for CAPM Alpha - and the difference in means is statistically significant (refer the Hypothesis tests below Figure 5).

Figure 5 – Average CAPM Alpha by Idiosyncratic Risk
Australian Equities – Sep 2010 to Sep 2015



Sources: Delta Research & Advisory

Hypothesis test: Difference in population means – Quintile 1&2 and Quintile 3&5

Null Hypothesis:	(Mean of AS Quintiles 1&2) – (Mean of AS Quintiles 3–5) = 0	
Alternative Hypothesis:	(Mean of AS Quintiles 1&2) – (Mean of AS Quintiles 3–5) ≠ 0	
	AS Quintiles 1 & 2	AS Quintiles 3 to 5
Sample Size:	-0.001	0.017
Sample Mean:	0.01112	0.05553
Sample Std Dev:	91	137
Difference in Sample Means:	-0.017898021	
t-Statistic (d.f. = 152):	-3.6637	
Critical Value(s):	± 1.9757	
Alpha:	0.05	
p-Value:	0.0003	
Decision Rule:	Reject the Null Hypothesis if |t-Statistic| > 1.9757 or p-Value < 0.05	
Conclusion:	**Reject the Null Hypothesis**	

So, after some potential data mining, there may be some evidence that greater Idiosyncratic Risk relates to higher levels of Alpha (a higher Furey Ratio) among Australian equities fund strategies.

For those interested, the level of Idiosyncratic Risk that intercepts between Quintiles 2 and 3 is only 5.82% (which is around the borderline of the clustering in Figure 3), meaning that if the market (as defined by MSCI Australia GR) explains more than 94.18% (i.e. 1 – 0.0582) of an Australian equity fund strategy's performance volatility, then this may decrease the chances of generating positive alpha, and vice versa.

CONCLUSION

Over the five years to 30 September 2015, the evidence presented here is possibly weaker than many would expect, showing there is little to no relationship between whether a fund manager generates Alpha and Idiosyncratic Risk, particularly for Global Equities strategies.

On the other hand, there is some evidence that greater Idiosyncratic Risk has led to higher Alpha amongst Australian Equities strategies, although it does not appear to be a linear relationship. Over the last five years, Australian equities managers have, on average, produced a significantly higher Alpha where their non-benchmark risk was greater than around 5.8%.

The optimistic conclusion is that there are two groups of managers. The first is the much-maligned benchmark huggers (Idiosyncratic Risk less than 5.8%) that struggled to produce any Alpha at all, on average. The second group (Idiosyncratic Risk higher than 5.8%) produced a significantly higher Alpha of 1.7% per annum over the five years to September 2015. This result doesn't mean that the higher the Idiosyncratic Risk, the higher the Alpha (because of the lack of evidence of a linear relationship). But, there is some evidence that a higher non-benchmark risk does increase the chances of positive Alpha. So the jury is still out - but benchmark huggers should beware!

Michael Furey is Managing Director of Delta Research & Advisory, which specialises in providing independent, conflict-free investment research and asset consulting services to dealer groups (AFSLs), financial planners, and self-directed investors. He has worked in the financial planning industry since 1999, both in research and financial planning roles.