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Bowman's Paradox Revisited: An Investigation of Three East Asian Markets

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ABSTRACT

One of the most puzzling phenomena in the strategy literature is the observed inverse risk-return association known as Bowman's Paradox. This paper examines a recent five-year dataset for organizations headquartered in China, Japan, and Vietnam to investigate if such paradoxical relationship exists in the East Asian markets. Analyses from 10,623 annual firm observations across 28 industries show support for the negative relationship between organizational risk and return across the three countries. We also borrow insights from prospect theory and find that firms performing below their industry median tend to be more risk-seeking than those firms who outperform the industry median.

KEYWORDS: Risk-return association, Bowman's paradox, Prospect theory, East Asian markets

INTRODUCTION

For years, economic conventional wisdom has asserted that risk is positively associated with return. Nevertheless, a plethora of evidence has suggested otherwise. Namely, evidence have shown results of a negative risk-return association for firms when performance is measured in terms of accounting indicators (e.g. [Bowman, 1982](#); [Chang & Thomas, 1989](#); [Chou, Chou, & Ko, 2009](#); [Fiegenbaum, 1990](#); [Gooding, Goel, & Wiseman, 1996](#); [Jegers, 1991](#); [Sinha, 1994](#)){e.g. \Jegers, 1991 #3;Fiegenbaum, 1990 #2;Bromiley, 1991 #5;Chou, 2009 #112}. That is, the higher the risk, the lower the return on equity (ROE), return on asset (ROA), cash flows, etc. Bowman's (1980) findings were the first to document this anomaly at the firm and industry level, and it led him to label the negative association between risk and return as a paradox as he challenged future researchers for further investigations.

In his later work, [Bowman \(1982\)](#) offered a possible explanation for the risk-return paradox. Through a content analysis of firms' annual reports, he concluded by stating that "troubled firms take more risk." This is consistent with prospect theory ([Kahneman & Tversky, 1979](#)) which posits that people have a tendency to exhibit risk averse behaviors in situations involving sure gains; whereas in circumstances involving sure losses, people are more risk seeking. In addition, prospect theory predicts that risk attitudes are determined by the outcome's relation to

some reference point. Those below a reference point tend to be more risk seeking, while those that are above, more often than not, are more risk averse.

The empirical support for prospect theory has been innumerable (e.g. [Bromiley, 1991](#); [Chang & Thomas, 1989](#); [Chou et al., 2009](#); [Fiegenbaum, 1990](#); [Fiegenbaum & Thomas, 1988](#); [Jegers, 1991](#)). However, most of the studies have been conducted in the western-country context. This leaves many to question if the risk-return relation holds true across nations and whether or not prospect theory and can be applied to all countries and cultures ([Arkes, Hirshleifer, Jiang, & Lim, 2007](#); [Barberis, Mukherjee, & Wang, 2014](#)). Therefore, the purpose of this paper is to address these concerns by providing a preliminary macro-level analysis on a number of Eastern countries.

This investigation seeks to answer an important research question: Will prospect theory hold in the context of eastern countries? To answer this question, data is collected from China, Japan and Vietnam. The cultural differences in sensitivities to risk have been duly noted in the literature; however, a number of studies (e.g. [Park & Jun, 2003](#); [Weber & Hsee, 1998](#)) have found no significant differences in behaviors toward risk across countries. Thus, this study makes a contribution to the literature by examining aggregated firm data from China, Japan and Vietnam in an attempt to provide additional insights into the risk-return paradoxical relationship as well as to prospect theory.

The organization of this paper is as follows. The next section will highlight a selected literature review. The sample, data and measurements will be discussed in the third section, with the following section devoted to the statistical methods and empirical results. Finally, the last section will include the discussion, conclusion and limitations of the research.

LITERATURE REVIEW

Bowman's Paradox

Despite general consensus in economic and financial theory that risk and return are positively correlated, Bowman (1980) conducted an exploratory study on this relationship and investigated at the firm and industry level, rather than the more widely-used context of the stock market domain. Data from 85 U.S. industries for the period of 1968-1976 was examined and he found that in the majority of the industries in his sample, the relationship between risk and return was negative. More precisely, higher-average-profit companies in terms of return on equity (ROE) tended to have lower variance and risk over time. Further analysis and results showed that neither the companies within industries nor the industries themselves showed a positive correlation between risk and return.

His research was the first to report this incongruity at the organizational level and he coined his findings a "paradox" because it contradicted the common belief of a positive association between the two variables by economists. A new research stream emerged from this paradox as scholars investigated the risk-return relationship by integrating accounting data and behavioral decision theories, namely prospect theory.

Prospect Theory

In an article published in *Econometrica*, [Kahneman and Tversky \(1979\)](#) introduced an alternative model to the expected utility theory called prospect theory. In short, the theory predicts that given a choice between risky prospects, people will underweight outcomes that are

probable relative to those that are definite. This indicates that people exhibit risk aversion in options involving sure gains and risk seeking behaviors in options involving sure losses. Moreover, the theory emphasizes the role of a target, or reference point. The reference point is considered to be a point of neutrality, and outcomes above the reference are considered to be gains, whereas, outcomes below a reference point are considered losses. It assumes that people are naturally risk-averse, but it also predicts that if people are below their reference point, they will engage in risk seeking behaviors.

In subsequent work, Bowman (1982) used insights from prospect theory as a theoretical foundation for his research. Bowman employed a content analysis of firm annual reports for three industries (food processing, computer/peripheral, and container) and found support for the prospect theory. Through a chi-square analysis, he found that troubled firms, or firms that are less profitable in terms of ROE, take more risks. [Fiegenbaum and Thomas \(1988\)](#) extended Bowman's research by using a 20-year period (1960-1979) and a more comprehensive dataset and found that similar results hold across different time periods and industries.

There have been other studies that have shown evidence that support the prospect theory on organizational and industry level investigations. In another analysis, [Fiegenbaum \(1990\)](#) examined 85 industries totaling about 3,300 firms for the time period of 1977-1984, showed that firms below their reference point were found to exhibit greater risk-taking behaviors while firms above the reference point were more risk-averse. He used secondary accounting measures for his study. The rate of return was measured using a firm segment's average ROA for the time period examined and risk was computed as the variance of the segment's ROA for the same period. The target level was calculated using the industry's median ROA.

Jeger (1991) extended Fiegenbaum's (1990) work with the use of Belgian accounting data. To further test the robustness of Fiegenbaum's findings and the prospect theory on firm-level analysis, Jeger also included three additional measures of returns (return on equity (ROE), cash flow on equity, cash flow plus financial outlays on total assets) as well as one additional measure of risk (coefficient of variation, measured as standard deviation of returns divided by average returns). His results also showed support for prospect theory as he concluded that inevitably, prospect theory "potentially extremely useful for the explanation of observed risk-return relations at the firm level." Nevertheless, he admitted that two confirming studies is not enough evidence for general acceptance of prospect theory.

Relatedly, [Chou et al. \(2009\)](#) provided a more recent sample of 27,416 U.S. firms and examined data for a period of 20 years (1984-2003). They argued that, at the time, most of the analyses have used early data from the COMPUSTAT database, which could potentially lead to biased results. They asserted that in 1978, the COMPUSTAT database was drastically updated to include over 6000 firms. The historical data of organizations were backfilled; however, no organizations that failed to survive through 1978 were added to the database. Therefore, they wanted to remove the "survivorship bias" by presenting a more current data set. In addition, they divided their sample into two ten-year time periods to further test robustness the findings. The two sub-periods examined were 1984-1993 and 1994-2003.

Interestingly, Chou and colleagues documented even stronger evidence in support of prospect theory relative to [Fiegenbaum \(1990\)](#). For both periods examined, they found that firms under the industry median show a strong negative risk-return relation, whereas firms performing above the industry median exhibited a positive, but weaker risk-return relationship. In their industry level analysis, they found similar results which show support for the risk adverse behaviors proposed by prospect theory.

Additional literature and empirical evidence in support for prospect theory and the risk-return relation has been well documented in literature (e.g. [Chang & Thomas, 1989](#); [Gooding et al., 1996](#); [Sinha, 1994](#)). The robustness of these findings have been tested with different sub-periods (e.g. [Chou et al., 2009](#); [Fiegenbaum & Thomas, 1988](#)), multiple measures for risk and return ([Jegers, 1991](#)), and across various industries, among others. However, the majority of these studies have examined western countries, specifically in the U.S. As one of the scarce studies to employ international data to test prospect theory, [Jegers \(1991\)](#) asserted that additional development and evidence such as different data sources and data from other countries are imperative to fully understand the essence of economic decision making.

Cross-Cultural Differences in Risk Perceptions

There has been evidence suggesting that the perceptions of risks vary across different countries and cultures. [Bontempo, Bottom, and Weber \(1997\)](#) study of students from Hong Kong, Taiwan, the Netherlands, and the U.S indicated that differences of risk judgment between respondents from the two western countries and the two eastern countries exist. Respondents from Taiwan and Hong Kong were generally more sensitive to potential negative outcomes and less mitigated by the probability of gains in terms of financial risks.

Similarly, [Schroeder, Tonsor, Pennings, and Mintert \(2007\)](#) collected data from 4,005 beef consumers in the U.S., Canada, Mexico and Japan, and found glaring differences in risk aversion, risk perceptions, and risk behaviors in terms of food safety and consumption among the four countries. Relative to the U.S. and Canadian consumers, Mexican and Japanese consumers generally perceived risk to be higher and responded by being more risk averse and not consuming as much beef.

Although the differences in risk perceptions across countries have been empirically supported and acknowledged, there has been some evidence that suggests that these differences in risk perceptions do not necessarily alter risk behaviors. In a cross-cultural investigation of four countries that included China, Germany, Poland and the U.S., [Weber and Hsee \(1998\)](#) found that risk preference, measured as the buying price for risky financial options, varied across countries. But, these differences were attributed to the *perceived risk* rather than the *attitudes toward risk perceptions*. In all four cultures, the majority of respondents showed risk-aversion behaviors presented by their willingness to pay a premium price for less-risky financial options. Park and Jun (2003) found similar results in a study of Korean and American consumer internet buying behavior. They noted differences between the risk perceptions towards online shopping, but no significant differences were shown for online purchase intentions.

These findings suggest that prospect theory will hold across different cultures. Seemingly, the evidence supports the notion that people are indeed risk-averse and that the attitudes and behaviors toward risk is standard. This would suggest that there are cultural differences in reference points, but that the behaviors toward perceived risk will be in accordance with previous findings.

This paper is an exploratory investigation to examine whether or not China, Japan, and Vietnam will show behaviors toward risk that are consistent with predictions of prospect theory. Therefore, consistent with the literature, we test the following competing hypotheses¹:

Hypothesis 1a: The relationship between risk and return is negative for firms that are low performers, such that, firms performing below the industry median will be associated with greater risk taking behaviors.

Hypothesis 1b: The relationship between risk and return is positive for firms that are low performers, such that, firms performing below the industry median will be associated with lower risk taking behaviors.

Hypothesis 2a: The relationship between risk and return is negative for firms that are high performers, such that, firms performing above the industry median will be associated with lower risk taking behaviors.

Hypothesis 2b: The relationship between risk and return is positive for firms that are high performers, such that, firms performing above the industry median will be associated with higher risk taking behaviors.

SAMPLE, DATA AND MEASUREMENTS

Sample and Data

The sample of this investigation included firm-level data from China, Japan and Vietnam. Accounting data was obtained from the COMPUSTAT database for the period of 2009-2014. Industries were distinguished using a two-digit SIC code. The original sample included 32,169 firms across 180 industries, aggregately. But, only firms with complete annual data necessary to calculate the variables were included. After elimination of firms with incomplete data, the final sample yielded 10,623 firms across 128 industries among the three countries. Table 1 presents a summary of the number of firm and industry observations for each of the countries. For a detailed list of the two-digit SIC code industry that was included for each of the countries, refer to Appendixes A-C.

Table 1: Summary of Sample

Country	Firm observations	Industries by 2-digit SIC
China	4,411	47
Japan	5,156	45
Vietnam	1,056	36
Total	10,623	128

Measurements

The two main variables of interest are return and risk. Return is represented with return on asset (ROA) for the firm segment, calculated as net income divided by total assets for the time period

¹ Hypotheses 1a and 2a are consistent with Prospect Theory's assertions

(2009-2014). To operationalize risk, we calculated the variance of the return from the segment's ROA for the same time period. This approach is comparable to many of the previous studies that have examined this relationship (e.g. [Bowman, 1980, 1982](#); [Chou et al., 2009](#); [Fiegenbaum, 1990](#); [Fiegenbaum & Thomas, 1988](#)).

[Fiegenbaum \(1990\)](#) listed several reasons why accounting measures are more relevant to organizational theorists and strategic management scholars, rather than market measures as suggested by others (e.g. [Bettis & Mahajan, 1985](#); [Laitner & Stolyarov, 2004](#)): 1) regardless of level analysis, managers have more control over accounting data, 2) accounting data for public firms is utilized and controlled by regulatory agencies, 3) in any business, firms have only accounting measures of performance, and 4) only accounting measures are relevant for the division of firms.

Reference Point

Prospect theory does not clearly identify a measure for the point of reference. Instead, Kahneman and Tversky (1979) stated there is no universal rule to determine a reference point and that the reference point depends on the specific circumstance. [Fiegenbaum and Thomas \(1988\)](#) developed a procedure to determine the reference point according industrial organization economics. Industrial organization economics ([Caves & Porter, 1977](#); [Porter, 1980](#)) is focused on the nature of competition in the industry. Firms act and react based on the decisions of other industrial firms. Moreover, potential entrants' observations of the industry as a whole and inclusive performance of the industry would either encourage or discourage them from entering.

[Fiegenbaum \(1990\)](#) explained that the industry average would be a good measure to indicate the reference point. [Lev \(1969\)](#) showed empirical results that supported the notion that firms alter their levels of performance to the industry mean. This supported his hypothesis that the industry mean is a good reference point. Drawing data from a different source, [Frecka and Lee \(1983\)](#) confirmed that industry average was a good reference point for firm and industry analysis.

However, the industry median return and risk have been widely used and accepted to calculate the reference point (e.g. [Bowman, 1980](#); [Bowman, 1982](#); [Fiegenbaum, 1990](#); [Fiegenbaum & Thomas, 1988](#); [Jegers, 1991](#)). Also, to evenly divide the sample into "low" and "high" risk and return, the industry median of each as the reference point is the more appropriate measure for this study.

A dummy variable was created to code whether the firm was at/above or below the reference point, 1 if at or above and 0 if below. The same procedure was used to calculate both the reference points of return and risk.

STATISTICAL METHODS AND RESULTS

This research replicates ([Bowman \(1980\), 1982](#)), but does so on a more macro-level. Instead of looking at each of the industry separately for a country, data is aggregated for all of the industries to examine the cross-country differences on a more general level. This holistic approach to the investigation makes it easier to compare the three countries and it also provides a great overview to explore how the different countries behave to risk.

The analysis is split into two parts. In the first part, we use STATA 13.1 to do a chi square analysis. Chi square is used to determine if a certain distribution differs from some predetermined theoretical distribution. One of the applications of this test is to test the null hypothesis that there are no significant differences among or between the responses of individuals or groups (Downie & Heath, 1970). A two by two contingency table is created to examine the number of firms that are above or below the reference points of risk and return, shown in Figures 1-3.

In the second part of the analysis, we conduct a more complete test to confirm or refute the findings in part 1. In line with (Bowman (1980), 1982)), I calculated the negative association as “High/Low plus Low/High divided by High/High plus Low/Low.” If the coefficient is less than 1, the association is indicated as a positive association. The results from these calculations are shown on Table 2.

Figure 1: China

Pearson chi-square= 2300 $\rho < .001$

	Low Risk	High Risk
High Return	1898	309
Low Return	319	1885

Figure 2: Japan

Pearson chi-square= 3300 $\rho < .001$

	Low Risk	High Risk
High Return	2324	257
Low Return	265	2320

Figure 3: Vietnam

Pearson chi-square= 3.8715 $\rho < .05$

	Low Risk	High Risk
High Return	365	139
Low Return	176	376

The values shown in each of the quadrants on the contingency tables shown in Figures 1-3 is based on a firm’s average profit and the variability of its profit over the period of 2009-2014. The tables are split into “Low” and “High” in order to divide the firms in half within a given industry. For example, if the firm’s profit and risk are below the industry’s average, the firm would be put into the “Low-Low” quadrant.

The results of the first analysis show evidence that supports prospect theory’s assertions for all of the three countries. Higher performing companies tended to be associated with lower risk over time. Figures 1, 2, and 3 show the two by two tables along with the results of the chi-square analysis for each of the countries examined. The results show significance for China, Japan, and Vietnam at the 1%, 1%, and 5%, respectively. Thus, the null hypothesis that there is no significant difference between risk and return is rejected.

Table 2: Countries Ranked by Negative Association Ratio² Based on 2009-2014 ROA and Variance

Country	Firm observations	Negative Association Ratio
Japan	5156	8.9
China	4411	6.0
Vietnam	1,056	2.4

The results in Table 2 confirm the results from Figures 1-3. A more detailed analysis shows that Japan shows a higher negative association ratio than China and Vietnam. But, across all three countries the calculations show a strong negative association ratio. Taken all together, the empirical results from both analyses show that China, Japan, nor Vietnam showed a positive relationship for risk and return. These results support hypotheses 1a and 2a, showing evidence that suggests that prospect theory holds across other nations.

DISCUSSION AND CONCLUSIONS

Against the general belief that risk and return are positively associated, ([Bowman, 1980](#)) recorded evidence of a negative relation on a firm and industry level analysis. This paradoxical relationship provided a new line of investigations in order to provide insight as to why this negative relationship exists. This led to many researchers to turn to the behavioral decisions literature in an attempt provide an explanation.

Prospect theory ([Kahneman & Tversky, 1979](#)) has served as a powerful theoretical tool to explain the relationship. A plethora of studies have tested its assertions with different time periods and sub-periods, data sources, and additional measurements of risk and return. However, the international evidence of prospect theory is scarce, especially for firms located in the eastern part of the world.

This preliminary study replicated Bowman's work on a country level analysis to test prospect theory and contributed to the literature by examining three eastern countries (China, Japan, and Vietnam) to explore whether the negative association between risk and return exists and if prospect theory can be applied to explain the negative relationship. Using a recent five-year data set (2009-2014) including observations from 10,623 firms and 28 industries across the three countries, empirical evidence show support for prospect theory and the paradoxical relationship that Bowman recorded.

A chi-square analysis of each country shows that high performing firms are associated with lower risk, whereas the underperforming firms tend to exhibit riskier behaviors. Further analysis indicates that among the three countries, Japanese firms show a stronger negative association between risk and return, followed by China and Vietnam.

Limitations and Avenues for Further Investigations

This study is a preliminary study and therefore, is not without limitations. However, these limitations offer opportunities for further investigations to provide additional insights to the literature. The first limitation is the lack of generalizability. The sample only included three

² Consistent with [Bowman \(1982\)](#) "Two by two contingency table: High/Low plus Low/High divided by High/High plus Low/Low. Less than 1.0 indicates a positive association"

eastern countries. Moreover, data was only examined for five years. Future research should include other eastern countries as well as examine data for a longer period of time and for different sub periods.

Another limitation of this research is that it used the median return and risk as the reference point for analysis. This study used the same reference points as the previous investigations on western countries. However, previous literature on risk and behaviors suggest that cultural differences lie in the perceptions of risk and not in the behaviors toward risk. Subsequent studies can use different methods to indicate the reference point in order to test the robustness of the findings.

In addition, this study only used ROA when accounting for risk and return. Although previous empirical work have shown other accounting measures such as ROE and cash flows provide similar results, future work should incorporate different and multiple measurements of risk and return.

Furthermore, this investigation aggregated the industries for each country in its analysis to compare results on a macro-level. A rich avenue for further studies is to investigate with a more detailed examination and analyze on an industry level for each country, just as Bowman (1982) and others ([Chou et al., 2009](#); [Fiegenbaum, 1990](#); [Jegers, 1991](#)). This can potentially provide even a stronger support for the inevitable inference that Kahneman and Tversky's (1979) prospect theory is particularly useful for explaining the paradoxical relationship of risk-return on the firm and industry level.

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APPENDIX A

China Industries by 2-digit SIC

China		China	
1	Agricultural Production - Crops	47	Transportation Services
2	Agricultural Production - Livestock	48	Communications
7	Agricultural Services	50	Wholesale Trade - Durable Goods
8	Forestry	53	General Merchandise Stores
9	Fishing, Hunting, & Trapping	54	Food Stores
12	Coal Mining	55	Automotive Dealers & Service Stations
13	Oil & Gas Extraction	56	Apparel & Accessory Stores
15	General Building Contractors	57	Furniture & Homefurnishings Stores
16	Heavy Construction, Except Building	58	Eating & Drinking Places
22	Textile Mill Products	59	Miscellaneous Retail
23	Apparel & Other Textile Products	60	Depository Institutions
25	Furniture & Fixtures	61	Nondepository Institutions
26	Paper & Allied Products	62	Security & Commodity Brokers
27	Printing & Publishing	63	Insurance Carriers
29	Petroleum & Coal Products	65	Real Estate
30	Rubber & Miscellaneous Plastics Products	67	Holding & Other Investment Offices
31	Leather & Leather Products	70	Hotels & Other Lodging Places
39	Miscellaneous Manufacturing Industries	78	Motion Pictures
40	Railroad Transportation	79	Amusement & Recreation Services
41	Local & Interurban Passenger Transit	80	Health Services
42	Trucking & Warehousing	82	Educational Services
44	Water Transportation	84	Museums, Botanical, Zoological Gardens
45	Transportation by Air	87	Engineering & Management Services
		99	Non-Classifiable Establishments

APPENDIX B

Japan Industries by 2-digit SIC

Japan		Japan	
1	Agricultural Production - Crops	41	Local & Interurban Passenger Transit
2	Agricultural Production - Livestock	42	Trucking & Warehousing
7	Agricultural Services	44	Water Transportation
9	Fishing, Hunting, & Trapping	45	Transportation by Air
10	Metal, Mining	47	Transportation Services
12	Coal Mining	54	Food Stores
13	Oil & Gas Extraction	55	Automotive Dealers & Service Stations
14	Nonmetallic Minerals, Except Fuels	56	Apparel & Accessory Stores
16	Heavy Construction, Except Building	60	Depository Institutions
17	Special Trade Contractors	63	Insurance Carriers
21	Tobacco Products	64	Insurance Agents, Brokers, & Service
22	Textile Mill Products	70	Hotels & Other Lodging Places
23	Apparel & Other Textile Products	72	Personal Services
25	Furniture & Fixtures	75	Auto Repair, Services, & Parking
26	Paper & Allied Products	76	Miscellaneous Repair Services
29	Petroleum & Coal Products	78	Motion Pictures
30	Rubber & Miscellaneous Plastics Products	79	Amusement & Recreation Services
31	Leather & Leather Products	80	Health Services
33	Primary Metal Industries	82	Educational Services
34	Fabricated Metal Products	83	Social Services
37	Transportation Equipment	86	Membership Organizations
39	Miscellaneous Manufacturing Industries	89	Services, Not Elsewhere Classified
40	Railroad Transportation	99	Non-Classifiable Establishments

APPENDIX C

Vietnam Industries by 2-digit SIC

Vietnam		Vietnam	
1	Agricultural Production - Crops	41	Local & Interurban Passenger Transit
10	Metal, Mining	42	Trucking & Warehousing
12	Coal Mining	47	Transportation Services
13	Oil & Gas Extraction	49	Electric, Gas, & Sanitary Services
14	Nonmetallic Minerals, Except Fuels	50	Wholesale Trade - Durable Goods
15	General Building Contractors	51	Wholesale Trade - Nondurable Goods
16	Heavy Construction, Except Building	55	Automotive Dealers & Service Stations
17	Special Trade Contractors	59	Miscellaneous Retail
21	Tobacco Products	60	Depository Institutions
22	Textile Mill Products	62	Security & Commodity Brokers
27	Printing & Publishing	63	Insurance Carriers
29	Petroleum & Coal Products	65	Real Estate
30	Rubber & Miscellaneous Plastics Products	67	Holding & Other Investment Offices
32	Stone, Clay, & Glass Products	70	Hotels & Other Lodging Places
34	Fabricated Metal Products	73	Business Services
35	Industrial Machinery & Equipment	79	Amusement & Recreation Services
36	Electronic & Other Electric Equipment	87	Engineering & Management Services
39	Miscellaneous Manufacturing Industries	99	Non-Classifiable Establishments