

Examinations on Risk Return Paradox and Risk Attitudes Based on Prospect Theory

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Abstract: Conventional financial theories believe that risk and return are positively related due to individual 'risk aversion' psychology. However, after 1980 when the Bowman paradox appeared, investor risk aversion psychology and positive risk return correlation were questioned. Prospect theory is developed to support the risk return paradox. It believes that individuals or firm's attitudes towards risk are a mixture of risk aversion and risk seeking. When a company's performance or wealth is below the target, they will be risk seeking; in contrast, when their performance and wealth are above the reference point, they will be risk averse. Later on, many researchers started to estimate this relationships and the company's risk attitude in different cases. Nevertheless, the results of these empirical studies are contradictory. This dissertation re-tests the risk return association using a cross-sectional research method, the results of which support the hypothesis of prospect theory.

1. Introduction

Attitudes towards risk can be divided into three types: first, risk averse implies investors would choose the investment with a lower risk level when they are given several investments with the same expected return; second, risk neutral indicates investors would select the investment with a higher expected return, regardless of risk level; thirdly, risk seeking suggests investors would like to choose the investment with a higher risk when they are given many investments with the same expected return^[1].

Risk averse investors may be satisfied with their current situation, thus, they like to avoid any risk that may reduce their wealth.^[3] This kind of investor would require a higher return if they were offering a higher risk. Therefore, risk aversion can cause a positive risk and return correlation. Investors should know and understand the relationship between return and risk and the mechanisms that decide the organizational risk attitude. Conventional economists believe that risk and return are positively related, due to individual risk aversion psychology^[6].

In 1980, Bowman used variance as the measure of risk and tested the risk return relationship, where he found that troubled companies are more likely to take higher risks, which suggests that risk and return may not be positively correlated^[2]. This paper uses a series of new data from Bloomberg database to re-test the risk return relationship and companies risk attitudes under different situations.

2. Research hypotheses

According to prospect theory, when firms' performance is above the reference point, decision makers are risk averse, which can lead to a positive correlation between risk and companies' status quo. But when it is below the reference point, they are risk seeking, which can cause a negative association between risk and companies status quo^[2].

This paper follows this assumption and re-tests the risk return association . Since this dissertation focuses on the firm level risk return correlation, the industry median ROA should be calculated from firms within the same industry rather than across all available industries. These median returns are used as reference points in this dissertation.

Thus, assuming reference point is the industry median, the following hypotheses can be made based on prospect theory^[3].

Hypothesis 1: The correlation between risk and return for companies whose performance is above the industry median is positive.

Hypothesis 2: The relationship between risk and return for firms whose performance is below the industry median is negative.

3. Methodologies

3.1. Cross-sectional research

As with previous cross sectional literature, to re-test the risk return paradox, the following model is used:

$$\delta_{i2} = \beta_0 + \beta_1(\text{ROA}_{t-1} - \text{ROA}_{t-1\text{median}}) + \varepsilon \quad (1)$$

In cross-sectional tests, the reference point is defined as the industry median ROA. As in cross-sectional design, the reference point is defined as the industry median ROA, so hypothesis 1 and hypothesis 2 are tested. Additionally, because the risk of a firm in this dissertation is calculated as the variance of its ROA in the following 4 years, in a cross-sectional test, 6 years risk attitude (σ^2) of firms can be tested, from 1999 to 2004. The risk (σ^2) after 2005 (include 2005) needs to be calculated with data from 2008 (including 2008). However, as the 2008 economic crisis significantly influenced the worldwide economy, data after 2008 is distorted and cannot be used. Thus, the risk attitude after 2005 cannot be measured.

In order to re-test Fiegenbaum and Thomas' results, this dissertation also divides 100 companies into two groups, one with organizations performing better than the industry median and the other performing worse than the industry median.

According to the Bowman paradox and hypothesis 1 and 2, negative correlations (β_1) are expected to be significantly observed in most of years for companies below the industry median. On the contrary, regressions for companies with higher ROA performance are expected to be observed with statistically significant positive correlations (β_1) in most of years. In addition, as prospect theory claims that risk attitude of firms are correlated to their return especially for troubled firms, a high R^2 of model 1 is expected for companies below the reference point.

3.2. Results and analysis for cross-sectional test

Detailed results for the cross-sectional test (model 1 test) are presented in Appendix 1, while the main result for this test is exhibited in table 1.

Table 1 cross-sectional test result 1

table1 (for 3 industries and 6years)						
Summary table of model 1						
characteristics	below industry median ROE			above industry median ROE		
	β_0	β_1	R square	β_0	β_1	R square
mean	-0.025141	-0.079392	0.319128	0.002045	0.0518597	0.153145611
median	0.0002725	-0.073257	0.258485	0.001123	0.0424155	0.1305875
No. of negative coefficients	11	18		1	2	
No. of negative and significant coefficients ($P \leq 0.10$)	0	18		0	2	
No. of positive coefficients	7	0		17	16	
No. of positive and significant coefficients ($P \leq 0.10$)	2	0		2	10	

The R^2 for both type of company are not very high, which suggests that the performance level of a firm cannot completely explain its risk attitude, though they are significantly related.

By observing cross sectional test result, it can be discovered that the R^2 of model 1 for companies below the reference point is much higher than for companies above the reference point. In addition, the mean value of R^2 of model 1 for companies below the reference point is about 31.91%, which is approximately twice as high as for companies above the reference point (15.31%). This is to say that this model explains about 15% more variability of data for companies below the target than those above the target. This phenomenon indicates that for companies below the reference point, the gap between performance and the reference point significantly inspires them to take on more risk. On the contrary, when company performance exceeds the reference point, the difference between them and the reference point may not affect a firm's risk choice much. In this case, other factors, such as the stability of the economy, industry development and firm size, may have more impact on a firm's decision^[8].

This dissertation investigates 100 firms in 3 industries over a 10-year period. However, the variance of ROA is available for 6 years from 1999 to 2004. Thus, there are 18 (6*3) equations and 36 (18*2) coefficients generated by model 1, in which only 18 coefficients (β_1) indicate the correlation between ROA and variance of ROA.

Results for firms whose ROA performance was below the industry median ROA is shown on the left side of table 1. It is found that, for all three industries, the risk-return correlation (represented by β_1) for performers below the industry median were negative during the 6-year period. None of the 18 coefficients was positive, which means that ROA for all firms with ROA below the industry median during the year 1998 to 2003 showed a negative correlation with their variance of ROA in later years. More importantly, 18 out of 18 negative coefficients is significant (with $P \leq 0.10$), as it proves that hypothesis 2—the relationship between risk and return for firms whose performance is below the industry median is negative—is right. It also supports the assumptions of prospect theory that individuals and firms are 'loss averse' rather than 'risk averse'. Because of this characteristic, companies are more likely to take risk to increase the chances of improving performance improving when they are suffering from losses.

In contrast, the result on the right-hand side of table 1 shows the correlation between ROA and variance of ROA for firms above the industry median level. Only 2 out of 18 coefficients are negative and significant, the remaining 16 coefficients are positive. More specifically, 10 out of these 16 positive coefficients are significant. This result indicates that variances of firms with a high performance level (above the industry median ROA) have significant negative associations with firms' ROA performance, which proves hypothesis 1—the relationship between risk and return for firms whose performance is below the industry median is negative.

Similar to the research of Fiegenbaum and Thomas (1988), this dissertation found the phenomenon that the slope for poor performers' regression was steeper than for good performers^[7]. This can be discovered by comparing the two groups' median or mean value of β_1 . The median and mean values of β_1 for regressions representing poor performers were -0.073257 and -0.0793919 respectively. In contrast, the median and mean value of β_1 for group with companies above the industry average level were 0.042416 and 0.05186 respectively, both of which are almost 1.8 times smaller than the slope of regression for companies below the reference point. This finding also support a hypothesis of prospect theory that the risk return relationship for performers below the reference point has a steeper association than good performers, which is called the 'endowment effect' in economics and behavioural decision theory (Tversky and Kahneman,1991). This is because of individual's 'loss aversion' psychology, suggesting that, in most cases, individuals evaluate the value of 'losing something' as twice as high as that of 'gaining the same thing' (Kahneman, Knetsch and Thaler, 1991).

The relationship between risk and return is not simply U-shaped, which contradicts the hypothesis of studies by Fiehenbaum and Thomas (1988). Like the red line shown in Figure 1, because of declining sensitivity, fluctuations can be seen on both side of the zero point. However, it cannot be denied that this result may result from the limited number of samples.

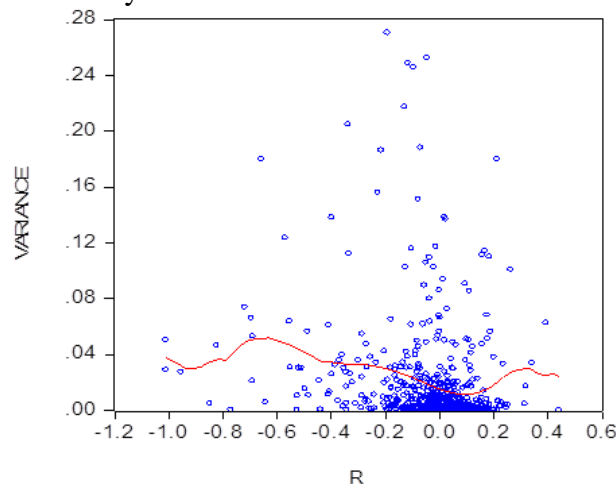


Figure 1 cross-sectional test result 2

Almost all of prospect theory hypotheses are proved by the cross-sectional test. A positive risk-return relationship is observed for companies with ROA performance above the industry median, while a negative correlation is proved for poor performers.

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