RISK-SEEKING BY TROUBLED FIRMS: JSE LISTED FIRMS

by

Name and surname: PEMBELANI RAPHUNGA

Student number: 602244

MCOM (FINANCE)

in the

SCHOOL OF ECONOMICS AND FINANCE

at the

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Supervisor: MR J. Britten, CFA

Date of submission: **23 October 2020**

A research report submitted to the Faculty of Commerce, Law and Management in order to fulfil the requirements for a Masters in Commerce with a 50% Research component.

Risk-Seeking by Troubled Firms

ABSTRACT

This study examines the risk-seeking behaviour of troubled firms using a sample of Johannesburg Stock Exchange (JSE) listed firms over the period 1995-2018. A firm's riskiness is determined by the absolute distance of its return on equity (ROE) from its industry median ROE. Thus, a firm's performance is defined relative to its peers. This study reports a statistically significant negative relationship between the firm's performance and its subsequent risk. When compared to prior gains, prior losses are followed by more risk-seeking activities. The findings are consistent with prospect theory. Firms take more risk when troubled, indicating that current performance of a firm determines its future risk level. Moreover, these associations are much stronger for firms which remain in the same states for longer periods.

SCHOOL OF ECONOMICS AND FINANCE

Declaration Regarding Plagiarism

I (full names & surname):	Pembelani Raphunga
Student number:	602244

Declare the following:

1. I understand what plagiarism entails and am aware of the University's policy in this regard.
2. I declare that this assignment is my own, original work. Where someone else's work was used (whether from a printed source, the Internet or any other source) due acknowledgement was given and reference was made according to departmental requirements.
3. I did not copy and paste any information directly from an electronic source (e.g., a web page, electronic journal article or CD-ROM) into this document.
4. I did not make use of another student's previous work and submitted it as my own.
5. I did not allow and will not allow anyone to copy my work with the intention of presenting it as his/her own work.

Signature

23/10/20
Date

ACKNOWLEDGEMENTS

I want to start by thanking the following people for making materially significant input in this research: Supervisor - James Britten. David McClelland and Ayesha Sayed from the school research committee.

I want to thank my mother - Litshani Nevhutalu for giving me courage. I thank Amos Muravha for motivating me. I thank Mboneni Muravha and Emmanuel Mutavhatsindi for providing emotional and financial support. I thank Phumudzo Raedani and Nkhumbuleni Lukhwa for providing technical support. I thank BankSeta for funding. Above all, I thank the Almighty for wisdom and knowledge.

Table of Contents

1. INTRODUCTION

1.1 BACKGROUND

Bowman (1982) is the earliest to document that troubled firms take more risk when compared to non-troubled firms. These findings are attributable to two explanations: Firstly, managers are naturally risk-seekers and not risk-averse. Secondly, managers take more risk merely as a way of a corporate strategy. That is, competent and skilled managers can reduce risk while maintaining the highest attainable return. The current study abides by these two explanations to investigate whether firms take more risk when troubled than when not troubled using the South African equities.

The findings in Bowman (1982) that firms are risk-seekers when underperforming relative to their peers relate to the findings which Kahneman and Tversky (1979) have documented. Indeed, Kahneman and Tversky (1979) found that individuals are risk-seekers when presented with gambles after experiencing losses. The risk-seeking or risk-aversion depends on how the reference point is defined (Díez-Esteban, García-Gómez, López-Iturriaga, & Santamaría-Mariscal, 2017; see also Coval & Shumway, 2005). Therefore, the question of how the reference point is defined has received much attention. For example, Kliger and Tsur (2011) use the firm's median industry return from the previous year as the reference point and the current study applies the same definition. The definition used for the reference point allows for variation in a firm's classification over the sample period. This is important since a firm is not expected to be under distress, at least, all its life.

Moreover, Bowman (1982) found that the positive risk-return relationship is reversed when firms are under distress. This suggests that the troubled firms are taking risks which are not necessarily compensated for. This opposes the well-documented principle in finance which states that the higher the perceived risk of the project, the higher the return expected from the project (see Reilly & Brown, 2003). The presence of the negative relationship is also well documented as well as the findings that the positive relationship between risk and return does not always hold (Bowman, 1982; see also Armour & Teece, 1978; Bowman, 1980; Treacy, 1980). Although the current study does not investigate the risk-return relationship in detail, it is a recognisable inference when analysing the risk-seeking using returns.

The firm's performance is reflected through the returns. Moreover, the study claims that managers decide on the project based on its risk level, and thus making the overall risk-return decision of the firm. Consequently, in line with the prospect theory, the risk-averse firms are those firms with a performance which is higher than the median industry performance. Furthermore, those firms with performance below their industry median should be risk-seeking. This is because such firms would forgo their expected returns in an attempt to increase variance in returns and hence, increase the rate at which they make the risk-return trade-off as their performance declines.

The current study applies the prospect theory using a total of 361 listed firms on the Johannesburg Stock Exchange (JSE) to investigate whether the troubled firms take more risk compared to the non-troubled firms. The current study also attempts to provide insights to the risk-seeking when firms remain in the same conditions for longer periods. The results suggest a strong risk-seeking (risk-aversion) behaviour on firms in the JSE when firms are troubled (not troubled). Moreover, the effect of risk-seeking is much stronger for firms which remain troubled or non-troubled for longer periods. The positive risk-return relationship is interrupted when firms are troubled.

1.2 PROBLEM STATEMENT / CORE RESEARCH QUESTION

The current study tries to use the prospect theory from Kahneman and Tversky (1979) in explaining why troubled firms would engage in more risk-seeking. When firms engage in high-risk activities, it is worthwhile to note that this behaviour may lead to low profitability. However, this study tries to answer the question: Do less profitable firms defined as troubled firms, tend to engage in higher risk-seeking activities as reflected in their return on equity (ROE) variances?

Recent studies have shifted the attention of investigating the risk-seeking by troubled firms by grouping the firms into the two-fixed groups of troubled and non-troubled throughout the studied period. This realisation is valuable since the firms under considerations are not expected to stay in the same conditions. An attempt is then made to allow risk levels to vary with returns. This changing of firms' performance and risk levels are found to suit the prospect theory better. However, such studies have only focused on the investigating intervals of the studied period and not cumulative. That is, the current study also combines the firm's performance over the years to distinguish the firms which were mostly troubled from those which were barely troubled. Therefore, this study also attempts to answer the question: Is the effect of risk-seeking stronger in firms which remain in the same states for longer periods?

1.3 RESEARCH OBJECTIVES / RESEARCH QUESTIONS

The purpose of the study is to test the view on the risk-seeking behaviour by troubled firms which Bowman (1982) stresses about and give insights on the risk-return relationship. The study applies the methodology developed in Kliger and Tsur (2011) to identify distressed firms and assess their risk-seeking behaviour. Moreover, as explored by Díez-Esteban et al., (2017), the study tests the opinion that when the firm's performance is above the reference point, managers have no incentive to increase business risk thereby making drastic changes to the firms. However, the current study cannot tell if the firms are avoiding the projects. Therefore, this opinion is tested by comparing the risk levels for the troubled firms to those of the non-troubled firms.

To test the premise of whether firms take more risks in the situation of financial distress, a firm's risk is measured as the distance between its ROE and the industry's median return at year t. Each hypothesis tracks the following sequence: Firstly, the firms are assumed to evaluate their year t-1 returns against the returns of the other firms within and/or across their industry and specifically against their target level, which is computed as the industry median return at t-1. In a given period, say year t, a firm's industry position is determined from year t-1 as to whether it is above or below the reference point. Secondly, each firm is assumed to decide on its subsequent risk-taking.

The argument is that the decision-makers for firms with returns above (below) their median levels tend to engage in lower (higher) risk activities as indicated by a smaller (larger) absolute distance in firm's ROE from their industry median returns. This is because higher risk-taking increases the chance to achieve a larger positive return while increasing the downside as well. Nonetheless, this possibility encourages firms which are below the target to take more risks. This is because by doing so, such firms increase their probability of reaching their targeted levels. The study also compares firms across industries because some firms are diversified into different industries. Therefore, the study states the following two broad formal alternative hypotheses:

- *H1*: There is a negative (positive) relationship between the performance and risk-seeking on the firms with ROEs below (above) their reference points across and/or within industries.
  i.e. the more troubled a firm is, the larger would be its subsequent risk.
- *H2*: The negative (positive) relationship between the performance and risk-seeking is stronger for firms with ROEs which remain below (above) the reference points for longer periods.
  i.e. such firms which are troubled (non-troubled) for longer periods take the more (less) risk.

The risk-return relationship is translated from the firm's performance and its subsequent risk. The performance is the difference in ROE and the reference point. Therefore, the traditional risk-return relationship is only treated as a proposition of the second-degree. Hence, the risk-return hypothesis i.e. there is a negative (positive) relationship between risk and return for firms which are troubled (non-troubled), although tested, is not stated explicitly in the current study.

1.4 IMPORTANCE AND BENEFITS OF THE STUDY

The study contributes to the literature of risk-seeking by troubled firms using South African data. The study is an application/examination of the prospect theory on the JSE listed firms. It may still be possible to make inferences for similar firms outside the firms on the JSE spectrum. Furthermore, investors can benefit if it is possible to distinguish, ex-ante, between those firms which are financially stronger and weaker ones in the aftermath.

Most of the studies such as Kliger and Tsur (2011), Díez-Esteban et al., (2017) and see also Coval and Shumway (2005) apply the definition of the reference point by a way of measuring firm's and/or individual's performance relative to their peers. Such studies only use the reference point to investigate the risk-seeking for each given interval and not cumulative. That is, these studies do not combine performance through time. Therefore, the current study also separates those firms with performance below the reference point more frequently from those firms which are barely classified as troubled. Therefore, this study is the first, to the student's knowledge, to use this approach to investigate the effect of risk-seeking by troubled firms when firms remain in the same states for longer periods.

1.5 DELIMITATIONS

Public firms with available information are considered for the study. Inferences made from the study about troubled firms' risk-seeking may be limited to firms listed on the JSE. This is because of the significant difference in agency costs between public and private firms. The investigation uses one proxy in an attempt to detect whether firms are passing projects and may encounter causality as a result which is reduced using some statistical tools. Timing of financial year-ends is also taken into account because ratios such as inventory-turnover ratio could be affected by the effect of seasonality.

1.6 DEFINITION OF KEY TERMS

1. **Business risk:** risk concerning the nature of the business itself. This includes all uncertainty surrounding the industry where the business operates.
2. **Financial risk:** risk reflecting the financing part of a firm. When the firm is financed with interest-bearing debt, interest must be paid regardless of the performance of the firm.
3. **Troubled firms:** the investigation strictly defines troubled firms as firms with ROE which are lower than the previous year's industry median return.

The study is organised as follows. Section 2 reviews related literature. Section 3 presents the data, including the methodology, the empirical analysis and the regression model. Section 4 presents the results. Section 5 concludes the investigation.

2 LITERATURE REVIEW

This section firstly reviews studies which focus on the relationship between risk and return, then studies on behavioural finance theories and risk preferences, and lastly, the measures, reference and indicators of financial trouble faced by firms.

2.1 FIRM BEHAVIOUR AND RISK-RETURN RELATIONSHIP

The study proclaims the risk-return relationship as a cornerstone to investigate the firm's risk-seeking. Therefore, the mixed evidence which is documented about the risk-return relationship is reviewed.

The positive association between risk and return is widely documented. Conrad and Plotkin (1968) examined 783 U.S. companies with 59 industries. Conrad and Plotkin (1968) found a significant positive risk-return relationship. Likewise, Fisher and Hall (1969) assumed that firms maximize expected utility rather than profit and observed a significant positive correlation between risk and return at a firm and industry level.

The current study focuses on business risk. Cootner and Holland (1970) defined the business risk using the dispersion of earnings of firms. The dispersion of the firm's rate of return was therefore used to indicate its business risk in that industry. Both time and industry effects were considered, and the results show a positive relationship between risk and return. The sample consisted of 315 U.S. firms in 39 different industries throughout the years between 1946-1960. The study assumed that risky investments as shown by having large standard deviations in earnings are compensated with higher rates of return. The statistical model developed captures about one-quarter of the variation on returns across industries and firms. The positive relationship is found to be statistically significant and unlikely to be random.

Hurdle (1974) used 228 U.S. firms grouped into 85 industries to support a positive association between risk and return for both firm and industry levels. Moreover, the hypothesis tested is that the dispersion of returns around the average industry's returns is an indication of the riskiness of the investment in that industry. This is similar to the approach employed by studies such as Kliger and Tsur (2011), which is also the methodology adopted in the current study.

Armour and Teece (1978) considered organisational structure in an attempt to remove model specification bias which possesses challenges on previous studies about firm profitability. Armour and Teece (1978) used the U.S. petroleum industry with 28 firms to examine the risk-return relationship through time. Armour and Teece (1978) found a negative but insignificant risk-return relationship. According to Armour and Teece (1978), no risk-return relationship exists independently of the organisational structure when considering the firm's size and profitability. In a related study using the West German industrial stock firms, Neumann, Böbel and Haid (1979) took advantage of large data availability and analysed 334 firms while considering firms' size. Indeed, Neumann et al., (1979) found that there is a significant positive correlation between risk and return.

Bowman (1980) used industry effect as an intervening variable in risk-return relationship to explain causal links between other variables such as leverage ratio and the rate of acquisitions in a larger sample of 1,572 U.S. firms divided into 85 industries between the period 1968-1976. A total of 56 out of the 85 industries indicated a negative correlation between risk and return whereas the 21 industries had the opposite correlation and the rest of the industries were inconclusive. Bowman (1980) also examined a shorter period 1972-1976 with 11 industries and found a significant negative correlation between risk and return within industries. A negative but insignificant relationship was observed across industries.

The study by Treacy (1980) found a much stronger negative correlation between the risk and return when compared to Bowman (1980). The sample included 1,458 firms in 54 industries from 1966-1975. When industries were ranked by these correlation coefficients, Treacy (1980) found that 43 out of 54 industries showed a negative correlation between risk and return. Additionally, after controlling for size, as measured by firms' assets, the number of industries showing a negative correlation was only reduced from 43 to 39 out of the 54 industries. Furthermore, larger firms are found to have lower debt to equity ratios and also indicated a lower risk computed using ROE.

Acquisitions activities involve risks of failure (Bowman, 1982). When acquisitions are used as a proxy for risk-seeking, indeed Bowman (1982) found that the firms associated with high acquisitions activities showed a 5-year average return of 8.9% and those firms with low acquisitions activities had a much higher 5-year average return of 12.8%. Therefore, high-risk acquisition activities are not rewarded with higher returns. The sample investigated includes 82 U.S. firms in food processing, computer and container industries. This is because profitable firms showed several differences compared to less profitable firms in those industries. Furthermore, more acquisitions activities were evidenced in firms showing lower profitability. That is, less profitable firms may opt to risk-seeking by using acquisitions activities. Indeed, Bowman (1982) found a significant negative relationship between risk and return in firms with higher acquisitions activities.

In addition to the findings that there is a positive relationship between the previously low profitable firm and its risky acquisitions activities, litigation exposure may also be considered as a surrogate measure of risk. This is because litigation exposure may indicate a form of pushing against the civil or public constraints of the law (Bowman, 1982). To do this, Bowman (1982) investigated the computer industry with 46 firms, since the firms show a much larger amount of litigation differences. Indeed, Bowman (1982) found a positive correlation between low profitable firms and litigation. Bowman (1982) realized that when using the return on sales, firms with no litigation discussions had a median profit higher than those for firms with litigation discussions.

Bowman (1982) suggested that the uncertainty regarding the risk-return relationship exists ex-ante and must be measured empirically after the event. In an attempt to match the finding that troubled firms take large risks, the notion of making decisions collectively was experimented by placing individuals in unfavourable situations, Bowman (1982) found that individuals try to eliminate or meet previously attained losses when faced with unfavourable situation thereby seeking more risk.

Bowman (1982) considers a firm's activities, approaches and ventures and concluded that new ways of conducting business may be considered a way of risk-seeking and found that most troubled firms engage in such actions. Bowman (1982) alluded that individuals are not risk-averse everywhere and that they may engage in riskier activities with lower returns when they are placed below their target levels.

Marsh and Swanson (1984) removed the general co-movements in ROE across firms and industries to examine the risk-return relationship. Indeed, Marsh and Swanson (1984) found a statistically insignificant correlation between risk and return. Marsh and Swanson (1984) extended the examination by considering a sample of firms with projects with risks within their estimated limits and those reflecting a positive association between risk and return. Indeed, Marsh and Swanson (1984) found that some firms have projects with lower risks but expected to have higher returns. In their original sample, a total of 135 firms in 13 industries was used to run the statistical tests. However, to avoid selection bias, the same statistical tests were also applied using similar industries in which Bowman (1980) found a statistically significant negative relationship. Indeed, Marsh and Swanson (1984) also found an insignificant correlation between ROE and risk using the sample used in Bowman (1980).

Fiegenbaum and Thomas (1985) found that through time, there was a significant negative correlation between risk and return for the period 1965-1969 and a reversed significant risk-return relationship was observed in the 1970s amongst the 7 industries of the 345 to 700 U.S. firms.

Fiegenbaum and Thomas (1986) used a much larger sample between 1,283 to 2,394 U.S. firms and more industries compared to Fiegenbaum and Thomas (1985). Moreover, Fiegenbaum and Thomas (1986) applied risk measurement with time to explain any causality in the risk-return relationship. Their study found a negative relationship between risk and return for accounting measures of risk in the 1970s, a statistically significant risk-return relationship for accounting measures in the 1960s. However, they found a statistically insignificant risk-return relationship for systematic risk measure.

Cheng (2010) compared Chinese firms to Western firms from 1987 to 2002 and found that Chinese firms are less sensitive than Western firms about risk-return relationships. When using a market benchmark as a reference point, Cheng (2010) found that the risk-return relationship is even less sensitive for more profitable firms.

Díez-Esteban et al., (2017) studied the risk-return relationship using 791 non-financial firms from 2001-2013 and found that the negative risk-return relationship is observed only for firms which are performing below their target levels. Furthermore, the positive risk-return relationship holds for those firms with performance above their target levels.

2.2 BEHAVIOURAL DECISION THEORY AND RISK TAKING

To explain the incentives on why firms would take more risk when troubled, the current study pulls theories on behavioural finance which are aimed at explaining how investors would behave under some conditions. There is mixed evidence of risk-seeking and risk-aversion behaviour. Furthermore, most of these theories tend to focus on distinguishing risk-seeking individuals from the crowd of risk aversions.

There is risk-seeking behaviour in situations below a target return level and risk aversion behaviour for above the target returns (Fishburn & Kocheberger, 1979; Kliger & Tsur, 2011). A practical revolution was obtained from substantial laboratory evidence by Kahneman and Tversky (1979) who supported the propositions that subjects are risk-seeking below some targeted level and risk aversion above the target level.

Kahneman and Tversky (1979) developed the paradigm termed prospect theory, which predicts that when subjects are faced with risky prospects, individuals tend to choose outcomes that are more certain compared to probable outcomes. The awareness that subjects use some target return level or reference point also received empirical support when Laughhunn, Payne and Crum (1980) used a larger sample compared to the original prospect theory' study. Laughhunn et al., (1980) found that most managers tend to be risk-seeking below the target only when there are non-ruinous losses in place and tend to switch to risk aversion when ruinous losses are involved.

Singh (1986) examined 64 medium-to-large U.S. and Canadian firms and found that those firms with poor performance tend to engage in riskier activities than those that are performing well. Moreover, Singh (1986) found that there is a negative association between the performance of a firm and its risk-seeking behaviour. It is important to note that a firm's circumstances change the level of managers' risk preference (Nickel & Rodriguez, 2002; see also La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2000).

Bowman (1982) could not validate if the results are biased due to the sampling period, Cheng (2010) investigated the risk-seeking using a sample of Chinese and Western firms. Indeed, Cheng (2010) found that Chinese firms are more risk-averse than Western firms, as a way to preserve earnings. This suggests that risk-seeking behaviour is geographically dependent - a need for the study on the South African market. In the prospect theory, a firm's position relative to the reference point, and therefore its actions, are state-dependent. Therefore, there is a need to compute the reference point for each year to eliminate the criticism that the return distribution is constant over the investigated period (Kliger & Tsur, 2011).

Alam and Boon-Tang (2012) used 99 Islamic banks across 14 countries and found that banks with performance, as measured by returns, above reference point tend to be risk-averse. Indeed, Alam and Boon-Tang (2012) found that those banks with performance below their reference point showed risk-seeking behaviour. Moreover, Alam and Boon-Tang (2012) found that banks which have higher loans to total asset ratio tend to be more risk-averse. Dasgupta (2017) investigated a sample of 50 Indian firms over the period 2009-2013 using the return on asset and ROE and capital ratios and found that firms with returns above the reference point show a risk-aversion behaviour, while those firms with returns below the reference point indicate a risk-seeking behaviour.

Risk-seeking behaviour is also investigated at shorter intervals. For example, Coval and Shumway (2005) studied the risk-seeking behaviour of 1,082 traders for the CBOT T-bond futures during 1998. Their results found that those traders with morning losses take more risk levels in the afternoon. This is because traders with morning losses are trying to make up for the losses by taking more risk thereby increasing their upside while increasing their downside as well.

Díez-Esteban et al., (2017) also argued that the risk-seeking behaviour of the firm depends on how the reference point is framed. Díez-Esteban et al., (2017) also found that those firms with a performance which are below their reference points show high levels of risk. This is because the firm pushes to achieve its desired performance thereby taking more risk.

2.3 MEASURES, REFERENCE AND INDICATORS OF FINANCIAL DISTRESS

The study reviews literature in search of evidence on using profitability of firms to detect financial distress. Furthermore, how the reference point or the target level is defined has received much attention over the years.

Indeed, when one considers the profitability of firms through time, there has been a tendency of less profitable firms to show higher variances in their operations and profits whereas more profitable firms show lower variance in their profitability (Armour & Teece, 1978). Another claim by the current study is that profits are linked to ROE. Since profits vary over time, so does ROE. Therefore, the current study uses ROE and asserts that shareholders will expect a higher return from troubled firms. When the firm's performance is below the reference point, the firm is classified as troubled.

Studies such as Fiegenbaum and Thomas (1988) emphasise the role of the reference point. This is because the risk-seeking or risk-aversion is dependent on how the reference point is defined. It then follows that the way the reference point is defined would have an impact on the empirical findings. These studies use the median or average return as a reference point. Fiegenbaum and Thomas (1988) used COMPUSTAT data for the period 1960-1970 with ROE and variance of ROE as returns and risk, respectively. The current study applies similar variables. However, the sample from Fiegenbaum and Thomas (1988) is divided into two groups: One group is of firms with a performance below the reference point and the other is of firms with a performance above the reference point. In this way, the reference is fixed. However, the current study allows the reference point to vary and so does the risk levels. This is because the firms do not stay troubled at all times.

The current study asserts that the shareholders' views are captured using the ROE. Persistent losses and dividend cuts point to financially distressed firms (H DeAngelo, L DeAngelo & Skinner, 1994). This is because of the obligatory agreements the firm has in its books.

The current study uses the accounting information (i.e. ROE) to signal performance. The use of accounting information is appropriate since Piotroski (2000) showed that using the accounting-based approach to do fundamental analysis can increase the returns earned by investors. After analysing the investment strategy of high book-to-market firms from 1976-1996 using data from COMPUSTAT, Piotroski (2000) found that firms with weak current indicators[1] are more likely to be distressed.

Moreover, Piotroski (2000) cheaper stocks are more likely to signal financial distress. This is because firms with cheaper stocks are unlikely to recover and therefore tend to yield negative returns. Furthermore, as suggested by Park (2005), the dispersion of earnings has strong predictive power for future share returns. Besides, Park (2005) found that the dispersion of earnings is strongly related to the trading volume. Therefore, higher dispersion of earnings may indicate more uncertainty around future stock prices, which can result in undervaluation of stocks. Therefore, in understanding with Piotroski (2000), the low-priced stock tends to indicate financial distress. Other studies such as Fama and French (1992) also suggest that high returns indicate a healthier financial status.

Profitability is an important indicator of a firm's financial health status. According to Fama and French (2006), more profitable firms have higher expected returns. Therefore, firms with higher expected returns are assumed to be less distressed in the study. Also, in agreement with Piotroski (2000), Fama and French (2006) found that higher expected returns are prominent in firms with higher book to market ratios. Therefore, the book to market ratio can also be a proxy for firms' financial distress. However, the current study argues that this is captured by profitability which in turn is argued to be reflected in the firm's ROE.

The focus of the current study is not in distinguishing between the different ways of predicting financial distress. However, it is worth pointing out that there are efforts to compare the scores to predict the firm's financial distress. For example, Pongsatat, Ramage and Lawrence (2004)

[1] The three main indicators for financial distress are: lagged profitability, asset growth and accruals. The current investigation absorbs all these indicators using ROE.

compared the Ohlson's logit model and Altman's four-variance model. Pongsatat et al., (2004) found that the two models have no significant difference in their predictive power in predicting the firm's financial distress. However, when considering the F-score, Hyde (2016) suggest that inferences to be drawn about the F-score strategy are sensitive to the chosen universe of stocks and approach to portfolio construction. Besides, this is a forewarning on using the findings in the JSE listed firms to make inferences outside the JSE spectrum. That is according to Hyde (2016), the F-score indicator should not be used in isolation as an investment strategy. Hyde (2016) suggested that factors such as value, momentum and low-risk factors should be considered when making investment decisions.

2.4 SUMMARY OF THE LITERATURE

The main argument of the current study revolves around the firm's business risk. Most studies, for example, Bowman (1980), define risk as the dispersion of returns. The current study adopts this definition of using the distance of returns from the median/reference point to measure business risk. There is mixed evidence on the risk-return relationship from the literature. The current study attempts to also provide some clarity on the risk-return relationship.

The current study accepts that the lagged profitability, asset growth and accruals as suggested by Fama and French (2006) are all related to the firm's returns. Moreover, the Piotroski (2000) and Ohlson(1980) scores are also related to the firm's returns (Fama & French, 2006). Therefore, returns are then used to signal financial health. Consequently, the current study proceeds to use ROE as an indicator of the firm's performance.

The reference point plays a major role in the firm's risk-seeking behaviour (Díez-Esteban et al., 2017). Moreover, the position or the state of the firm as measured by its performance determines subsequent risk levels (see Coval & Shumway, 2005). Most studies such as Kliger and Tsur (2011) have shown that there is risk-seeking behaviour when firms have a performance which are below their reference points. The literature shows that risk-aversion behaviour is noticeable when firms have a performance which are above their reference points.

There has been mixed evidence on the risk-return relationship. However, the relationship appears to be dependent on whether firms have a performance which is below or above their reference points. Moreover, the literature shows the existence of the negative risk-return relationship for firms with a performance which is below the reference points. Nonetheless, the positive risk-return relationship is evidenced when firms are performing above their reference points.

3 DATA AND METHODOLOGY

3.1 METHODOLOGY (RESEARCH DESIGN AND METHODS)

3.1.1 Sampling and Data Collection

The investigation focuses on the JSE listed firms. The reported ROE may be affected by accounting conventions. Therefore, ROE information for the firms is from one stock exchange to limit differing accounting conventions. Data is obtained from the Iress Expert. The sample includes firms from all the sectors in the JSE. Historical firms' ROE is examined to detect whether high risk investing is awarded higher returns. The Industry Classification Benchmark (ICB) was used to classify firms' industries.

The investigation uses yearly data for the period 1995-2018. This is the longest period used compared to the others used in the related literature, for example, Kliger and Tsur (2011) covered 14 years, and hence the 24 years chosen in the current study captures a wider range of changes in the economic conditions. The ICB applied is a crude industrial classification compared to the widely used COMPUSTAT's four-digit industrial classification (see Kliger & Tsur, 2011). The choice is influenced by the limited data availability for South African firms. A finer industrial classification in this study significantly reduces the number of firms for each industry. Nonetheless, the ICB is acceptable because it is similar to the two-digit industrial classification which is applied, for example, by Bowman (1980).

Moreover, the study also creates an effort to signify shareholders' interests. However, the investigation is limited to use the recorded data. Furthermore, the focus is on the expected ROE - the return computed from accounting information. Unlike the required rate of return, the expected

ROE is based on the financial statements/ratios computed from the accounting conventions at hand. The risk of investment affects both its required return and eventually the ROE. This follows immediately since the study measures risk using the volatility of ROE. The more volatile an investment is, the higher the premium for the risk estimated. Thus, the higher risk might lead to a higher expected ROE. However, the study uses the ROE to investigate whether the firm's performance affects its subsequent risk level.

There is a total of 361 firms grouped in nine industries which are extracted from the database. The ROE data points were manipulated in the following way; The ROEs which were found to be above the 200% were questioned and the firms' income statements were examined. Extreme amounts which were recorded as other expenses, for example, were removed. This rigorous manipulation was motivated by four reasons: Firstly, the extreme ROE values were found not to be driven by firms' market capitalisations. Secondly, only a few numbers of ROEs were found to be extreme and thus removing the extreme reported amounts did not have a statistical impact. Thirdly, after removing those extreme unexplained amounts, the negative ROEs values remained in the negative domain while positive ROE values also remained in the positive domain. Fourthly, the ROE values approached the firm's average ROE (excluding the extreme value of interest) and this is the normality condition as required by the central limit theory. Therefore, the main idea of the study (from the hypotheses) was neither lost nor reaffirmed by applying such a method. Table 1 and Table 2 show the sample's descriptive statistics of these firms' ROEs grouped by industry and year, respectively.

Table 1 categorised firms by industry and the names of the nine industries examined are shown under the Industry Name categorical variable. The Firm-year Obs. variable is shown as the average number of firms with the number of observations taken into account in each year. In a given year, the financial industry has the highest average number of firms, followed by industrial firms. The oil and gas industry has the smallest average number of firms in each year. The lowest ROE (-199.03%) belongs to an industrial firm. The financial industry shows the highest ROE of 188.12% in the sample under consideration.

Table 1: Sample's Descriptive Statistics by Industry

The table shows the number of firms[2] in each one of the nine studied industries, and descriptive statistics (minimum, maximum, median, average and standard deviation) about the ROE of the firms in each industry.

Sample's Descriptive Statistics by Industry						
Industry Name	Firm-year Obs.	ROE (% Representation)				
		Min	Max	Median	Avg.	Std Dev.
Basic Materials	36.7	-197.59	166.96	8.78	6.44	33.40
Financials	56.1	-178.60	188.12	12.45	12.00	27.05
Consumer Goods	13.5	-197.42	126.40	15.66	15.89	25.03
Consumer Services	27.2	-137.42	88.05	20.43	19.41	19.73
Health Care	4.4	-120.50	71.13	14.80	10.51	27.85
Industrials	40.2	-199.03	126.71	14.61	11.61	26.40
Technology	12.3	-158.72	105.32	14.02	10.58	29.07
Oil & Gas	1.9	-115.09	67.85	-10.33	-15.99	36.89
Telecommunications	3.8	-65.11	125.17	13.94	19.38	22.78

The median ROE value for the oil and gas industry lies in the negative domain while the consumer services industry has the highest median ROE recorded. It follows that the oil and gas industry also has a negative average ROE and consumer services industry also has the highest average ROE. The oil and gas industry has a much larger dispersion in its ROE, followed by the basic materials industry. The consumer services industry has the lowest ROE standard deviation.

Table 2 groups the firms by year. The years under consideration are shown under the Year categorical variable. The No. of Firms variable reports the total number of firms considered in each year. The number of firms has increased over the years. This is as expected, since as the number of firms listed increases with time, so does the availability of data from the database used to extract the firms.

[2] To get Firm-year Obs., the number of firms for each industry is computed as the *average* number of firms with the number of observations taken into account in each year as follows: For example, there are 60 firms extracted from the Basic Materials industry for the 24 years examined. There should be a total of observations equal to 60 multiplied by 24. However, this is not the case since there are some missing observations. Thus, in an attempt to get back to the 60 firms, the number of the actual observations recorded is divided by the 24 years and that is assumed to be the Firm-year Obs. statistic.

Table 2: Sample's Descriptive Statistics by Year

The table shows the number of firms in each year from 1995 to 2018, and descriptive statistics (minimum, maximum, median, average and standard deviation) about the ROE of the firms in each year.

Sample's Descriptive Statistics by Year						
Year	No. of Firms	ROE (% Representation)				
		Min	Max	Median	Avg.	Std Dev.
1995	96	-128.68	67.47	15.34	11.75	22.76
1996	102	-121.04	119.65	14.62	14.36	24.75
1997	105	-115.09	78.50	12.32	10.79	22.86
1998	114	-120.50	51.91	13.73	9.97	23.70
1999	133	-155.87	110.73	11.98	7.60	33.74
2000	137	-199.03	183.91	12.01	6.72	45.75
2001	145	-171.28	179.15	14.64	9.86	39.23
2002	151	-138.12	114.63	14.58	10.36	33.57
2003	154	-160.82	97.26	17.72	12.46	31.76
2004	157	-174.93	149.07	17.12	14.80	31.27
2005	161	-178.60	108.26	21.99	22.19	30.55
2006	169	-109.91	153.37	21.88	22.15	23.96
2007	189	-124.46	126.40	21.53	21.75	22.70
2008	215	-197.42	105.09	19.39	15.51	30.56
2009	223	-136.11	188.12	13.21	14.71	27.99
2010	230	-129.08	125.17	13.39	13.04	23.50
2011	240	-127.09	107.64	12.59	10.95	22.79
2012	248	-104.11	166.96	12.62	12.59	24.08
2013	251	-135.97	74.15	13.04	9.09	25.82
2014	265	-160.87	91.41	12.69	10.36	23.06
2015	280	-141.78	121.39	12.14	10.50	23.83
2016	298	-128.20	126.71	10.24	10.02	21.38
2017	315	-176.39	77.39	9.54	7.42	23.99
2018	324	-136.29	101.68	9.45	4.50	26.10

Also, this is tolerable since it is pointed out, for example in P Chou, R Chou and Ko (2009), that survivorship bias[3] does not affect the findings on studies of this nature.

[3] Kliger and Tsur (2011) have also sampled data from COMPUSTAT as an attempt to correct for survivorship bias. Indeed, both Chou et al., (2009) and Kliger and Tsur (2011) showed that the findings in Bowman (1980) are not affected by survivorship bias. The current study does not investigate for survivorship bias and therefore, takes the

The smallest ROE (-199.03%) ever reported is from the year 2000 which belongs to an industrial firm. The highest ROE (188.12%) is from the year 2009 belonging to a financial firm. The lowest median ROE value equals to 9.45% which is from the year 2018 while the highest median ROE value equals to 21.99% which is from the year 2005. In addition to having the smallest median ROE, the year 2018 also has the lowest average ROE (4.5%), and likewise, the highest average ROE (22.19%) is from the year 2005. The largest ROE standard deviation value (45.75%) is from the year 2000 while the year 2016 has the least ROE standard deviation value (21.38%) amongst the years examined.

3.1.2 Description of Overall Research Design

The study makes an explicit assumption that a group of individuals will, on aggregate, tend to make decisions which reflect risk tolerance of the firm. Therefore, the distribution of risk tolerance, between personal and managerial actions, is assumed to be stable. There is a need to assume a link between individual decisions and those decisions made by a group of individuals – a firm. However, this is a popular assumption, for example, Díez-Esteban et al., (2017) and see also Coval and Shumway (2005). This is because the prospect theory was originally formulated to explain choices faced by an individual. Therefore, there is a need to assume a level of aggregation in supporting theories, since one individual making decisions in prospect theory, for instance, may not be the same as a firm making such decisions for itself.

It may not be possible under the current study to tell if firms are passing the projects. This study to refines the definition of a 'distressed' firm by using the industry median returns. To identify financial distress and assess risk-seeking as set out by Kliger and Tsur (2011), the methodology adopts the linearity assumption of the risk-return relationship as proposed by the prospect theory. The study makes a strong assumption that aligns the risk preferences of firms to those of individuals. For this to hold, individuals' risk preferences are assumed to be in a one-to-one with risk preferences of firms. The reference points in this study are defined using ROE medians. This

findings in Chou et al., (2009) and Kliger and Tsur (2011) to suffice, in assuming that its results are also not affected by survivorship bias.

implicitly assumes that the firms are considered to be evaluating their performances, as measured by ROE, relative to their peers.

Since firms evaluate their performance and financial ratios relative to their industry averages; therefore, this presumption supports the use of industry average and/or median as a reference point. When using the ROE over time, this approach assumes that the ROE is constant over time. This approach speculates that firms know the current performance of their peers, however, this information is only revealed after the period under consideration. Therefore, firms base their future risk-seeking on a target level before it is realized.

The study argues that information about the previous performance of the firm plays an important part in predicting its future performance. The volatilities computed rely on the statistical tools used and the ROE used from the recorded accounting data are assumed to be realistic estimates of the future expectations. This approach of using expectations is valid because financial managers and investors invest in forecasts to generate income. Unfortunately, practitioners are not able to tell with certainty whether their decisions are bad or good until future events confirm or repudiate the expectations in which the decisions were based.

The main focus of the study is broken into two parts; Firstly, to apply reference points computed from industry median returns to measure and to classify financial distress. This is achieved by defining firms' reference point in each year throughout the studied period. Firms with performance below their reference points are classified as troubled. Secondly, to compute the firms' dispersion of returns to assess whether firms have higher variances in returns when distressed compared to the less distressed firms. However, it is important to keep in mind that the main investigation is not on the causation of troubled firms and return variances, but on the ability to isolate return variances of when firms are 'troubled' from a group of 'not troubled' firms.

Studies such as Fishburn and Kocheberger (1979) which apply the prospect theory stress about defining the reference points. The methodology applied in most of those studies followed from the assumption that investors measure risk in terms of the variance of returns, this permits the computation of the standard deviations as the measurement of risk from historical returns. Many have opted for this mean-variance approach when defining the reference point. However, as indicated, this method works only if the distribution of return is assumed to be constant over time. The standard deviation was then computed around the average return under the same period.

The current study adopts a better methodology as shown in Kliger and Tsur (2011) in that it allows the distribution of the returns to vary over time. The methodology defines the reference point for firm *i* in the industry *j* in year *t* as the median of the firm's industry returns in the previous year. The median levels are therefore based on historical industrial performance. This is represented by $Ref_{i,j,t}$ and it is calculated each year. Formally;

$$\boldsymbol{Ref_{i,j,t} = Med_{j,t-1}} \quad (1)$$

where $Med_{j,t-1}$, is the median industry *j*'s ROE at year *t*- 1. This annually adjusts the reference point to the last known industry median return. Hence, both the return and the standard deviation are calculated for each year separately. This helps to adopt the prospect theory better since it allows the return distribution to change over time - a requirement for the prospect theory. The hypothesized relationship between risk and return is, therefore, curvilinear in harmony with the risk-return relationship assumed under prospect theory. ROE is used since firms are assumed to be shareholders' value-maximisers in this study. It is natural to expect a rational shareholder to aim for higher returns given the level of risk - i.e. risk aversion.

Risk in each year *t* is measured as the absolute difference between firm *i*'s return and its industry's median return in the same year. Formally;

$$\boldsymbol{Risk_{i,j,t} = |ROE_{i,j,t} - Med_{j,t}|} \quad (2)$$

where $ROE_{i,j,t}$, is the ROE for firm *i* in industry *j* at year *t*. In this case, the firm's risk is also defined as a dispersion of returns. However, this definition shows the dispersion of firm *i*'s annual returns around its industry's median return as opposed to around firm *i*'s average return over the studied period. In this way, the effects of exogenous factors[4] which are not under the firm's control but affect the whole industry are also taken into account. *Risk* is defined given industry *j*'s median

[4] Of course, an economic shock may affect certain firms more than others. However, for simplicity, it is assumed that all firms in a given industry are affected similarly.

return; therefore, the risk is measured ex-ante in this study. This is achieved by examining the effect of a firm's return in a given year on its selected risk level in the following year. Risk is still measured traditionally as the deviation of ROE, in both directions, from the industry median ROE.

3.2 EMPIRICAL ANALYSIS

Table 3 shows descriptive statistics of the three research variables (namely; ROE, $Risk$ and Ref). There are 4 702 observations which are examined. However, a total of 96 observations (about 2.04% of the total sample) is lost in both the $Risk_{i,j,t}$ and $Ref_{i,j,t}$ variables as a result of the one-year lagged data requirement for the $Ref_{i,j,t}$ variable. This is the number of observations equal to the observations for the $ROE_{i,j,t}$ variable without the year 1995. Since there is a need to compute the reference points from industry median returns, the $Risk_{i,j,t}$ has also lost the 96 observations by default to meet the regression condition.

Table 3: Descriptive Statistics of Research Variables

$\boldsymbol{ROE_{i,j,t}}$ represents the ROE for firm *i* in industry *j* at year *t*, $\boldsymbol{Risk_{i,j,t}}$ is the absolute difference between firm *i's* return and its industry median ROE in year *t* and $\boldsymbol{Ref_{i,j,t}}$ is the reference point for firm *i* in industry *j* in year *t* which is defined as the median ROE for industry *j* at year *t*-1 , i.e. median ROE from the previous year. The following descriptive statistics are shown for the three variables: the number of observations (shown as No. of Firms), minimum and maximum values, average, median and the standard deviation.

Descriptive Statistics of Research Variables						
Measure	No. of Firms	Min (%)	Max (%)	Avg.(%)	Median (%)	Std Dev. (%)
$ROE_{i,j,t}$	4 702	-199.03	188.12	11.82	13.60	27.56
$Risk_{i,j,t}$	4 606	0.00	216.80	14.43	7.63	22.36
$Ref_{i,j,t}$	4 606	-115.09	43.52	13.93	13.28	7.25

The results presented also indicate both the smallest ROE and the largest ROE values in the sample as highlighted before. The average ROE for the overall sample is 11.82% and the median ROE is slightly higher at 13.60%. The overall sample's ROE standard deviation (27.56%) is relatively higher than the most ROE standard deviations reported in the earlier subsamples. When applying the definition for risk, the lowest value of risk is zero. The highest value of risk is computed as 216.80%. The average risk is 14.43% and it is significantly higher than the median risk of 7.63%. The variable capturing risk has a standard deviation of 22.36%.

The lowest reference point is at -115.09% and the highest reference point is at 43.52%. This indicates that there is a possibility of negatively skewed reference points. However, that may not be the case when judging by the reference points average (13.93%) and the reference points median value (13.28%) which are comparably not far from the maximum value of 43.52%. Additionally, the reference points standard deviation (7.25%) is fairly low relative to the standard deviations of both the ROE and risk variables. It is suspected that this minimum value may be showing a possible reference point outlier. This is examined in more detail under the model diagnostics section. Therefore, it can be said that the $Ref_{i,j,t}$ variable has more stable data points than any other variables reported in the table (its median is almost the same as the average and has both lowest maximum and standard deviation values).

The regression to test the relationship between a firm's performance in the industry and its subsequent risk-seeking is tested using the Ordinary-Least-Squares (OLS) method. The regression is represented formally in the following way:

$$\boldsymbol{Risk_{i,j,t} = \alpha + \beta \times I_{\_gain i,j,t} + e_{i,j,t}} \quad (3)$$

where $I_{\_gain i,j,t}$ is the firm's performance and is measured as the difference of the firm's ROE at the previous year and its reference point (i.e. $I_{\_gain i,j,t} = ROE_{i,j,t-1} - Ref_{i,j,t}$). $Risk_{i,j,t}$ represents the model's dependent variable measuring the firm's risk-seeking. The model' stochastic error term is represented as $e_{i,j,t}$ and accounts for possible errors due to the omission of explanatory variables in estimating $Risk_{i,j,t}$. The effect of the firm's performance in the industry to the firm's subsequent risk-seeking is represented by the coefficient β. The main hypothesis states that a firm's performance is negatively related to its subsequent risk-seeking. Therefore, the slope of the independent variable must be negative. It then follows from the definition of the firm's performance that, when compared to the reference point, high ROE firms are expected to take less risk than low ROE firms.

The OLS is estimated in three different ways: The first regression method for the estimation is a pooled regression on the panel data. Secondly, an industry panel regression for each industry (i.e. the nine industries) is also estimated using the pooling method. Lastly, a separate annual cross-sectional regression for each of the years (1996-2018) studied (i.e. a total of 23 regressions).

The regression estimations in these methods control for time-, industry- and firm-specific effects. The first regression method (pooled regression) controls for industry and year effects. The second method (separate industry regression) controls for effects of firm identity and year. Separate annual cross-sectional regressions are solely controlling for the industry effect. This is because some industries noticeably dominate the others when measured by the number of firm-year observations. For example, the basic materials industry has a much higher firm-year observations statistic when compared to the telecommunications industry, 36.7 and 3.8, respectively. There is a requirement for one-year lagged data to estimate regression as state variables. This requirement has reduced the number of analysed observations from 4 702 to 4 606 as pointed out earlier.

3.2.1 Firm's "Rate of Success" Distribution

Before the regression analysis, the distribution of the firms' "rate of success" is examined. A firm's rate of success is defined as the number of times its ROE exceeded the industry median ROE, divided by the number of years the firm's ROE was reported. Thus, firms which have ROE values which are reported above their reference points for longer periods have higher success rates. A success rate for firm *i* is represented formally as follows:

$$\boldsymbol{SR_i} = \frac{\sum \boldsymbol{I\_\emptyset_{i,t}}}{\sum \boldsymbol{I\_y_{i,t}}} \qquad \textbf{(4)}$$

for;

i = 1, …, n_j {no. of firms}

j = 1, …, 9 {no. of industries}

t = 1996, …, 2018 {no. of years after one-year lag}

where n_j is the number of firms in industry j, $I\_\emptyset_{i,t} = I[ROE_{i,j,t} > Med_{j,t}]$, $I\_y_{i,t}$ accounts for the year in which ROE for firm i is reported, $I[.]$ is an indicator function[5] returning the value of 1 when the stated condition holds and zero otherwise and SR_i is the success rate for firm i.

[5] The same definition is applied when controlling for industry, firm and time effects. The controlled dummy variables are specified such that the results are diagonal matrices of 1s diagonally and 0s elsewhere. For example, when controlling for the basic materials industry: The 0s are assigned to the basic materials firms and 1s elsewhere.

The value of SR_i, by definition, lies between 0% and 100%, inclusive. Therefore, firms with 0% success rates are considered as the most "unsuccessful" firms while a value of 100% would indicate the most "successful" firms. When considering the most "successful" firms, only 29 firms (i.e. 8.03% of the total sample) were always above their industry reference point, and among the most "unsuccessful" firms, 57 firms (i.e. 15.79% of the total sample) were always below their industry reference point.

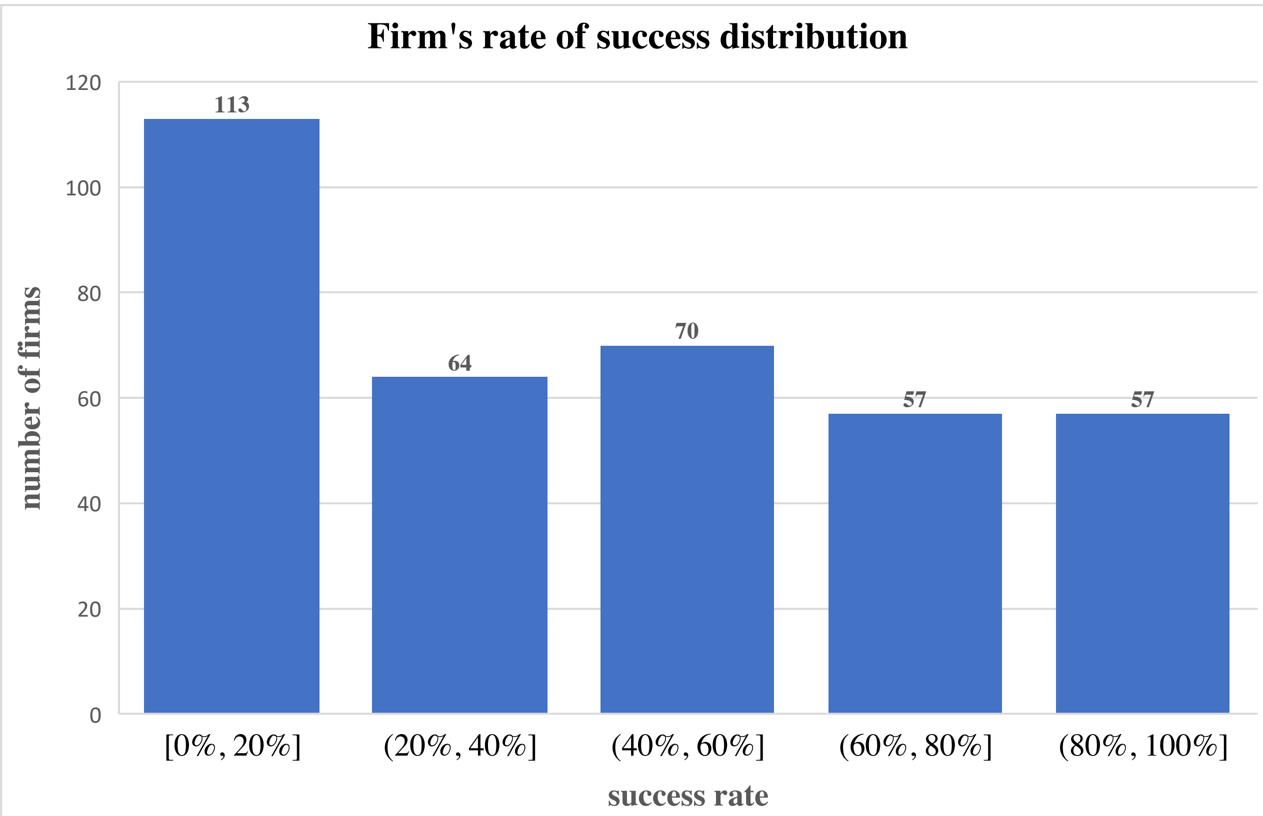

Figure 1: Firm's rate of success distribution

Represents the distribution of firm's "rate of success" which is defined for each firm as the number of times its ROE was above its industry median ROE divided by the number of years the firm's ROE was reported. The x-axis represents the five "rate of success" intervals from 0% to 100% in decimal representation. The y-axis represents the number of firms included in each "rate of success" interval.

Firms are not troubled at all times and therefore, firms move between the two states (i.e. of troubled and not troubled) over the years. It follows that firms are not risk-averse all the time. This supports the findings in Bowman (1982). Nonetheless, by the definition of SR_i, the success rates of the firms are fixed.

Figure 1 shows the distribution of the rate of success and the number of firms included in each of the success rate intervals. The figure shows that about 31% of the firms considered have success rates which are less than 20%. Also, the results show normally distributed success rates with an average value between 40% and 60%. This is similar to the results found in other studies, for example, from Kliger and Tsur (2011) which is found using a different dataset. Extreme values (the most "successful" and the most "unsuccessful firms") are removed and the results are reported later as part of the robustness analysis. As expected, for those firms which are included in the filtered sample, the distribution for the firm's rate of success is more normally distributed.

3.2.2 Regressions

The pooled regression model includes the dummy variables controlling for the industry- and time-specific effects. The regression is performed in the four different ways to include the subsets[6] of the controlled variables.

$$\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\textbf{\_gain}\boldsymbol{i,j,t}} + \sum_k \acute{\text{Y}}\boldsymbol{k} \times \boldsymbol{I}_{\textbf{\_Ind}\boldsymbol{i,k,t}} + \sum_l \text{Ø}\boldsymbol{l} \times \boldsymbol{I}_{\textbf{\_Year}\boldsymbol{i,j,t}} + \boldsymbol{e_{i,j,t}} \qquad (5)$$

for;

i = 1, …, n_j {no. of firms}

j = 1, …, 9 {no. of industries}

t = 1996, …, 2018 {no. of years after one-year lag}

k = 1, …, 8 {the other industries}

l = 1996, …, 2017 {without 2018 and lagged for one year}

where n_j is the number of firms in industry j, $I_{\text{\_Ind}i,k,t} = I[k=j]$, $I_{\text{\_Year}i,j,t} = I[l=t]$, Ý and Ø are the coefficients for dummy variables which are controlling for industry effects and time effects, respectively.

The industry regressions are performed with the dummy variables controlling for time- and firm-specific factors. A separate regression is performed for each one of the nine studied industries.

$$\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\textbf{\_gain}\boldsymbol{i,j,t}} + \sum_m \tilde{\text{O}}\boldsymbol{j,m} \times \boldsymbol{I}_{\textbf{\_firm}\boldsymbol{m,j,t}} + \sum_l \text{Ø}\boldsymbol{l} \times \boldsymbol{I}_{\textbf{\_Year}\boldsymbol{i,j,t}} + \boldsymbol{e_{i,j,t}} \qquad (6)$$

for;

[6] The four variations of the model are as follows; (1). Not controlled for either industry or time, (2). Controlled for time, (3). Controlled for industry, (4). Controlled for both time and industry.

j = 1, …, 9 {no. of industries}

i = 1, …, n_j {no. of firms}

t = 1996, …, 2018 {no. of years after one-year lag}

l = 1996, …, 2017 {without 2018 and lagged for one year}

m = 1, …, n_j - 1

where n_j is the number of firms in industry j, $I_{\_\text{firm}m,j,t}$ = $I[m = i]$, $I_{\_\text{Year}i,j,t}$ = $I[l = t]$, Õ and Ø are the coefficients for dummy variables controlling for firm effects and time effects, respectively.

The separate cross-sectional regression is performed for each year, from 1996 to 2018. The dummy variables are included to control for industry effects.

$$\boldsymbol{Risk_{i,j,t} = \alpha + \beta \times I_{\_\text{gain}i,j,t} + \sum_k \acute{Y}k \times I_{\_\text{Ind}i,k,t} + e_{i,j,t}} \quad (7)$$

for;

t = 1996, …, 2018 { i.e. 23 regressions}

i = 1, …, n_j {no. of firms}

j = 1, …, 9 {no. of industries}

k = 1, …, 8 {the other industries}

where n_j is the number of firms in industry j, $I_{\_\text{Ind}i,k,t}$ = $I[k = j]$, $I_{\_\text{Year}i,j,t}$ = $I[l = t]$ and Ý is the coefficient for dummy variable controlling for industry effects.

To support the claim of this investigation which states that firms with lower ROE show more risk-seeking than firms with higher ROE; β is expected to be negative in each regression. This shows that the less profitable firms are expected to take more risk than the more profitable firms.

4 RESULTS

4.1 POOLED REGRESSION ANALYSIS

To test the effect of *H1* across industries, that there is a negative (positive) relationship between performance and risk-seeking for firms with ROEs below (above) the reference points, a pooled regression model is performed. Table 4 reports the results for a pooled panel regression in the four variations (i.e. controlling for neither industry nor time effect, controlling for industry, controlling for time, controlling for both time and industry effects).

The coefficient in each case is negative. This indicates a negative relationship between the firms' performance and their subsequent risk. This is consistent with previous studies such as Singh (1986) which reported the negative relationship between performance and risk-seeking. When none of the mentioned effects is controlled for, β suggests that the subsequent risk decreases by 0.069 units, for every unit increase in the firm's performance, all else equal. This is emphasized since β is statistically significant at the 1% level, indicating that the null hypothesis that β is zero is rejected with a 99% confidence level. The average risk, as measured by the model's constant[7], is 14.27%. This value is also statistically different from zero at the 1% level. The model shows the level of subsequent risk-seeking which is similar to the average risk reported in Table 3 which has a value of 14.43%. There are 4,606 total observations as indicated by the model's *N*. The F statistic (29.66) is statistically significant at the 1% level. This reinforces the existence of the relationship between the firms' performance and their subsequent risk. Only a small proportion of the total variation in risk is explained by the firms' performance variable.

When the industry effect is controlled for, the absolute value of β increases. The industry control column shows that for each unit increase in the firms' performance, the subsequent risk decreases by 0.075 units, all else equal. This is statistically significant at the 1% level. The predicted average subsequent risk is higher when the basic materials firms are used as control for the industry effect, as shown by the model's constant which is 18.06%. The basic materials firms reduce the overall predicted average subsequent risk by 4.64%. The number of observations included is reduced to 4,442. However, the F statistic is still strongly significant at the 1% level. Therefore, the relationship between the firms' performance and their subsequent risk is not by chance. The R-squared shows that the model is not a good fit since the firms' performance variable only explains a small proportion of the variation in risk.

---

[7] Since the specified model's explanatory variable (i.e. $I_{\_gain i,j,t} = ROE_{i,j,t-1} - Ref_{i,j,t}$) is, by definition, allowed to be zero and have values which are close to zero. The model's constant is permitted to be interpreted as the average *Risk*.

When time is the only effect which is controlled for, the regression model shows that each unit increase in the firms' performance would decrease their subsequent risk by 0.07 units, all else equal. The overall predicted average subsequent risk is lower when the year 2018 is used as control for the time effect, as shown by the model's constant which is 14.06%. The year 2018 increases the predicted average subsequent risk by 0.22%. The model has included all the industries when controlling for the time effect. Additionally, the F statistic is statistically significant at the 1% level. There is strong evidence about the existence of the relationship between the firms' performance and their subsequent risk. The same variation in risk (0.6%) from the first case is explained by the firms' performance variable. This suggests that the model applied is not a good fit for the dataset used.

When both the time and the industry effects are controlled for, β is of the same value as when only industry effect is controlled for. This suggests that the firms' subsequent risk decreases by 0.075 units, for every unit increase in their performance. The predicted average subsequent risk is higher when both the basic materials industry and the year 2018 are not included, as shown by the model's constant which is 18.03%. The year 2018, without the basic materials firms, increases the predicted average subsequent risk by 0.033%, while the basic material in isolation still reduces the model's subsequent risk by 4.64%. The model retains the same number of observations included when only the industry effect is controlled for. The F statistic is statistically significant at the 1% level which indicates that the relationship between the firms' performance and their subsequent risk is not random.

The standard errors for the βs are not far from zero. Therefore, the average model's estimates are not far from the actual slopes suggested by the data points. The standard errors for the constants are also less than the estimates of their constants. Therefore, there is a high degree of accuracy in the estimation of the coefficients.

The coefficients from all the four variations of the panel regression model show that there is a negative relationship between a firm's performance and its subsequent risk-seeking. All these coefficients are highly statistically significant at the 1% level. Thus, as the firm's performance becomes better, its average subsequent risk-seeking will decrease. All the βs from the results are highly significant at the 1% level. This indicates that it is unlikely that the negative relationship observed between a firm's performance and its subsequent risk-seeking is coincidental.

Table 4: Panel Regression Results

The table is a summary for panel regression on the full dataset from 1996 to 2018 with the 361 firms under consideration. The regression is estimated as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_\mathrm{gain}i,j,t}} + \sum_k \acute{Y}\boldsymbol{k} \times \boldsymbol{I_{\_\mathrm{Ind}i,k,t}} + \sum_l \boldsymbol{Øl} \times \boldsymbol{I_{\_\mathrm{Year}i,j,t}} + \boldsymbol{e_{i,j,t}}$. The No Controls panel shows panel regression which is controlled for neither industry nor time. The Industry Control panel only controls for industry while the Time Control panel only controls for time-specific effects. Both time- and industry-specific effects are controlled as represented in the last column.

Panel Regression Results

	No Controls	Industry Control	Time Control	Time and Industry Controls
			Risk	
β	-0.069*** (0.013)	-0.075*** (0.013)	-0.070*** (0.013)	-0.075*** (0.013)
Industry Control	No	-4.638*** (0.846)	No	-4.638*** (0.846)
Time Control	No	No	0.224 (1.285)	0.033 (1.289)
Constant	14.270*** (0.330)	18.064*** (0.761)	14.062*** (1.239)	18.032*** (1.433)
Linear Model?	Yes	Yes	Yes	Yes
Good Model?	No	No	No	No
N	4,606	4,442	4,606	4,442
R2	0.006	0.014	0.006	0.014
Adjusted R2	0.006	0.014	0.006	0.013
F Statistic	29.663*** (df = 1; 4604)	31.656*** (df = 2; 4439)	14.843*** (df = 2; 4603)	21.099*** (df = 3; 4438)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

The basic materials firms reduce the model's predicted subsequent risk by more than a quarter while the year 2018 does not have a significant effect in increasing the predicted subsequent risk.

Given the overall total number of the observations; the F statistic is large enough to reject the null hypothesis that there is no relationship between a firm's performance and its subsequent risk-seeking.

All the values of the model's coefficients highly statistically significant at the 1% level. However, the model's constant without any controls is much closer to the average risk reported in Table 3. Therefore, the explanatory variable is not explaining much on the firm's subsequent risk-seeking.

4.2 INDUSTRY REGRESSION ANALYSIS

To test *H1* within industries that there is a negative (positive) relationship between performance and risk-seeking on firms with ROEs below (above) the reference points, the industry regressions are performed for all the nine industries.

Table 5 shows that the basic materials industry has the highest average of risk as represented by the model's intercept, while the telecommunication industry has the lowest average of risk. The basic materials industry's β is negative and significant at the 1% level. Therefore, each unit increase in the basic materials industry's performance will reduce the subsequent risk-seeking by 0.085 units. The basic materials industry's constant is statistically significant at the 1% level and indicates an average risk of 18.02%. This is much higher than the average subsequent risk for the full sample including the other industries as well as for separate industries. Therefore, the basic materials firms are on average, more risk-seeking when compared to the other industries. The F statistic is highly significant (at the 1% level). Therefore, the model rejects the null hypothesis that there exists no relationship between basic materials firms' performance and their subsequent risk-seeking. However, the model used shows its weakness in explaining risk-seeking variance for the basic materials industry using its firms' performance.

There is a strong negative relationship between the financial firms' performance and their subsequent risk-seeking since β is negative and highly statistically significant. Each unit increase in the financial industry's performance will reduce the subsequent risk by 0.077 units, all else equal. The financial industry's constant is statistically significant at the 1% level and shows an average risk of 13.83%. This is much lower than the average subsequent risk predicted for the basic materials firms. Therefore, the financial firms, on average, are much less risk-seeking when compared to the basic materials firms.

Table 5: Separate Industries Regression Results

The table shows regressions for each industry studied. These regressions are similar to the panel regression performed on the full dataset but for separate industries. The estimated OLS regression equation is as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}\boldsymbol{i,j,t}} + \boldsymbol{e_{i,j,t}}$. The **Name** variable represents the names of each industry. For every industry; **β** captures the estimate of the slope and its standard error is shown underneath, the constant for each regression is represented with the **Constant** statistic, ***N*** shows the number of observations under consideration, the **Fit?** variable is added to support **R-squared**, **Adjusted R-squared** and **F Statistic** which are all shown in the table.

Separate Industries Regression Results

Name	**β**	**Constant**	***N***	**R2**	**Adjusted R2**	**F Statistic**	**Fit?**
Basic Materials	-0.085***	18.020***	858	0.010	0.009	8.766***	No
	(0.029)	(0.892)				(df = 1; 856)	
Financials	-0.077***	13.830***	1,328	0.008	0.007	10.389***	No
	(0.024)	(0.625)				(df = 1; 1326)	
Consumer Goods	-0.036	12.066***	316	0.002	-0.002	0.498	No
	(0.050)	(1.244)				(df = 1; 314)	
Consumer Services	-0.055*	12.110***	635	0.005	0.003	3.170* (df = 1; 633)	No
	(0.031)	(0.581)				3.170* (df = 1; 633)	
Health Care	-0.240***	14.132***	105	0.075	0.066	8.314***	Yes
	(0.083)	(1.904)				(df = 1; 103)	
Industrials	-0.076**	13.369***	941	0.007	0.006	6.461**	No
	(0.030)	(0.731)				(df = 1; 939)	
Technology	-0.046	15.114***	291	0.003	-0.001	0.822	No
	(0.050)	(1.414)				(df = 1; 289)	
Oil and Gas	0.162	16.776***	44	0.041	0.018	1.804	Sort of
	(0.121)	(3.135)				(df = 1; 42)	
Telecommunications	0.251***	11.340***	88	0.097	0.086	9.230***	Yes
	(0.083)	(1.826)				(df = 1; 86)	

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

However, it is tempting to expect the models' predictions for the average subsequent risk-seeking on the two industries to be insignificantly different from each other. Since the two industries are also competing on the number of observations included from each industry. However, the size of the industry does not seem to have a significant impact on the industry's subsequent risk-seeking.

The existence of the relationship in the financial firms is strongly supported by both the F statistic value (which is highly significant at the l% level) and the number of observations used to explain the parameters. The R-squared is significantly low and this may suggest the need to include another variable such as auditor's resignation and litigation in addition to the firms' performance in explaining the financial industry's risk-seeking.

The value of β for the consumer goods is negative, however, it is not significant. This indicates a weak negative relationship between consumer goods firms' performance and their subsequent risk-seeking. The consumer goods industry's constant shows the lowest average subsequent risk of 12.07% as compared to the other industries in Table 5, when considering industries which reported the negative relationship between firms' performance and their subsequent risk. The value of the F Statistic is significantly low at 0.498 (a value less than a unit) and the number of observations used in the model is less compared to the observations included in the other industries. The existence of the relationship between the firm's performance and its subsequent risk-seeking is doubted in the consumer goods industry. The model's goodness fit as represented by the R-squared is also weak in the consumer industry. Therefore, the model used in this dataset does not explain the firm's risk-seeking variance.

The consumer services industry has some similarities with the consumer goods industry. The average subsequent risk of the consumer services industry is almost the same as that of the consumer goods industry (12.11% versus 12.07%). This is expected since, in practice, the two industries should be highly related to each other. The value of consumer services β is negative and only statistically significant at the 10% level. This indicates that there is a negative relationship (although relatively weak compared to the other industries above) between the consumer services firms' performance and their subsequent risk. The observations which are included in the consumer services industry are doubled compared to the consumer goods. The value of the model's F static is also statistically significant at the 10% level. Both of these reasons signifies the presence of the relationship between the consumer services firm's performance and their subsequent risk.

The firm's performance variable alone is weak in explaining its subsequent risk as represented by the R-squared.

The health care industry shows a strong negative relationship between its firms' performance and their subsequent risk-seeking. The health care industry β is significant at the 1% level and indicates that for each unit increase in the firms' performance, their subsequent risk will decrease by 0.24 units. The health care shows an average risk of 14.13% which is statistically different from zero at the 1% level. There are relatively fewer observations used in the health care industry, however, the value of the F statistic is highly statistically significant at the 1% level. This indicates that the relationship between the firm's performance and its subsequent risk did not occur by chance. The independent variable chosen is also a good fit in explaining the health care firms' subsequent risk-seeking.

The industrial firms show β which is statistically significant at the 5% level. The sign of the β is negative indicating a reduction in the industrial firms' subsequent risk-seeking for every unit increase in their firms' performance. The industrials model's constant shows an average risk of 13.37% which is statistically significant at the 1% level. A larger number of observations (N = 941) is used and the model's F statistic value is greater than a unit and also statistically significant at the 5% level. This shows the existence of the relationship between industrial firms' performance and their subsequent risk-seeking. However, little variance in risk-seeking is explained by the firm's performance as indicated by the model's R-squared.

There is a negative relationship between the technological firms' performance and their subsequent risk-seeking as shown by the β of -0.046. However, this β is not statistically significant and thus the results shown fail to reject the null hypothesis that the β is any statistically different from zero. The model's constant shows average risk which is both high and highly statistically significant. The industry has fewer observations considered and its F statistic value is significantly low at 0.822. This implies that it is likely that the negative relationship between the technology industry firms' performance and their subsequent risk exists by chance. The R-squared shows that a small variance of the subsequent risk is explained by the firm's performance.

The oil and gas firms show the opposite but statistically insignificant relationship between their performance and their subsequent risk. This is indicated by the model's β which is positive. In this case, positive β would imply that for every unit increase in the firms' performance, their subsequent risk-seeking will increase by 0.162 units. However, the F statistic value, although greater than one, is statistically insignificant. Fewer oil and gas observations are included in the regression. Both the F statistic and the number of observations (F statistic = 1.804 and N =44) indicate that the relationship between the firms' performance and their subsequent risk is purely random. However, the firm's performance variable attempted to explain its subsequent risk-seeking as indicated by the R-squared with a value which is greater than 2%.

The telecommunications firms follow the same trend of the oil and gas industry in that there also exists a positive relationship between firms' performance and their subsequent risk-seeking. This positive relationship is even stronger in this telecommunications industry in that the β is even highly statistically significant. The null hypothesis that this β value is zero is rejected with 99% confidence. Each unit increase in telecommunications firms' performance would lead to an increase of 0.251 units in their subsequent risk-seeking. The telecommunications industry shows an average risk of 11.34%. This value is relatively lower than the other industries averages. The F statistic value is surprisingly higher and statistically significant at the 1% level given the lower number of observations used. This indicates that the relationship found between firms' performance and their subsequent risk-seeking is not random. The firms' performance variable data points also fit the model well to explain the firms' risk-seeking as indicated by the model's R-squared.

The βs of seven out of the nine studied industries are negative indicating that the negative relationship between a firm's subsequent risk-seeking and its performance holds. This negative relationship is more prominent in the health care industry with β of a higher magnitude compared to the βs of the other industries. Additionally, the value of R-squared at 7.5% shows that the data points in the health care industry better fit the model applied. The relationship of interest is confirmed by its F Statistic which is both high and highly statistically significant with the 105 total data points.

Both βs of telecommunication and oil and gas industries show a positive relationship between the firm's performance its subsequent risk-seeking. However, only one of these coefficients is statistically significant. This may be due to a lack of observations in these two industries compared to the other industries. In addition to the fewer data points, the F Statistic from the oil and gas industry is comparably low, thus leading to failing to reject the null hypotheses there is a relationship (i.e. a positive link) between firm's performance its subsequent risk-seeking.

The financial industry has both a higher number of observations and the F statistic value which support the existence of the negative relationship as represented by the β which is highly statistically significant at the 1% level. The results from regressing each industry separately show that the financial industry has more data points and a higher F Statistic than the other industries. When considering R-squared, more industries show that the observations of the variable used are weak in explaining its risk.

The standard errors reveal that βs are estimated with a high degree of accuracy compared to the model's constants. All the standard errors are relatively low. The oil and gas industry has a higher standard error, mainly because the industry has a small number of observations included. Therefore, the constant estimate for the oil and gas industry falls in a much larger interval compared to the others, which makes it the least precise estimate on the table.

The results from the separate industry regressions reject the null hypothesis that there is no relationship between the firms' performance and their subsequent risk within industries. Therefore, the alternative hypothesis *H1* is accepted that there exists a negative (positive) relationship between risk and return for firms that are below (above) the median return levels within industries.

The separate industry regressions with controls for time- and firm- specific effects are reported in Table A-4. The results show that when controlling for both effects, the average risk is reduced in each industry as shown by the industries βs. A negative relationship between the industry's performance and its subsequent risk-seeking still holds. The βs of the seven out of the nine industries are still negative and statistically significant (except for the consumer goods and the technological firms) at least at the 5% level. This confirms the negative relationship between the firms' performance and their subsequent risk-seeking.

4.3 CROSS-SECTIONAL REGRESSION ANALYSIS

This section validates the results on the *H1* that there is a negative (positive) relationship between performance and risk-seeking on firms with ROEs below (above) the reference points across time.

Table 6: Cross-Sectional Regression Results

The actual estimated OLS regression is as follows: $\boldsymbol{Risk_{i,j,t} = \alpha + \beta \times I_{\_gain i,j,t} + e_{i,j,t}}$. Under the **Coefficient** column; both β and Constant statistics shown in the table with statistics for a summary of cross-sectional sectional regression analysis. These include the average as shown by the **Average** statistic, **Std Dev**. measures the standard deviation, minimum values of the statistics are represented in the **Min** column and the maximum values of the statistics are shown under the **Max** column. The pooled regression (controlled for neither time- nor industry-specific effects) results for slope and constant are shown in **Pooled** in the last column.

Cross-Sectional Regression Results

Coefficient	Average	Median	Std Dev.	Min	Max	Pooled
β	-0.081	-0.073	0.137	-0.481	0.127	-0.069***
Constant	14.531	13.442	2.889	11.379	22.346	14.270***

Notes: ***, ** , * significant at the 1%,5% and 10% respectively

The relationship between a firm's performance its subsequent risk-seeking was also assessed over time. The average β for the regressions in different years is negative. This shows that over the years, there exists a negative relationship between firms' performance and their subsequent risk-seeking. The lowest β value is -0.481 while the highest β value is 0.127 in the 23 years regressed.

The two extreme values and the measures of central tendency (mean of -0.081 and median of -0.073) strongly confirms the negative relationship between firms' performance and their subsequent risk-seeking. It is also shown that the β from the pooled panel regression, although larger than the cross-sectional's average and median βs, also lies within the cross-sectional's minimum and maximum values. Each year under consideration has a mean value of risk equals

14.53% on average. The average risk from the pooled regression also lies between the lowest and the highest average risk ever achieved over the years.

The summary for the cross-sectional regression found that the relationship between a firm's performance its subsequent risk-seeking is, on average, negative. These results are consistent with previous literature, for example, Singh (1986) documents the negative relationship between performance and risk-seeking.

Table 7: Cross-Sectional Regression with Controls Results

The actual estimated OLS regression is as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\text{\_gain}i,j,t} + \sum_{k} \acute{Y}\boldsymbol{k} \times \boldsymbol{I}_{\text{\_Ind}i,k,t} + \boldsymbol{e_{i,j,t}}$. In each β, Industry Control and Constant statistics under the **Coefficient** column represented in the table, and from the summary of cross-sectional sectional regression analysis; The table represents the average as shown by the **Average** statistic, **Std Dev.** measures the standard deviation, minimum values of the statistics are represented in the **Min** column and the maximum values of the statistics are shown under the **Max** column. The pooled regression (controlled for industry-specific effects) results for slope and constant are shown in **Pooled** in the last column.

Cross-Sectional Regression with Controls Results

Coefficient	**Average**	**Median**	**Std Dev.**	**Min**	**Max**	**Pooled**
β	-0.084	-0.079	0.135	-0.474	0.119	-0.075***
Industry Control	-4.545	-5.486	4.951	-11.527	5.264	-4.638***
Constant	18.040	17.858	5.552	7.026	28.859	18.064***

Notes: ***, ** , * significant at the 1%,5% and 10% respectively

The industry effects were accounted for in Table 7 and the average relationship between the firm's performance its subsequent risk-seeking over time is also found to be negative. The results show that over the years, for each unit increase in the firms' performance, their subsequent risk will decrease on average by 0.084 units, all else equal. The basic materials industry reduces the overall predicted subsequent risk-seeking. The average risk-seeking over the years is higher when the regression is controlled for the industry-specific effects. Therefore, firms are predicted to become more risk-seeking than when the regression is not controlled for the industry-specific effects.

Furthermore, the negative relationship between firms' performance and their subsequent risk becomes stronger as shown by the βs over the years.

4.4 SUCCESS RATE CUT-OFF PANEL REGRESSION ANALYSIS

The study extends the literature by investigating whether the effect of risk-seeking is stronger when the firms are staying in the same state of financial distress for longer periods. As indicated earlier, a firm' success rate measures, through time, the number of times its ROE is above its industry median ROE. Therefore, firms with lower success rates would imply that such firms suffered more years as troubled. The *H2* is tested in two steps; the first step follows from the methodology employed in testing *H1*. The second step involves setting up a sub-hypothesis that the two samples (i.e. βs) are statistically different from each other.

Table 8 represents the panel regression results for separate groups[8] of firms which are below and above the median success rates. This reports the regression results used to test the first step of the *H2* (i.e. there is a negative (positive) relationship between firms' performance and their subsequent risk-seeking) are shown separately for the two samples. The panel regression results from the full sample are also added for comparisons.

The second part of the *H2* states that the negative effect is stronger for firms with success rates which are below the median success rate. Therefore, the study sets up the following hypothesis to compare[9] if the two coefficients are statistically different from each other:

H_0: $\beta_{Below\ Median} \geq \beta_{Above\ Median}$

H_1: $\beta_{Below\ Median} < \beta_{Above\ Median}$

The *z* statistic[10] computed indicates that the null hypothesis is rejected with 99% confidence. The study accepts the alternative hypothesis that firms which are below the median success rates show a much larger negative effect (as shown by the negative coefficient in Table 8).

---

[8] To get the two samples, the cut-off is the midpoint of the success rates distribution.

[9] The model diagnostics performed suggests that homogeneity in error variances cannot be assumed. The *N* used in both samples is greater than 25. Therefore, the test used to compare the two samples is a normal *z* test.

[10] $Z \geq \frac{\beta Below\ Median - \beta Above\ Median}{S\beta Below - S\beta Above}$, where $S\beta Below$ and $S\beta Above$ are the β standard errors for the below and above sample, respectively. The computed *Z* is -9.28 which has a probability of almost zero on the left tail.

Table 8: Panel Regression Results (Success Rate Cut-off)

Represents panel regression results for separate groups for firms with success rates which are below and above the median success rate. The OLS regression for each sample is estimated as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. Panel regression results on the full sample are shown for comparisons.

Panel Regression Results (Success Rate Cut-off)

	Full Sample	Below Median Success Rate	Above Median Success Rate
		Risk	
β	-0.069***	-0.180***	0.065***
	(0.013)	(0.021)	(0.016)
Constant	14.270***	14.112***	13.100***
	(0.330)	(0.585)	(0.387)
Linear Model?	Yes	Yes	Yes
Good Model?	No	Yes	No
N	4,606	2,056	2,550
R2	0.006	0.036	0.006
Adjusted R2	0.006	0.035	0.006
F Statistic	29.663*** (df = 1; 4604)	76.435*** (df = 1; 2054)	15.585*** (df = 1; 2548)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

It can be deduced that the two βs (i.e. -0.180 on the Below Median sample and 0.065 on the Above Median sample) are statistically different from each other. Therefore, the regression results strongly support the proposition that the more troubled firms engage in more risk-seeking activities than those firms which are lesser troubled. Additionally, β for the full sample records a negative value which is also strongly statistically significant at the 1% level. These results present a strong negative (positive) relationship between a firm's performance and their subsequent risk for which are more troubled (less troubled) firms. The results in Table 8 and from the comparison for βs support the overall theory of the study (i.e. indeed, the more troubled firms take more risk).

4.5 ROBUSTNESS ANALYSIS

The robustness analysis is carried out by amending the firm's rate of success distribution. Firms with extreme success rates are removed to find out if the regression analysis results are affected.

4.5.1 Filtered Sample's Results

Table A-1 indicates the descriptive statistics of the filtered sample when firms are grouped by industries. The table shows that the telecommunication industry is eliminated when filtering out firms with success rates which are outside the 20% and 80% range. The Firm-year Obs. shows that the average number of firms in each year for each industry is now reduced. The financial industry still has the largest average number of firms for each year while the oil and gas industry shows the smallest firms recorded for each year. The smallest ROE (-199.03%) across the industry still belongs to an industrial firm. Moreover, the highest ROE value is still reported as 188.12%. The basic materials industry has the smallest median ROE while the consumer services industry has the highest median ROE, 7.58% and 22.76%, respectively. The oil and gas industry still has the lowest average ROE value. The highest average ROE (21.59%) is recorded in the consumer services industry. Both the basic materials (Std Dev. of 33.15%) and the oil and gas (Std Dev. of 35.68%) industries still show the highest variations in their ROE. The consumer services industry still has the smallest variation in its ROE (19.06%).

Table A-2 reports the descriptive statistics of the filtered sample when firms are grouped by years. The No. of Firms variable reveals a reduction in the number of firms which are examined in each year. The number of firms included in the sample still get larger in more recent years. The smallest ROE (-199.03%) is still from the year 2000. The year 2009 still holds the highest sample's ROE (188.12%). The Median variable shows that the year 2018 still has the lowest, although increased, median ROE value (10.57%). The highest median ROE value (22.68%) is now from the year 2005. The lowest average ROE (6.64%) still falls in the year 2018 while the highest ROE (23.72%) is in the year 2007. The year 2000 still has the highest, although increased, variation in ROE (Std Dev. of 46.31%) while the smallest dispersion in the sample's ROE (16.74%) is shown in the year 2010.

When the firm's rate of success distribution is reassessed, firms with success rates which are always above or below their industry medians were filtered out. This is done as a way to exclude firms with extreme success rates. Only firms which are found to have success rates which are between 20% and 80% are considered for the robustness analysis.

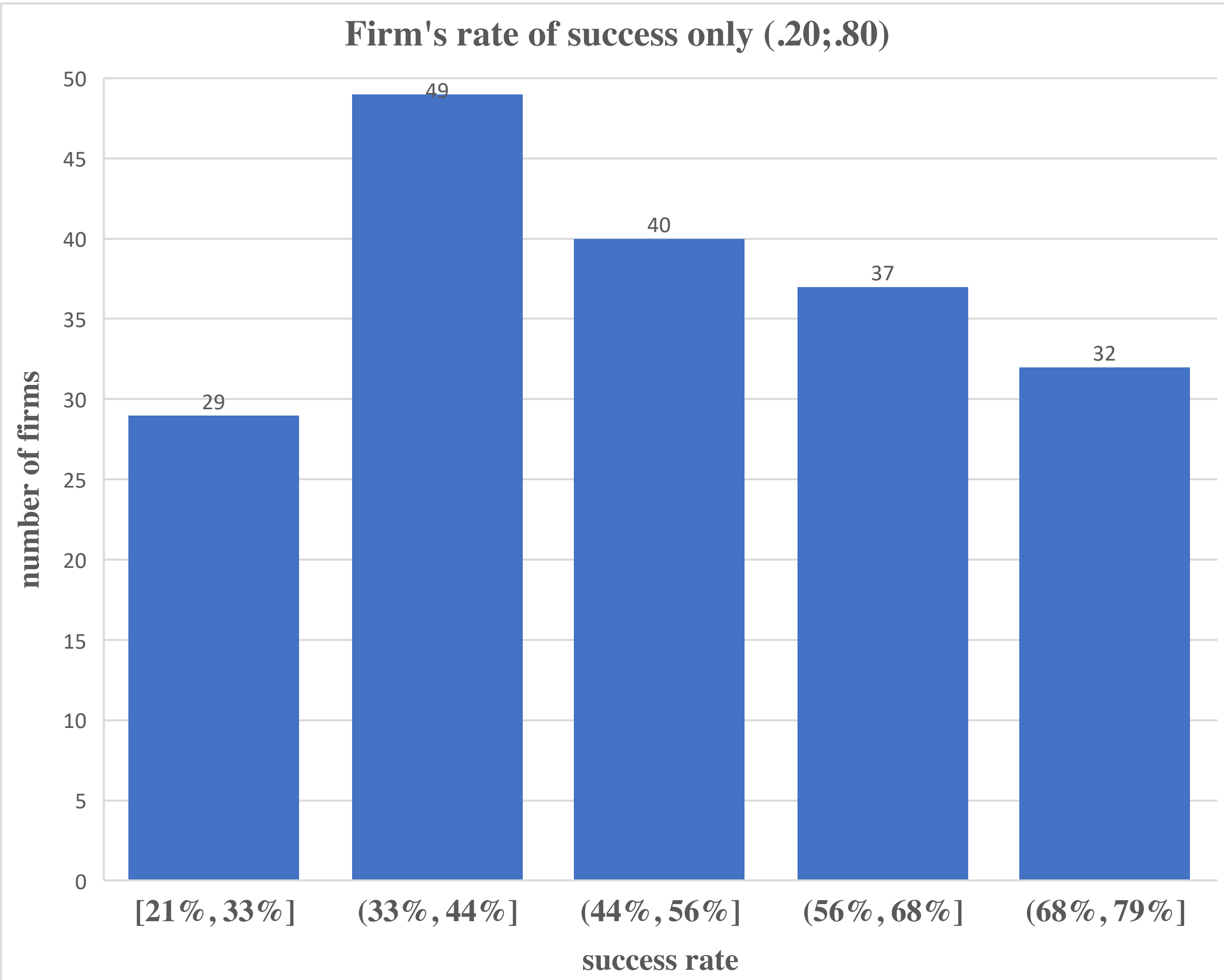

Figure 2: Firm's rate of success distribution [success rate (.20;.80)]

Represents the distribution of the firm's "rate of success" only for firms which have success rates between 20 percent and 80 percent. The x-axis represents the five "rate of success" intervals from 21% to 79% in decimal representation. The y-axis represents the number of firms included in each "rate of success" interval.

This choice reduces the number of firms analysed from 361 to 187 (the number of firms lost includes firms with extreme success rates and those firms with undefined values/errors). This a reduction of nearly 50%, however, this improved sample is a necessary condition chosen for robustness. Figure 2 represents the firm's rate of success distribution for firms with only success rates which are between 20% and 80%.

Figure 2 reveals that when a total of those 174 firms is excluded from the sample, the distribution of the success rate represented on the chart is more normally distributed with mean equals to 0.495 and median of 0.5 (compared to the mean of 0.459 and median of 0.455 from the original rate of success distribution). The medians of industry ROE of the filtered sample are also shifted upwards as expected since more firms' success rates fall below the 21% cut-off. Generally, removing firms with lower success rates significantly improved[11] the sample's firms' ROE. This is as expected since, by definition, the firm's rate of success is linked to its ROE.

Table A-3 reports the descriptive statistics of the research variables for the filtered sample. The results reflect the reduction of observations after the filter as recorded under the No. of Firms variable. The lowest ROE is still recorded at -199.03% and the highest ROE is recorded at 188.12% even after filtering out firms with success rates which fall outside the 20% and 80% band. Both the average ROE (11.96%) and median ROE (13.96%) have increased. The filtered sample's standard deviation (27.30%) is reduced. This implies that the ROE of the filtered sample is less dispersed than that of the original sample. The minimum value of a risk which is taken by a particular firm is still at zero. However, the largest value of risk is reduced from 216.80% to 211.96%. As expected, the average risk (13.44%) and median risk (6.63%) have also decreased.

Surprisingly, the filtered sample's risk standard deviation (22.58%) has increased compared to the original risk standard deviation (22.36%). This implies that the overall filtered sample's risk is more dispersed compared to the original sample's risk. The value of the lowest reference point used in the filtered sample has decreased together with the value of the highest reference point. Interestingly, the average reference point and the median reference point are now higher than those of the original sample (mean of 14.11% versus 13.95% and median of 13.65% versus 13.28%).

Table 9 is a summary for panel regression results for the filtered sample. The results show that even when none of the effects is controlled for, the model's β is negative and statistically significant at the 1% level. The No Controls section indicates that for each unit increase in the firm's performance, its subsequent risk will decrease by 0.118 units.

---

[11] However, the individual firm' success rates do not automatically improve. This is because the new reference points computed from the medians have also increased, and thus, still limiting the firm's probability to "succeed".

Table 9: Filtered Sample's Panel Regression Results

The table is a summary for panel regression on the filtered dataset using firm' success rates from 1996 to 2018. The regression is estimated as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}i,j,t} + \sum_k \acute{Y}\boldsymbol{k} \times \boldsymbol{I}_{\_\mathbf{Ind}i,k,t} + \sum_l \O\boldsymbol{l} \times \boldsymbol{I}_{\_\mathbf{Year}i,j,t} + \boldsymbol{e}_{i,j,t}$. A total of 187 firms is included under investigation. No Controls panel shows panel regression which is controlled for neither industry nor time. Industry Control only controls for industry while Time Control only controls for time-specific effects. Both time- and industry-specific effects are controlled as represented in the last column.

Filtered Sample's Panel Regression Results

	No Controls	Industry Control	Time Control	Time and Industry Controls
			Risk	
β	-0.118***	-0.117***	-0.117***	-0.117***
	(0.016)	(0.016)	(0.016)	(0.016)
Industry Control	No	-5.656***	No	-5.652***
		(1.038)		(1.038)
Time Control	No	No	0.738	0.650
			(1.721)	(1.713)
Constant	13.167***	17.768***	12.473***	17.153***
	(0.408)	(0.937)	(1.669)	(1.871)
Linear Model?	Yes	Yes	Yes	Yes
Good Model?	No	Yes	No	Yes
N	3,036	3,036	3,036	3,036
R2	0.018	0.027	0.018	0.027
Adjusted R2	0.017	0.027	0.017	0.026
F Statistic	54.529*** (df = 1; 3034)	42.373*** (df = 2; 3033)	27.349*** (df = 2; 3033)	28.289*** (df = 3; 3032)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

When industry effects are controlled for, each unit increase in the firm's performance will decrease its subsequent risk by 0.117 units. The same effect is detected in the other two sections (under the Time Control and under the Time and Industry Controls, same β = -0.117). The average risk is at its lowest level only when the time effect is controlled for (at 12.47%). More variation (about 2.7%) in the firm's subsequent risk is explained by its performance when time effects are controlled for in the regression model.

The standard errors for the estimates are slightly higher than those of the original sample. This is mainly due to the reduced sample's size on the filtered sample since, in general, a larger *N* implies a smaller standard error. Nonetheless, the standard errors are still relatively lower than their coefficients estimates.

Table 10 represents a summary for panel regression in each industry for the remaining eight industries. The basic materials industry has a negative β. This shows a negative relationship between basic materials industry's current status and its subsequent risk. Additionally, for each increase in the basic materials industry's current status, its subsequent risk decreases by 0.13 units. This is more than the decrease in risk which is reported in the unfiltered sample. The average basic materials industry's risk has decreased to 17.74%. About 34% of the observations are lost due to the filtering. However, the model's F statistic has increased significantly. There is now a more solid proof about the existence of the relationship between basic materials industry's subsequent risk and its performance. The model has also become a good fit as shown by the R-squared of 2.3%. Therefore, more variation in the basic materials industry's subsequent risk is now explained by its performance.

The filtered sample's financial industry also shows a more reduction of 0.1 units in its subsequent risk for a given unit increase in its performance. The financial industry's β is negative and statistically significant at the 1% level. Therefore, there is a strong negative relationship between the financial industry's performance and its subsequent risk. The average model's response for risk when β and noise are zero has now decreased to 12.97%. The number of observations has decreased significantly by 35%. However, the F statistic remains significant at the 1% level and has also increased from 10.39 to 11.67. Nonetheless, the model is still not a good fit, as indicated by R-squared of 1.3%, in explaining variation in the financial industry's subsequent risk.

A unit increase in the consumer goods industry's performance will now lead to a much more reduction in its subsequent risk. The negative relationship between the consumer goods industry's performance and its subsequent risk persists. This is indicated by the model's β with a negative sign. The performance's coefficient is now statistically significant at the 1% level which indicates a stronger negative relationship. The average response for risk has now decreased to 8.51% when the performance variable and noise are removed. The observations included have decreased by 39%. Nonetheless, the F statistic (8.51% and significant at the 1% level) now shows a stronger presence of the relationship between the consumer goods industry's performance and its subsequent risk. More variation in risk is now explained by the consumer goods industry's performance variable, since the R-squared and the Adjusted R-squared have now increased to 4.2% and 3.7%, respectively.

The consumer services industry's β is still negative, however, it is now statistically insignificant at the 10% level. The negative relationship between consumer services industry's performance and its subsequent risk has become weak. The average risk as indicated by the model's constant of 9.70% is lower than the risk reported in the unfiltered sample's constant. The number of observations included in the consumer services industry has now decreased by more than 40%. The F statistic (0.54) has also decreased and it is now statistically insignificant at the 10% level. Therefore, the two problems (the reduction of both *N* and F statistic) indicate that the relationship between consumer services industry's performance and its performance is by chance. Additionally, only the 0.1%, as indicated by the R-squared, of the variation in consumer services industry's subsequent risk is explained by its performance.

The health care industry shows that reports a negative, but statistically insignificant, β. The model claims that for each increase in the health care industry's performance, its subsequent risk will decrease by 0.108 units. This shows that the same unit increase in the performance here has a less impact on the health care industry's risk, which would have increased by 0.24 units in the unfiltered sample. The average risk has decreased to 11.04% as indicated by the model's constant. About 66% of the unfiltered observations are included in the regression model. The F statistic has decreased and also become statistically insignificant at all the reported levels. Only about 1.7% in variation for the health care industry's risk is now explained by its performance.

Table 10: Separate Filtered Industries Regression Results

The table shows the regressions on the filtered data using firm' success rates for the eight remaining industries. The estimated OLS regression equation for each industry is as follows: $\boldsymbol{Risk_{i,j,t} = \alpha + \beta \times I_{\_gain i,j,t} + e_{i,j,t}}$. These regressions are similar to the filtered panel regressions on the filtered dataset but for separate industries. The **Name** variable represents each industry. For every industry; **β** captures the estimate of the slope and its standard error is shown underneath, the constant of each regression is represented with the **Constant** statistic, ***N*** shows the number of observations under consideration, the **Fit?** variable is added to support **R-squared**, **Adjusted R-squared** and **F Statistic** which are all shown in the table.

Separate Filtered Sample's Industries Regression Results

Name	**β**	**Constant**	***N***	**R2**	**Adjusted R2**	**F Statistic**	**Fit?**
Basic Materials	-0.129***	17.735***	567	0.023	0.022	13.457***	Yes
	(0.035)	(1.129)				(df = 1; 565)	
Financials	-0.102***	12.969***	860	0.013	0.012	11.666***	No
	(0.030)	(0.778)				(df = 1; 858)	
Consumer Goods	-0.191***	8.509***	194	0.042	0.037	8.508***	Yes
	(0.065)	(1.350)				(df = 1; 192)	
Consumer Services	-0.032	9.702***	377	0.001	-0.001	0.539	No
	(0.043)	(0.778)				(df = 1; 375)	
Health Care	-0.108	11.036***	69	0.017	0.003	1.189	No
	(0.099)	(2.020)				(df = 1; 67)	
Industrials	-0.152***	12.749***	733	0.026	0.025	19.666***	Yes
	(0.034)	(0.842)				(df = 1; 731)	
Technology	-0.042	14.131***	219	0.003	-0.002	0.565	No
	(0.057)	(1.455)				(df = 1; 217)	
Oil and Gas	0.027	14.189**	17	0.001	-0.066	0.016	No
	(0.213)	(5.037)				(df = 1; 15)	

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

The industrial firms show a negative relationship between their performance and subsequent risk. The β is statistically significant at the 1% level. Additionally, the β indicates that the industrials' subsequent risk decreases by 0.152 units for every unit increase in its performance. This is a comparably much larger decrease in risk. Additionally, the average risk recorded has decreased to 12.75% as indicated by the model's constant. Fewer observations are used (733) compared to the 941 observations of the unfiltered sample. The F statistic has more than doubled from 6.46 to 19.67 and has become more statistically significant (from at the 5% level to 1%). The relationship between the performance and subsequent risk is now more visible than in the unfiltered sample.

The regression model now fits the data better as indicated by the R-squared of 2.6%. That is, a larger variation in subsequent risk is now accounted for by the performance variable.

The technology industry is reported as having a negative, but statistically insignificant β. This indicates a weak negative relationship between the technology industry's performance and its subsequent risk. The model's average risk is now at 14.13% which decreased from 15.11% of the unfiltered sample. Only about 25% of the total observations are lost. The F statistic (0.565 versus 0.822) has also become weaker. The F statistic and *N* show that the relationship between the technology industry's performance and its subsequent risk is by chance. Additionally, only 0.3% of the subsequent risk is explained by the performance variable.

The oil and gas industry shows the opposite relationship between its performance and subsequent risk. The β indicates that each unit increase in its performance will indeed increase its risk by 0.027 units. However, this claim is statistically insignificant. The model's average risk has decreased to 14.19% from 16.78% reported in the unfiltered sample. The number of observations has decreased by more than half. The F statistic is now less than a unit. These figures (N = 17 and F statistic = 0.016) give doubt to the existence of the relationship between the oil and gas industry's performance and its subsequent risk.

The standard errors for the coefficients estimates are higher than those of the unfiltered sample. This is due to the loss of observations on the filtered sample. However, the standard errors are still low, when compared to their coefficients estimates.

Table 11 represents a summary for cross-sectional regression results of the filtered sample. The table shows that over the years β is, on average, negative. This indicates a negative relationship between a firm's performance and its subsequent risk. The filtered sample's β standard deviation is higher than that of the cross-sectional regression on the original sample (0.17 versus 0.14). The lowest value of β is -0.61 while its highest value is 0.12. The β from the pooled regression is negative and falls within the minimum and the maximum βs of the cross-sectional regression. For each unit increase in firms' performance, their subsequent risk would, on average, decrease by

0.13 units. The reduction in risk here is more than the reduction indicated by the pooled regression model (a differential of 0.01 units).

Table 11: Filtered Sample's Cross-Sectional Regression Results

The actual estimated OLS regression is as follows: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}i,j,t} + \boldsymbol{e_{i,j,t}}$. In each β and Constant statistics under the **Coefficient** column represented in the table, and from the summary of cross-sectional sectional regression analysis, the table represents; the average as shown by the **Average** statistic, **Std Dev.** measures the standard deviation, minimum values of the statistics are represented in the **Min** column and the maximum values of the statistics are shown under the **Max** column. The pooled regression (controlled for industry-specific effects) results for slope and constant are shown in **Pooled** in the last column.

Filtered Sample's Cross-Sectional Regression Results

Coefficient	**Average**	**Std Dev.**	**Min**	**Max**	**Pooled**
β	-0.134	0.170	-0.606	0.123	-0.118***
Constant	13.456	3.413	9.711	22.192	13.167***

Notes: ***, ** , * significant at the 1%,5% and 10% respectively

When the other features are zero, Table 11 shows that the model's constant reports the average mean risk value equals to 13.46%. The standard deviation of the filtered sample's constants is higher than that of the cross-sectional regression of the original sample (3.41% versus 2.89%). Additionally, the difference between the maximum average risk (22.19%) and the minimum average risk (9.71%) on the filtered sample's cross-sectional regression is larger than that of the maximum average risk (22.35%) and the minimum average risk (11.38%) on the original sample's cross-sectional regression. The average cross-sectional mean risk is higher than the average risk form the pooled regression (13.46% versus 13.17%).

4.5.2 Model Diagnostics

The model used assumed a linear relationship between a firm's performance (i.e. IGain) and its subsequent risk. This section examines whether the regression model applied suits the dataset used. It may be considered as an additional step after the F statistic, the R-squared and the Adjusted R-squared, and statistically significance of the β. It is worth pointing out that there may be outliers which may be affecting the regression results. Since the linear regression model is used in this study, it is also worthwhile examining the linearity assumptions. The distribution of the residuals plays an important part in the following discussion.

Figure A-1 plots the firms' performance against their subsequent risk. The plot shows that not all values fall in the downward sloping line. The difference between the actual points and the perfect line is called the residual error. Visually, there is evidence of high residual errors. Therefore, this indicates that the relationship between the firms' performance and their subsequent risk is not perfectly linear.

Linearity of the data

Figure A-2 plots the residuals versus fitted values. The plot examines the linearity between the firm's performance and its subsequent risk. For the linearity to hold, the line has to lie horizontally at zero residuals. However, this is not the case. The line has a sharp curve. This indicates that the relationship between the firm's performance and its subsequent risk-taking is not entirely linear.

Normality of residuals

To examine the normality of the residuals as plotted in Figure A-3, the standardised residuals are plotted against their theoretical quantiles. The residuals are not following the straight dashed line. Therefore, this indicates that the residuals are not normally distributed.

Homogeneity of residuals variance (Homoscedasticity)

Homogeneity is residual variance is another condition which is required on the residuals and is indicated in Figure A-4. To check for homoscedasticity, the figure plots the fitted values against the standard deviation of the standardised residuals. The line is not horizontal, and the points are not spread evenly across the region. Most of these points are congested in one location. Therefore, there is heteroscedasticity.

A solution to this heteroscedasticity problem may involve transforming the risk variable. For example, the scale-location in Figure A-8 uses the variable for risk squared, and as a result, the line becomes flatter to indicate constant variance in the residuals.

Influential values
Figure A-5 plots leverage points against the standardised residuals. This is to highlight outliers or high leverage data points if any. To check for the position of the outliers, the Cook's distance is applied. Outliers (i.e. risk values) are detected in data points if their standardised residuals, in absolute values, exceed the value of three. Extreme values of the firms' performance (IGain) are also highlighted. All top three outliers (identified by their positions in the dataset) have standard deviations which are higher than three.

The leverage[12] statistic value is 0.0009 using all the observations. This threshold is too low, and as a result, this indicates that high leverage points are present, since most of the data points show leverage statistic values which are above the threshold.

Cook's distance[13] statistic value is also 0.0009. Figure A-6 shows that at least three of the highlighted data points have values which are above the threshold. Additionally, most of the data points are outside Cook's distance lines. That is, the Cook's distance lines have stretched inside the residuals versus leverage plot. Therefore, the outliers in the dataset have influenced the regression results.

4.6 SUMMARY OF THE REGRESSION RESULTS

The main argument of the study is captured by the models' βs. Most of these βs reveal the hypothesised negative relationship between the firms' performance and their subsequent risk. This is consistent with the results found in Kliger and Tsur (2011). The existence of such a relationship

---

[12]The model defines leverage statistic as follows:

$$\frac{\mathbf{2(p+1)}}{\boldsymbol{N}}$$

where *p* is the number of the independent variables and *N* is the number of observations as defined earlier.

[13] The investigation defines the Cook's distance statistic as follows:

$$\frac{\mathbf{4}}{(\boldsymbol{N}-\boldsymbol{p}-\mathbf{1})}$$

where *p* is the number of the independent variables and *N* is the number of observations as defined earlier.

is supported by highly statistically significant values of the F statistic. The βs are found to be most significant at the 1% level. Moreover, the models' constants representing the average response for risk are also highly statistically significant. Likewise, the values of these constants are around the recorded average risk from the table of the descriptive statistics for the research variables. The *N* used for each case is large enough to validate the overall results found since these *N*s meet the theoretical rule of thumb (i.e. $N > 25$) for most of the statistics used. However, the values of R-squared are low and show that more variables such as leverage ratio and the rate of acquisitions could have been included, in addition to the firm's performance, to explain the firms' subsequent risk. However, similar studies such as Kliger and Tsur (2011) have also found such low values of R-squared.

4.7 ECONOMIC INTERPRETATIONS AND IMPLICATIONS OF THE FINDINGS

The results strongly suggest a negative relationship between a firm's performance and its subsequent risk. The existence of such a relationship in practice proves the prospect theory at the firm and industry level. These findings imply that risk-averse investors should consider investing in those firms which have better performances (indicating better financial health). These risk-averse investors should only invest in the other group (i.e. bad performance) only if a higher compensation is promised to match the anticipated risk. Therefore, investors who are risk-seekers would look for firms which are troubled (bad performance) since such firms have higher risk as measured by their ROE.

The results support the literature in the following two ways; troubled firms take more risk and the positive risk-return relationship is doubted. That is, from the firm's point of view, bad financial health implies more risk-taking the following year. This implies that, from the investors' point of view, high-risk investing may not be compensated with higher returns (i.e. ROE may not match the risk). Besides, firms need to take some calculated risks to remain in business. Nonetheless, the findings suggest that investors need to consider business risk in evaluating whether high-risk investing is indeed rewarded with higher returns.

The results also reveal that the firm's performance is periodic (i.e. a firm is not troubled at all times). Moreover, the results found that, in agreement with Bowman (1982), firms are not risk-averse everywhere. Consequently, the findings are consistent with Nickel and Rodriguez (2002) in that the firm's risk preferences change with its circumstances. Therefore, investors must always adjust their portfolios of stocks according to their taste for risk. Investors need to be aware that the positive relationship between risk and return does not always hold in practice.

5 CONCLUSION

The study sought to investigate the risk-seeking behaviour of troubled firms. Firm's risk was measured as the distance of its ROE from the previous year's industry median return. The investigation included all the 361 firms from the database which are found to be listed in the JSE over the 24 years. The study documents a negative relationship between firms' performance and subsequent risk levels. Indeed, the study shows that troubled firms take more risk. Overall, the results are consistent with the prospect theory.

The model's βs were found to be highly statistically significant (mostly at the 1% level). The results are consistent with the literature in both ways; for firms with ROEs which are below their reference points, the study found a negative relationship between firms' performance and their subsequent risk. Firms with ROEs which are above their reference points showed a positive relationship between performances and their subsequent risk levels. Another insight from the results is that firms which stayed as troubled (non-troubled) for longer periods showed a much stronger negative (positive) relationship between the performance and subsequent risk.

Non-troubled firms (firms with ROE above their reference points) are found to be risk-averse, whereas troubled firms are risk-seeking. Thus, troubled firms are found to forgo their expected returns to increase their variance in returns. When managers are naturally risk seekers, the positive risk-return relationship does not hold. Therefore, troubled firms in this study have shown the existence of the negative relationship between risk and return. Perhaps the shareholders of the troubled firms are compelling the firms to be more aggressive in their project taking behaviour thereby engaging in risky projects.

The results strongly suggest that the negative relationship between firms' performance and their subsequent risk indeed exists in practice. This negative relationship is more noticeable in firms which are troubled for longer periods. The sample period used is sufficient enough to strongly conclude the existence of these relationships. Extending the sample period might strengthen the results, however, data accessible from the database used may be problematic. Nonetheless, the sample period used is good enough to support most of the statistical tools used. The results support the prospect theory at the firm and industry level.

The study expands the empirical literature on the firms' risk-seeking and returns using the prospect theory and guides investors about future risk levels of firms based on the firms' performances. Future research should focus on refining the definition of troubled firms/ the reference point to test if the prospect theory still holds. Additional variables to the firms' performance should be considered when explaining firms' subsequent risk-seeing. Firms may also be ordered by their market capitalizations to detect whether the size affects the risk-seeking behaviour.

6 REFERENCES

Alam, N., & Boon-Tang, K. (2012). Risk-taking behaviour of Islamic banks: application of prospect theory. *Qualitative Research in Financial Markets*, *4*(2/3), 156-164.

Armour, H. O., & Teece, D. J. (1978). Organizational structure and economic performance: A test of the multidivisional hypothesis. *The Bell Journal of Economics*, *9*, 106-122.

Bowman, E. H. (1980). A risk/return paradox for strategic management. *Sloan Management Review*, *21*(3), 17-31.

Bowman, E. H. (1982). Risk seeking by troubled firms. *Sloan Management Review (pre-1986)*, *23*(4), 33.

Cheng, C. H. (2010). Are the Chinese really more risk averse? A cross-cultural comparison of the risk-return relationship. *Journal of Global Business Management*, *6*(2), 1-6.

Chou, P.H., Chou, R.K., & Ko, K.C. (2009). Prospect theory and the risk-return paradox: some recent evidence. *Quantitative Financial Accounting*, *33*, 193-208.

Conrad, G. R., & Plotkin, I. H. (1968). Risk-Return-United-States Industry Pattern. *Harvard Business Review*, *46*(2), 90-99.

Cootner, P. H., & Holland, D. M. (1970). Rate of return and business risk. *The Bell Journal of Economics and Management Science*, *1*, 211-226.

Coval, J. D., & Shumway, T. (2005). Do behavioural Biases Affect Prices? *The Journal of Finance*, *60*(1), 1-34.

Dasgupta, R. (2017). Behavioral Implications of Risk-Return Associations: An Application of Prospect Theory on CNX NIFTY Companies. *Australasian Accounting, Business and Finance Journal*, *11*(3), 103-126.

DeAngelo, H., DeAngelo, L., & Skinner, D. J. (1994). Accounting choice in troubled companies. *Journal of accounting and economics*, *17*(1-2), 113-143.

Díez-Esteban, J. M., García-Gómez, C. D., López-Iturriaga, F. J., & Santamaría-Mariscal, M. (2017). Corporate risk-taking, returns and the nature of major shareholders: Evidence from prospect theory. *Research in International Business and Finance*, *42*, 900-911.

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *Journal of Finance*, *47*, 427-465.

Fama, E. F., & French, K. R. (2006). Profitability, investment and average returns. *Journal of Financial Economics*, *82*(3), 491-518.

Fiegenbaum, A., & Thomas, H. (1985). An Examination of the Structural Stability of Bowman's Risk-Return Paradox. *Academy of Management Proceedings*, *1*, 7-10.

Fiegenbaum, A., & Thomas, H. (1986). Dynamic and Risk Measurement Perspectives on Bowman's Risk-Return Paradox for Strategic Management: An empirical study. *Academy of Management Journal*, *7*, 395-407.

Fiegenbaum, A., & Thomas, H. (1988). Attitudes and the risk-return paradox: Prospect theory explanations. *Academy of Management Journal*, *31*(1), 85-106.

Fishburn, P. C., & Kochenberger, G. A. (1979). Two-piece von Neumann-Morgenstern utility functions. *Decision Sciences*, *10*(4), 503-518.

Fisher, I. N., & Hall, G. R. (1969). Risk and corporate rates of return. *The Quarterly Journal of Economics*, *83*, 79-92.

Hurdle, G. J. (1974). Leverage, risk, market structure and profitability. *The Review of Economics and Statistics*, *56*, 478-485.

Hyde, CE. (2016). The Piotroski *F* -score: evidence from Australia. *Accounting & Finance*, *58*(2),423-444.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica, 47*(2), 263-291.

Kliger, D., & Tsur, I. (2011). Prospect Theory and Risk-Seeking Behaviour by Troubled Firms. *Journal of Behavioural Finance*, *12*, 29-40.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2000). Investor protection and corporate governance. *Journal of financial economics*, *58*(1-2), 3-27.

Laughhunn, D., Payne, J., & Crum, R. (1980). Managerial Risk Preferences for Below-Target Returns. *Management Science, 26*(12), 1238-1249.

Marsh, T. A., & Swanson, D. S. (1984). Risk-return trade-offs for strategic management. *Sloan Management Review (pre-1986)*, *25*(3), 35.

Neumann, M., Böbel, I., & Haid, A. (1979). Profitability, risk and market structure in West German industries. *The Journal of Industrial Economics*, *27*(3), 227-242.

Nickel, M. N., & Rodriguez, M. C. (2002). A review of research on the negative accounting relationship between risk and return: Bowman's paradox. *Omega*, *30*(1), 1-18.

Ohlson, J. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, *18*, 109-131.

Park, C. (2005). Stock Return Predictability and the Dispersion in Earnings Forecasts. *The Journal of Business, 78*(6), 2351-2376.

Piotroski, J. D. (2000). Value investing: The use of historical financial statement information to separate winners from losers. *Journal of Accounting Research*, *38*, 1-52.

Pongsatat, S., Ramage, J., & Lawrence, H. (2004). Bankruptcy prediction for large and small firms in Asia: a comparison of Ohlson and Altman. *Journal of Accounting and Corporate Governance*, *1*(2), 1-13.

Reilly, F. K., & Brown, K. C. (2003). *Investment analysis and portfolio management*. Mason, Ohio: South-Western/Thomson Learning.

Singh, J. (1986). Performance, Slack, and Risk Taking in Organizational Decision Making. *The Academy of Management Journal, 29*(3), 562-585.

Treacy, M. E. F. (1980). Profitability patterns and firm size. Unpublished manuscript, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Mass.

7 APPENDIX

Table A- 1: Filtered Sample’s Descriptive Statistics by Industry

The table shows the *average* number of firms with the number of observations taken into account in each one of the eight remaining industries (i.e. excluding the telecommunication industry), and descriptive statistics (minimum, maximum, average and standard deviation) about the ROE of the firms in each industry.

Filtered Sample's Descriptive Statistics by Industry						
Industry Name	Firm-year Obs.	ROE (% Representation)				
		Min	Max	Median	Avg.	Std Dev.
Basic Materials	24.3	-197.59	166.96	7.58	5.51	33.15
Financials	36.4	-178.60	188.12	12.88	13.25	27.09
Consumer Goods	8.4	-197.42	126.40	13.64	12.72	20.64
Consumer Services	16.1	-137.42	88.05	22.76	21.59	19.06
Health Care	2.9	-120.50	71.13	17.18	16.48	24.75
Industrials	31.3	-199.03	126.71	14.52	10.42	26.30
Technology	9.3	-138.12	105.32	13.81	10.77	26.81
Oil & Gas	0.8	-113.87	67.85	9.41	5.41	35.68

Table A- 2: Filtered Sample's Descriptive Statistics by Year

The table shows the number of firms on the filtered sample in each year from 1995 to 2018, and descriptive statistics (minimum, maximum, average and standard deviation) about the ROE of the firms in each year.

Filtered Sample's Descriptive Statistics by Year						
Year	No. of Firms	ROE (% Representation)				
		Min	Max	Median	Avg.	Std Dev.
1995	70	-128.68	55.98	14.87	9.82	23.21
1996	73	-121.04	88.48	14.19	11.49	24.89
1997	76	-63.94	61.00	12.08	10.06	19.97
1998	83	-120.50	51.91	12.84	9.04	25.62
1999	95	-136.22	110.73	11.68	9.61	29.74
2000	98	-199.03	183.91	11.96	8.49	46.31
2001	103	-141.89	117.48	14.52	7.70	36.86
2002	109	-138.12	114.63	14.28	9.44	37.55
2003	111	-160.82	82.54	17.78	10.55	32.46
2004	113	-174.93	149.07	16.72	15.05	31.97
2005	115	-178.60	108.26	21.26	21.52	32.50
2006	120	-39.17	153.37	22.68	23.31	22.67

2007	127	-26.35	126.40	21.86	23.72	17.47
2008	144	-197.42	80.08	19.66	14.80	30.38
2009	146	-136.11	188.12	12.98	14.50	26.06
2010	150	-49.45	95.10	13.29	12.96	16.74
2011	155	-73.23	67.49	12.41	9.64	19.58
2012	163	-104.11	166.96	13.37	12.78	24.17
2013	164	-135.97	71.13	13.08	8.52	25.87
2014	168	-160.87	84.02	13.08	9.30	24.32
2015	178	-141.78	121.39	13.46	10.07	26.74
2016	182	-98.36	126.71	11.54	10.95	21.45
2017	184	-118.18	77.39	11.30	9.22	22.30
2018	180	-136.29	101.68	10.57	6.64	25.67

Table A- 3: Descriptive Statistics of Research Variables on Filtered Sample

Represents descriptive statistics of the research variables as defined in Table 3. The statistics include the number of observations (shown as No. of Firms), minimum and maximum values, average, median and the standard deviation. There are 71 lost observations due to one-year lag. This higher loss of observations (-2.29% versus -2.04% loss on the unfiltered sample) is also attributable to the fact that the telecommunication industry is completely filtered out.

Descriptive Statistics of Research Variables on Filtered Sample						
Measure	No. of Firms	Min (%)	Max (%)	Avg. (%)	Median (%)	Std Dev. (%)
$ROE_{i,j,t}$	3 107	-199.03	188.12	11.96	13.96	27.30
$Risk_{i,j,t}$	3 036	0.00	211.96	13.44	6.63	22.58
$Ref_{i,j,t}$	3 036	-55.18	38.54	14.11	13.65	6.86

Table A- 4: Separate Industries Regression with Controls Results

The table shows separate regressions for all the industries studied. The estimated OLS regression equation is as follows: $\boldsymbol{Risk}_{i,j,t} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}i,j,t} + \sum_{m} \tilde{O}\boldsymbol{j}, \boldsymbol{m} \times \boldsymbol{I}_{\_\mathbf{firm}m,j,t} + \sum_{l} \O\boldsymbol{l} \times \boldsymbol{I}_{\_\mathbf{Year}i,j,t} + \boldsymbol{e}_{i,j,t}$. These regressions are similar to the panel regression for the full dataset but for separate industries. The **Name** variable represents each industry. For every industry; **β** captures the estimate of the slope and its standard error is shown underneath, firm-specific effects and time-specific effects are represented by the **Firm Control** and **Time Control** respectively, the constant of each regression is represented with the **Constant** statistic, ***N*** shows the number of observations under consideration, the **Linear?** column checks if the regression is a linear model, the **Good Model?** variable is added to support the **R-squared**, **Adjusted R-squared** and **F Statistic** which are all shown in the table.

Separate Industries Regression with Controls Results

Name	β	Firm Control	Time Control	Constant	*N*	R2	Adjusted R2	F Statistic	Linear?	Good Model?
1. Basic Materials	-0.085***	8.462	5.071	4.925	858	0.014	0.011	4.154***	Yes	No
	(0.029)	(5.501)	(4.432)	(6.888)				(df = 3; 854)		
2. Financials	-0.082**	-1.101	1.971	13.088	584	0.011	0.006	2.209*	Yes	No
	(0.033)	(12.251)	(2.975)	(12.573)				(df = 3; 580)		
3. Consumer Goods	-0.045	-1.141	4.443	9.581	193	0.005	-0.011	0.310	Yes	No
	(0.061)	(11.005)	(7.240)	(13.047)				(df = 3; 189)		
4. Consumer Services	-0.103**	Not Required	2.147	9.983***	346	0.019	0.013	3.290**	Yes	No
	(0.042)		(3.472)	(3.369)				(df = 2; 343)		
5. Health Care	-0.280**	16.228	-8.272	7.253	54	0.142	0.090	2.755*	Yes	Yes
	(0.127)	(12.137)	(8.908)	(14.790)				(df = 3; 50)		
6. Industrials	-0.107***	1.924	0.986	9.767	644	0.017	0.013	3.736**	Yes	No
	(0.032)	(5.888)	(3.379)	(6.737)				(df = 3; 640)		
7. Technology	-0.065	Not Required	-0.048	14.246**	193	0.006	-0.005	0.563	Yes	No
	(0.061)		(6.542)	(6.348)				(df = 2; 190)		
8. Oil and Gas	0.336**	20.437*	7.135	-7.135	20	0.344	0.221	2.793*	Yes	Yes
	(0.156)	(10.746)	(14.367)	(17.211)				(df = 3; 16)		
9.Telecommunications	0.329***	8.630*	6.246	1.140	63	0.153	0.110	3.547**	Yes	Yes
	(0.110)	(5.069)	(8.722)	(9.318)				(df = 3; 59)		

Notes: standard errors in parentheses

***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A- 5: Cross-Sectional Regression No Controls Results (1996-2005)

The table presents the full results on the cross-sectional regression summary from 1996 to 2005. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression No Controls Results (1996-2005)

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
						Risk				
β	-0.481***	-0.073	-0.079	-0.234*	-0.053	0.013	-0.050	-0.123*	-0.086	0.055
	(0.082)	(0.069)	(0.088)	(0.123)	(0.104)	(0.063)	(0.062)	(0.066)	(0.068)	(0.068)
Constant	11.379***	11.432***	11.915***	16.911***	22.346***	19.925***	17.354***	16.669***	16.266***	17.044***
	(1.775)	(1.496)	(1.654)	(2.492)	(3.417)	(2.778)	(2.297)	(2.085)	(2.088)	(1.980)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	No	No	Yes	No	No	No	Yes	No	No
N	102	105	114	133		145	151	154	157	161
R2	0.256	0.011	0.007	0.027	0.002	0.0003	0.004	0.022	0.010	0.004
Adjusted R2	0.249	0.001	-0.002	0.019	-0.005	-0.007	-0.002	0.016	0.004	-0.002
Residual Std. Error	17.704 (df = 100)	15.265 (df = 103)	17.516 (df = 112)	28.305 (df = 131)	39.693 (df = 135)	33.245 (df = 143)	28.094 (df = 149)	25.532 (df = 152)	25.967 (df = 155)	25.074 (df = 159)
F Statistic	34.476*** (df = 1; 100)	1.128 (df = 1; 103)	0.788 (df = 1; 112)	3.617* (df = 1; 131)	0.262 (df = 1; 135)	0.045 (df = 1; 143)	0.643 (df = 1; 149)	3.470* (df = 1; 152)	1.610 (df = 1; 155)	0.656 (df = 1; 159)

Notes: standard errors in parentheses

***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A- 6: Cross-Sectional Regression No Controls Results (2006-2014)

The table presents the full results on the cross-sectional regression summary from 2006 to 2014. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t} = \alpha + \beta \times I_{\_gain i,j,t} + e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression No Controls Results (2006-2014)

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
					Risk				
β	-0.166***	0.005	0.016	-0.170***	0.067	0.127***	-0.012	0.114**	-0.039
	(0.048)	(0.054)	(0.083)	(0.049)	(0.046)	(0.049)	(0.057)	(0.052)	(0.048)
Constant	13.873***	12.672***	16.092***	14.514***	13.126***	13.416***	13.371***	14.582***	12.035***
	(1.428)	(1.261)	(1.775)	(1.474)	(1.241)	(1.110)	(1.238)	(1.221)	(1.117)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	No	No	Yes	No	Yes	No	Sort of	No
N	169	189	215	223	230	240	248	251	265
R2	0.068	0.00004	0.0002	0.052	0.009	0.028	0.0002	0.019	0.003
Adjusted R2	0.062	-0.005	-0.005	0.048	0.005	0.024	-0.004	0.015	-0.001
Residual Std. Error	18.548 (df = 167)	17.297 (df = 187)	25.932 (df = 213)	21.863 (df = 221)	18.819 (df = 228)	17.188 (df = 238)	19.483 (df = 246)	19.346 (df = 249)	17.997 (df = 263)
F Statistic	12.101*** (df = 1; 167)	0.007 (df = 1; 187)	0.036 (df = 1; 213)	12.079*** (df = 1; 221)	2.079 (df = 1; 228)	6.752*** (df = 1; 238)	0.044 (df = 1; 246)	4.774** (df = 1; 249)	0.681 (df = 1; 263)

Notes: standard errors in parentheses
***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A- 7: Cross-Sectional Regression No Controls Results (2015-2018)

The table presents the full results on the cross-sectional regression summary from 2015 to 2018. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression No Controls Results (2015-2018)

	2015	**2016**	**2017**	**2018**
		Risk		
β	-0.175***	-0.109**	-0.129**	-0.290***
	(0.053)	(0.048)	(0.053)	(0.050)
Constant	11.454***	11.545***	12.849***	13.442***
	(1.127)	(1.012)	(1.101)	(1.167)
Linear Model?	Yes	Yes	Yes	Yes
Good Model?	Yes	No	No	Yes
N	280	298	315	324
R2	0.038	0.017	0.019	0.093
Adjusted R2	0.034	0.014	0.015	0.090
Residual Std. Error	18.755 (df = 278)	17.378 (df = 296)	19.498 (df = 313)	20.849 (df = 322)
F Statistic	10.912*** (df = 1; 278)	5.132** (df = 1; 296)	5.912** (df = 1; 313)	33.135*** (df = 1; 322)

Notes: standard errors in parentheses
***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table A- 8: Cross-Sectional Regression with Controls Results (1996-2004)

The table presents the full results on the cross-sectional regression controlled for industry specific effects summary from 1996 to 2004. The estimated OLS regression is specified as: $\boldsymbol{Risk}_{i,j,t} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}i,j,t} + \sum_{k} \acute{Y}\boldsymbol{k} \times \boldsymbol{I}_{\_\mathbf{Ind}i,k,t} + \boldsymbol{e}_{i,j,t}$. β represents the slope estimates with their standard errors, Industry Control is an industry dummy coefficient controlling for industry specific effects, models' constants are represented by Constant with estimates of their standard errors shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each year, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression with Controls Results (1996-2004)

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
					Risk				
β	-0.474***	-0.101	-0.079	-0.233*	-0.031	-0.051	-0.040	-0.129*	-0.105
	(0.083)	(0.068)	(0.088)	(0.125)	(0.100)	(0.067)	(0.066)	(0.069)	(0.071)
Industry Control	-5.439	5.264	Not required	1.604	-9.303	-10.842	-6.871	4.869	-7.680
	(4.269)	(3.574)		(6.399)	(8.519)	(7.193)	(6.127)	(5.507)	(5.667)
Constant	15.625***	7.026**	11.915***	15.670***	28.859***	28.144***	23.290***	12.303**	22.492***
	(3.766)	(3.159)	(1.654)	(5.779)	(7.718)	(6.473)	(5.540)	(5.001)	(5.145)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	Sort of	No	Yes	No	Sort of	No	Sort of	Yes
N	99	102	114	129	132	138	144	146	149
R2	0.267	0.036	0.007	0.027	0.010	0.020	0.012	0.029	0.026
Adjusted R2	0.252	0.016	-0.002	0.012	-0.005	0.005	-0.002	0.015	0.012
Residual Std. Error	17.913 (df = 96)	14.840 (df = 99)	17.516 (df = 112)	28.706 (df = 126)	37.749 (df = 129)	32.996 (df = 135)	28.673 (df = 141)	25.457 (df = 143)	26.231 (df = 146)
F Statistic	17.468*** (df = 2; 96)	1.838 (df = 2; 99)	0.788 (df = 1; 112)	1.764 (df = 2; 126)	0.647 (df = 2; 129)	1.371 (df = 2; 135)	0.841 (df = 2; 141)	2.141 (df = 2; 143)	1.916 (df = 2; 146)

Notes: standard errors in parentheses

***, ** , * significant at the 1%,5% and 10% respectively

Table A- 9: Cross-Sectional Regression with Controls Results (2005-2013)

The table presents the full results on the cross-sectional regression industry specific effects summary from 2005 to 2013. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I}_{\_\mathbf{gain}i,j,t} + \sum_k \acute{Y}\boldsymbol{k} \times \boldsymbol{I}_{\_\mathbf{Indi},k,t} + \boldsymbol{e_{i,j,t}}$. β represents the slope estimates with their standard errors, Industry Control is an industry dummy coefficient controlling for industry specific effects, models' constants are represented by Constant with estimates of their standard errors shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each year, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression with Controls Results (2005-2013)

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
					Risk				
β	0.071	-0.190***	-0.001	0.028	-0.152***	0.065	0.119**	-0.009	0.098*
	(0.069)	(0.049)	(0.055)	(0.085)	(0.049)	(0.049)	(0.050)	(0.059)	(0.053)
Industry Control	-11.527**	-7.246**	-7.471**	-6.704	1.052	3.613	-5.532*	-5.317*	-8.573***
	(5.140)	(3.641)	(3.173)	(4.532)	(3.730)	(3.195)	(2.839)	(3.141)	(3.097)
Constant	26.254***	19.676***	18.672***	21.708***	13.728***	10.474***	17.912***	17.858***	21.685***
	(4.639)	(3.258)	(2.814)	(4.047)	(3.314)	(2.851)	(2.530)	(2.793)	(2.754)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
N	153	161	180	206	215	221	230	238	241
R2	0.036	0.106	0.030	0.011	0.045	0.014	0.043	0.012	0.050
Adjusted R2	0.023	0.094	0.020	0.001	0.036	0.005	0.035	0.004	0.042
Residual Std. Error	24.711 (df = 150)	18.429 (df = 158)	17.340 (df = 177)	26.204 (df = 203)	21.673 (df = 212)	19.124 (df = 218)	17.321 (df = 227)	19.741 (df = 235)	19.384 (df = 238)
F Statistic	2.800* (df = 2; 150)	9.337*** (df = 2; 158)	2.781* (df = 2; 177)	1.144 (df = 2; 203)	4.988*** (df = 2; 212)	1.541 (df = 2; 218)	5.106*** (df = 2; 227)	1.448 (df = 2; 235)	6.199*** (df = 2; 238)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

Table A- 10: Cross-Sectional Regression with Controls Results (2014-2018)

The table presents the full results on the cross-sectional regression industry specific effects summary from 2014 to 2018. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gaini,j,t}} + \sum_k \acute{Y}\boldsymbol{k} \times \boldsymbol{I_{\_Indi,k,t}} + \boldsymbol{e_{i,j,t}}$. β represents the slope estimates with their standard errors, Industry Control is an industry dummy coefficient controlling for industry specific effects, models' constants are represented by Constant with estimates of their standard errors shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each year, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Cross-Sectional Regression with Controls Results (2014-2018)

	2014	**2015**	**2016**	**2017**	**2018**
			Risk		
β	-0.019	-0.170***	-0.107**	-0.127**	-0.289***
	(0.048)	(0.053)	(0.049)	(0.054)	(0.051)
Industry Control	-9.143***	-5.125*	-2.081	-3.722	-3.805
	(2.822)	(2.924)	(2.709)	(2.982)	(3.220)
Constant	19.704***	15.773***	13.382***	16.047***	16.725***
	(2.545)	(2.638)	(2.461)	(2.724)	(2.964)
Linear Model?	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	Yes	No	Sort of	Yes
N	256	271	290	310	321
R2	0.042	0.049	0.018	0.024	0.097
Adjusted R2	0.034	0.042	0.012	0.017	0.092
Residual Std. Error	17.907 (df = 253)	18.921 (df = 268)	17.563 (df = 287)	19.601 (df = 307)	20.916 (df = 318)
F Statistic	5.556*** (df = 2; 253)	6.945*** (df = 2; 268)	2.695* (df = 2; 287)	3.712** (df = 2; 307)	17.153*** (df = 2; 318)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

Table A- 11: Filtered Sample's Cross-Sectional Regression Results (1996-2004)

The table presents the full results on the cross-sectional regression summary from 1996 to 2004. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Filtered Sample's Cross-Sectional Regression Results (1996-2004)

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
					Risk				
β	-0.606***	-0.092	-0.068	-0.101	-0.033	0.063	-0.045	-0.091	-0.090
	(0.083)	(0.077)	(0.109)	(0.113)	(0.144)	(0.067)	(0.090)	(0.073)	(0.082)
Constant	10.843***	11.522***	13.276***	16.399***	22.192***	19.429***	18.699***	16.647***	15.552***
	(1.879)	(1.870)	(2.125)	(2.529)	(4.110)	(3.003)	(3.022)	(2.636)	(2.624)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	Yes	No	No	No	No	No	No	No	No
N	73	76	83	95	98	103	109	111	113
R2	0.429	0.019	0.005	0.008	0.001	0.009	0.002	0.014	0.011
Adjusted R2	0.421	0.006	-0.008	-0.002	-0.010	-0.001	-0.007	0.005	0.002
Residual Std. Error	15.775 (df = 71)	16.196 (df = 74)	19.140 (df = 81)	24.261 (df = 93)	40.633 (df = 96)	30.428 (df = 101)	31.299 (df = 107)	27.199 (df = 109)	27.502 (df = 111)
F Statistic	53.336*** (df = 1; 71)	1.422 (df = 1;74)	0.387 (df = 1;81)	0.792 (df = 1;93)	0.051 (df = 1;96)	0.899 (df = 1;101)	0.249 (df 1;107)	1.534 (df = 1; 109)	1.205 (df = 1; 111)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

Table A- 12: Filtered Sample's Cross-Sectional Regression Results (2005-2013)

The table presents the full results on the cross-sectional regression summary from 2005 to 2013. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Filtered Sample's Cross-Sectional Regression Results (2005-2013)

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
					Risk				
β	0.061	-0.197***	0.033	-0.148	-0.311***	-0.026	0.001	-0.218**	0.123*
	(0.088)	(0.050)	(0.055)	(0.125)	(0.056)	(0.042)	(0.074)	(0.088)	(0.064)
Constant	16.142***	12.387***	10.085***	14.832***	10.821***	9.711***	11.288***	11.667***	13.077***
	(2.614)	(1.581)	(1.204)	(2.182)	(1.682)	(1.043)	(1.177)	(1.591)	(1.510)
Linear Model?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Good Model?	No	Yes	No	No	Yes	No	No	Yes	Sort of
N	114	120	127	144	146	150	155	163	164
R2	0.004	0.116	0.003	0.010	0.176	0.003	0.00000	0.037	0.022
Adjusted R2	-0.005	0.109	-0.005	0.003	0.171	-0.004	-0.007	0.031	0.016
Residual Std. Error	27.890 (df = 112)	17.299 (df = 118)	13.554 (df = 125)	26.173 (df = 142)	20.048 (df = 144)	12.772 (df = 148)	14.632 (df = 153)	20.222 (df = 161)	19.337 (df = 162)
F Statistic	0.470 (df = 1; 112)	15.559*** df = 1; 118)	0.355 (df = 1; 125)	1.391 (df = 1; 142)	30.853*** (df = 1; 144)	0.373 (df = 1; 148)	0.0004(df = 1; 153)	6.139** (df = 1; 161)	19.337 (df = 162)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

Table A- 13: Filtered Sample's Cross-Sectional Regression Results (2014-2018)

The table presents the full results on the cross-sectional regression summary from 2014 to 2018. The estimated OLS regression is specified as: $\boldsymbol{Risk_{i,j,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta} \times \boldsymbol{I_{\_gain i,j,t}} + \boldsymbol{e_{i,j,t}}$. For each year; β represents the slope estimate with its standard error, the model's constant is represented by Constant with its estimate of standard error shown underneath. The Linear Model? row suggests that the model used is a linear regression. *N* shows the number of observations considered in each regression, and R-squared, Adjusted R-squared, Residual Standard Error and F Statics are included as well as whether the model is a good fit as represented by the Good Model? row.

Filtered Sample's Cross-Sectional Regression Results (2014-2018)

	2014	**2015**	**2016**	**2017**	**2018**
			Risk		
β	-0.136**	-0.344***	-0.178***	-0.283***	-0.400***
	(0.068)	(0.071)	(0.054)	(0.062)	(0.072)
Constant	10.368***	11.241***	10.306***	11.132***	11.865***
	(1.548)	(1.577)	(1.264)	(1.263)	(1.532)
Linear Model?	Yes	Yes	Yes	Yes	Yes
Good Model?	Sort of	Yes	Yes	Yes	Yes
N	168	178	182	184	180
R2	0.023	0.118	0.057	0.102	0.149
Adjusted R2	0.018	0.113	0.052	0.097	0.144
Residual Std. Error	19.818 (df = 166)	20.774 (df = 176)	16.926 (df = 180)	17.114 (df = 182)	20.443 (df = 178)
F Statistic	3.975** (df = 1; 166)	23.549*** (df = 1; 176)	10.912*** (df = 1; 180)	20.685*** (df = 1; 182)	31.100*** (df = 1; 178)

Notes: standard errors in parentheses
***, ** , * significant at the 1%,5% and 10% respectively

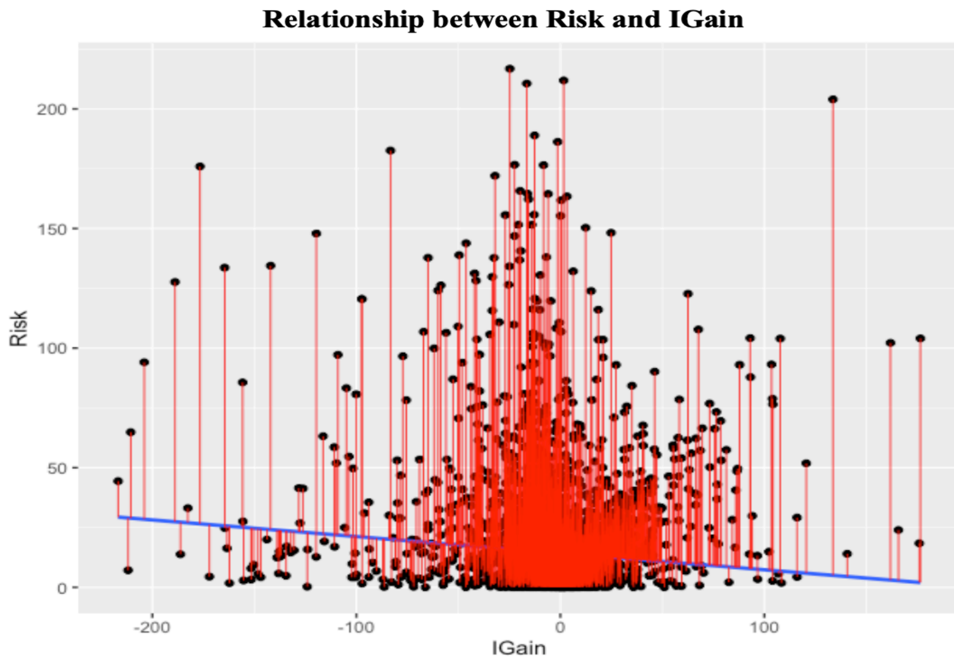

Figure A- 1: Relationship between Risk and IGain

Plots the values of firms' performance (i.e. IGain) against their subsequent risk. The x-axis represents firms' performance in percentage representation. The y-axis represents firms' subsequent risk in percentage representation.

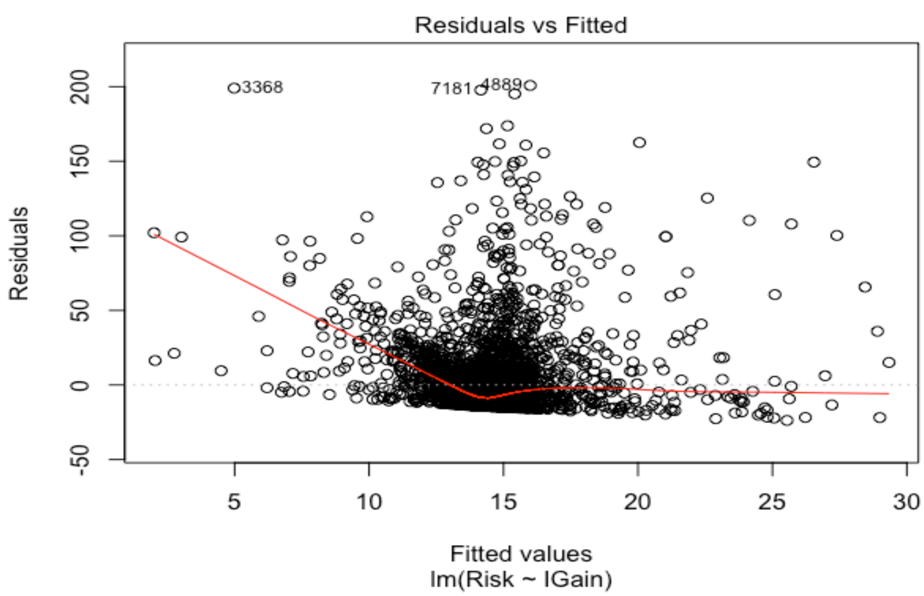

Figure A- 2: Residuals vs Fitted

Represents the residual errors versus fitted values. The x-axis represents the fitted values. The y-axis represents the residuals.

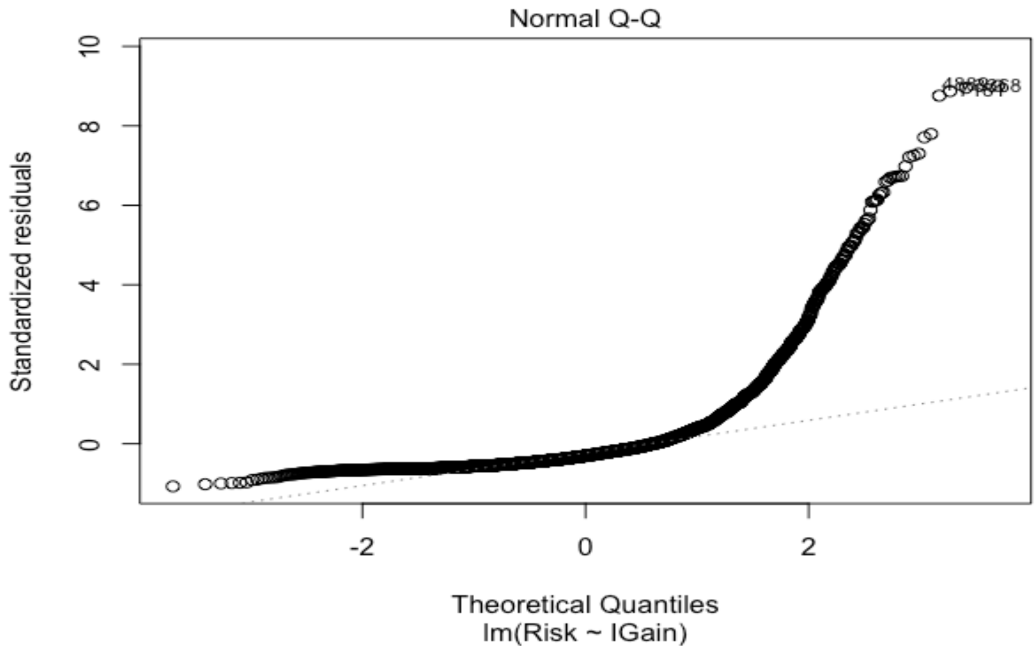

Figure A- 3: Normal Q-Q

Represents a plot for normal Q-Q. The x-axis represents the theoretical quantiles. The y-axis represents the standardised residuals.

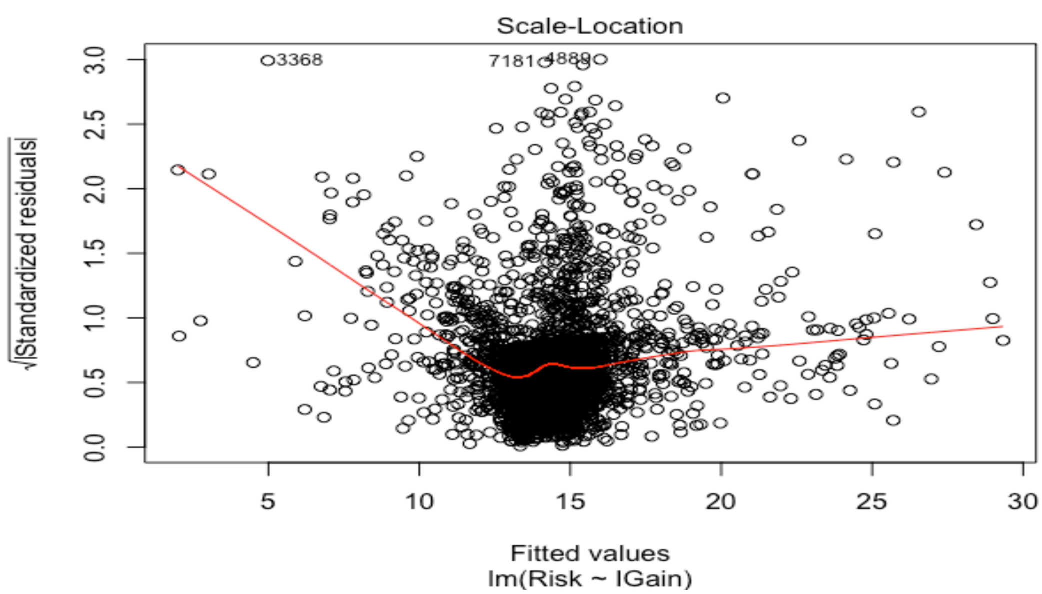

Figure A- 4: Scale-Location

Represents scale-location. The x-axis represents the fitted values. The y-axis represents the standardised residuals with their standard deviations.

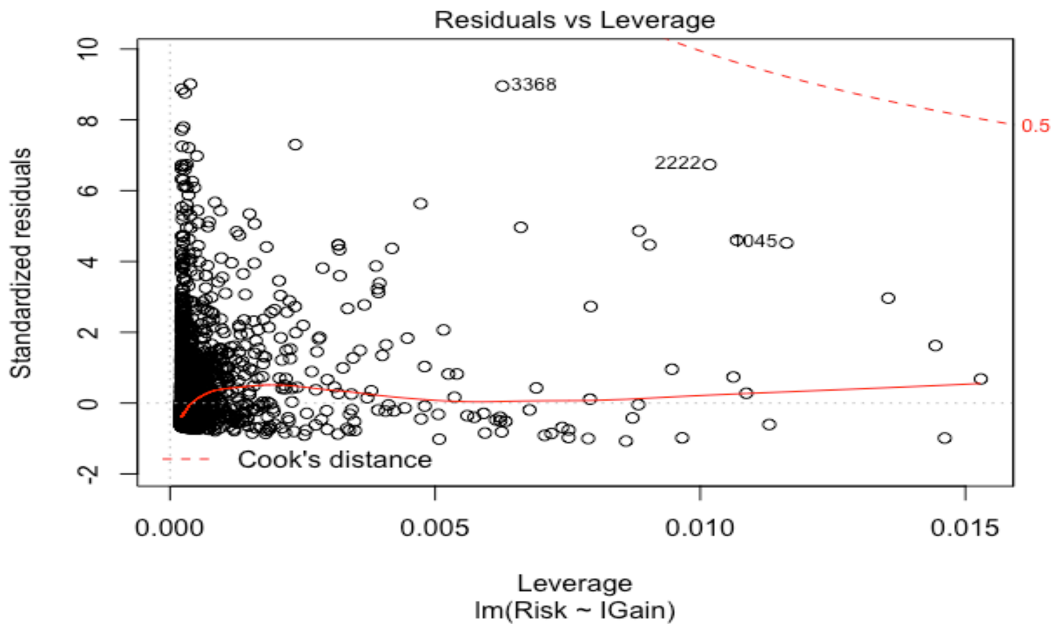

Figure A- 5: Residuals vs Leverage

Represents the outliers, high leverage points and the Cook's distance. The x-axis represents leverage points with their positions on the plane. The y-axis represents residuals with their standard deviations. Cook's distance is shown on the plane.

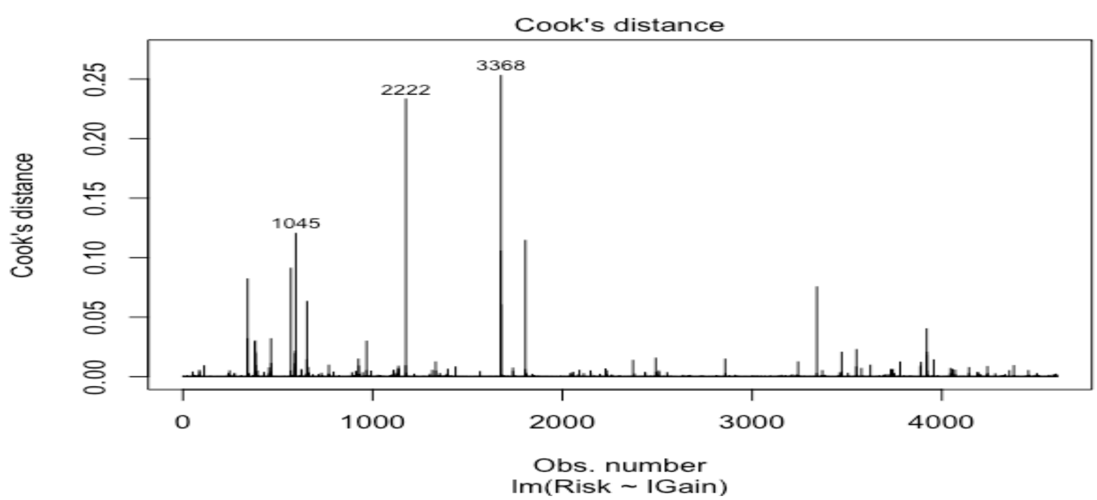

Figure A- 6: Cook's distance

Represents the positions of the outliers as pointed by the Cook's distance. The x-axis represents the observation number. The y-axis represents the Cook's distance.

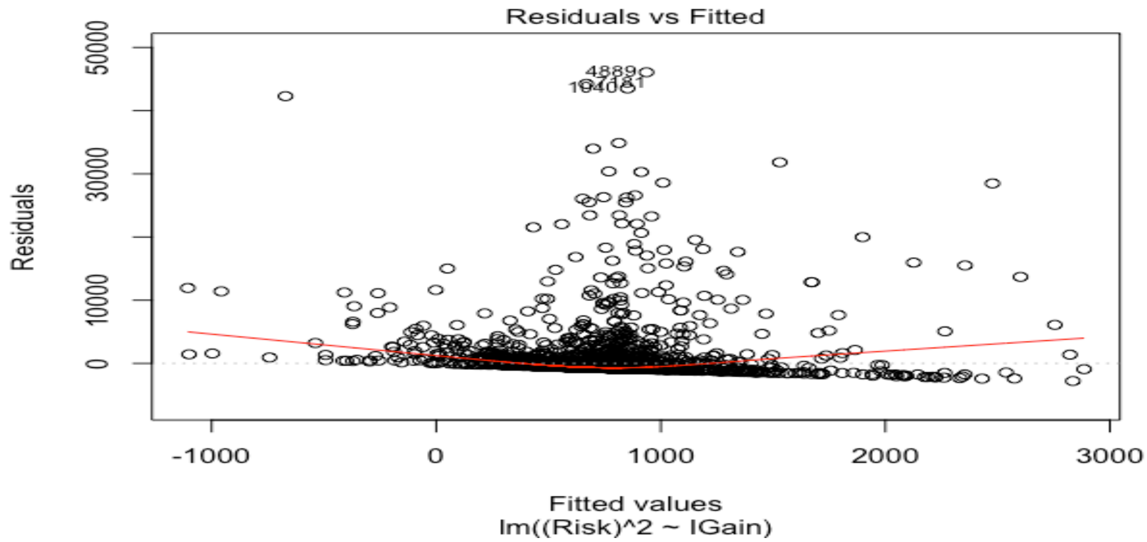

Figure A- 7: Transformed model's Residuals vs Fitted

Represents the fitted values versus residuals with a squared dependent variable. The x-axes represent the fitted values. The y-axis represents the residuals and their standard deviations.

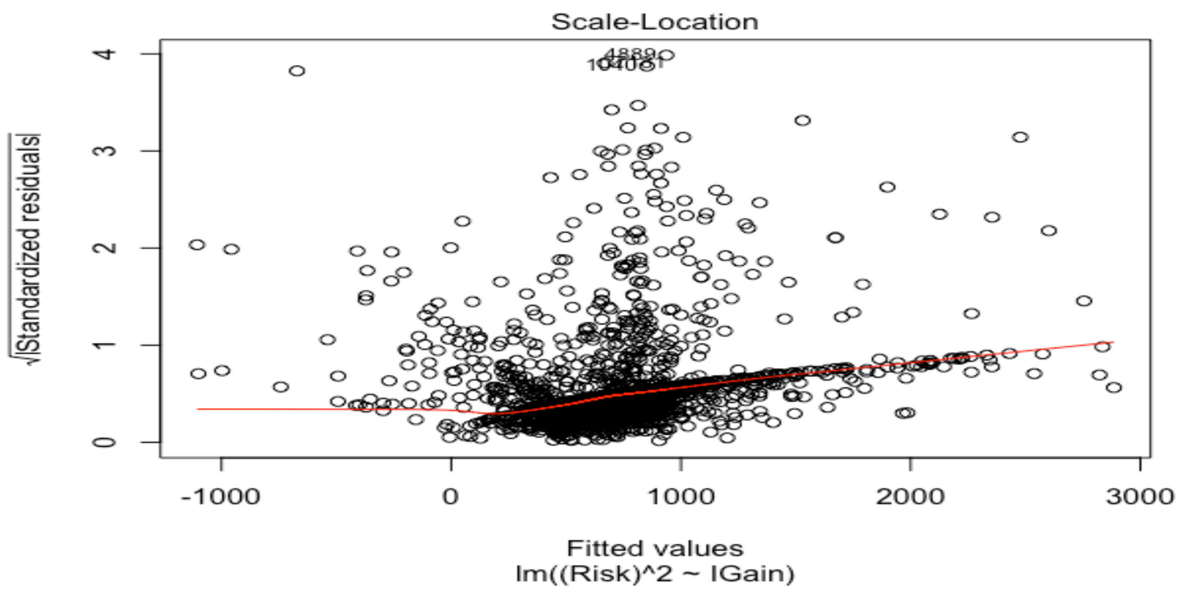

Figure A- 8: Transformed model's Scale-Location

Represents the fitted values against the standard deviations of residuals with a squared dependent variable. The x-axes represent the fitted values. The y-axis represents the residuals and their standard deviations.

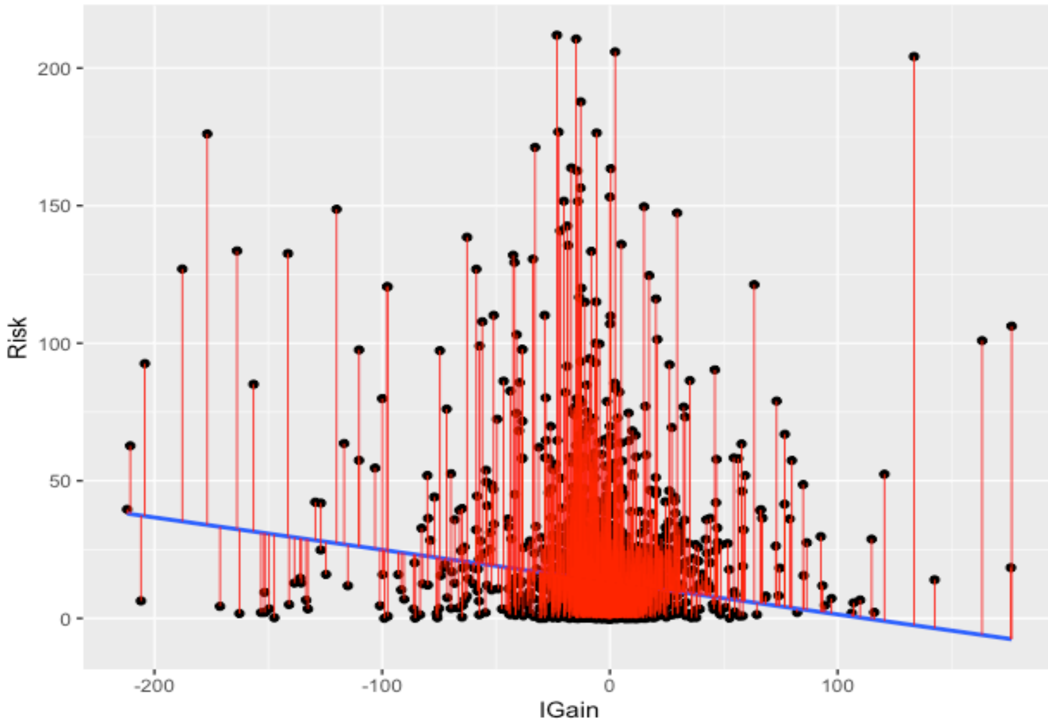

Figure A- 9: Filtered Sample's Relationship between Risk and IGain

Plots the values of the firm's performance (IGain) against their firm' subsequent risk of the filtered sample. The x-axis represents firms' performance in percentage representation. The y-axis represents firms' subsequent risk in percentage representation.

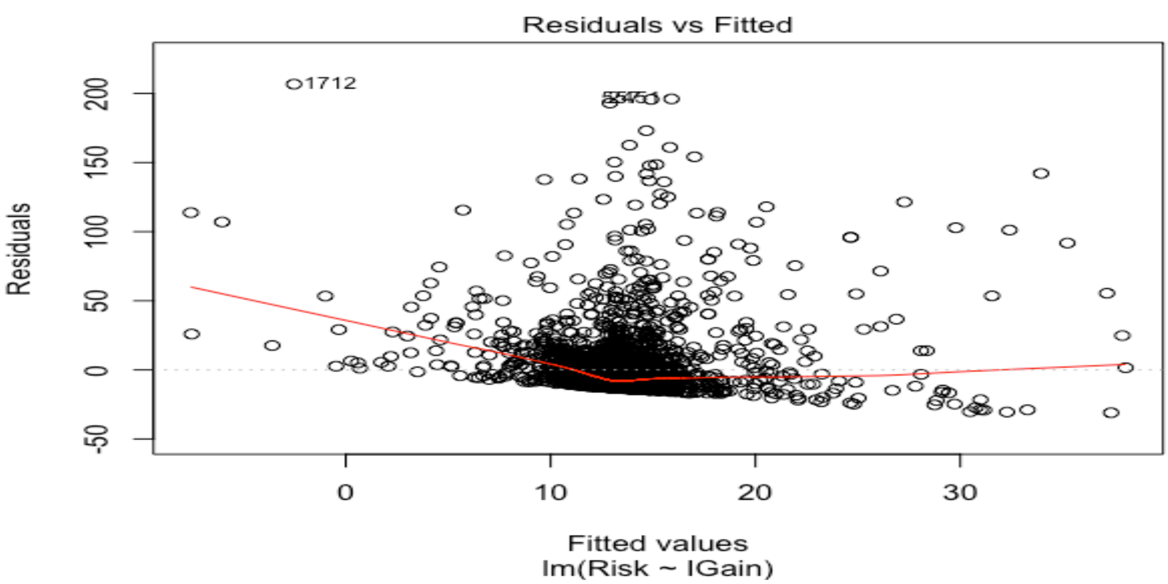

Figure A- 10: Filtered Sample's Residuals vs Fitted

Represents residual errors versus the fitted values of the filtered sample. The x-axis represents the fitted values. The y-axis represents the residuals.

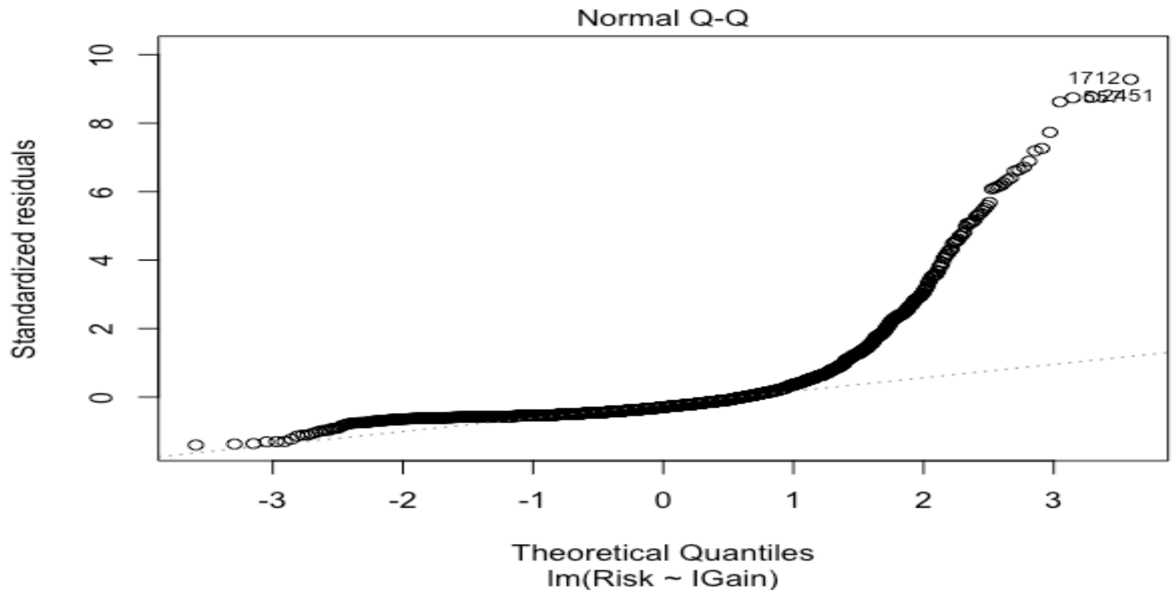

Figure A- 11: Filtered Sample's Normal Q-Q

Represents a plot for filtered sample's normal Q-Q. The x-axis represents the theoretical quantiles. The y-axis represents the standardised residuals.

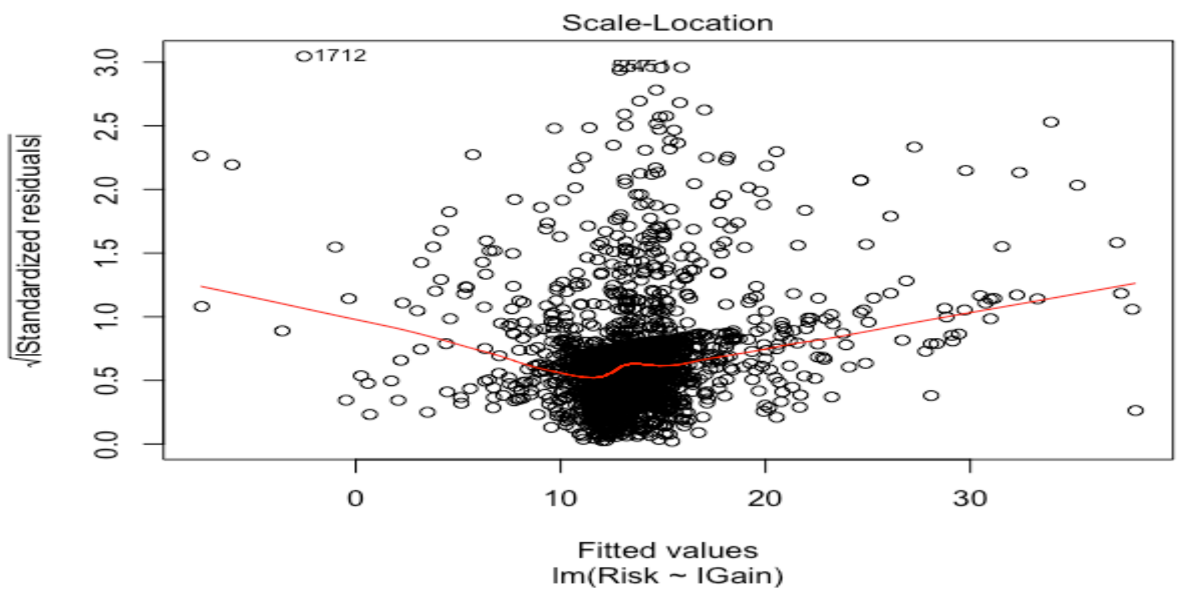

Figure A- 12: Filtered Sample's Scale-Location

Represents scale-location of the filtered sample. The x-axis represents the fitted values. The y-axis represents the standardised residuals with their standard deviations.

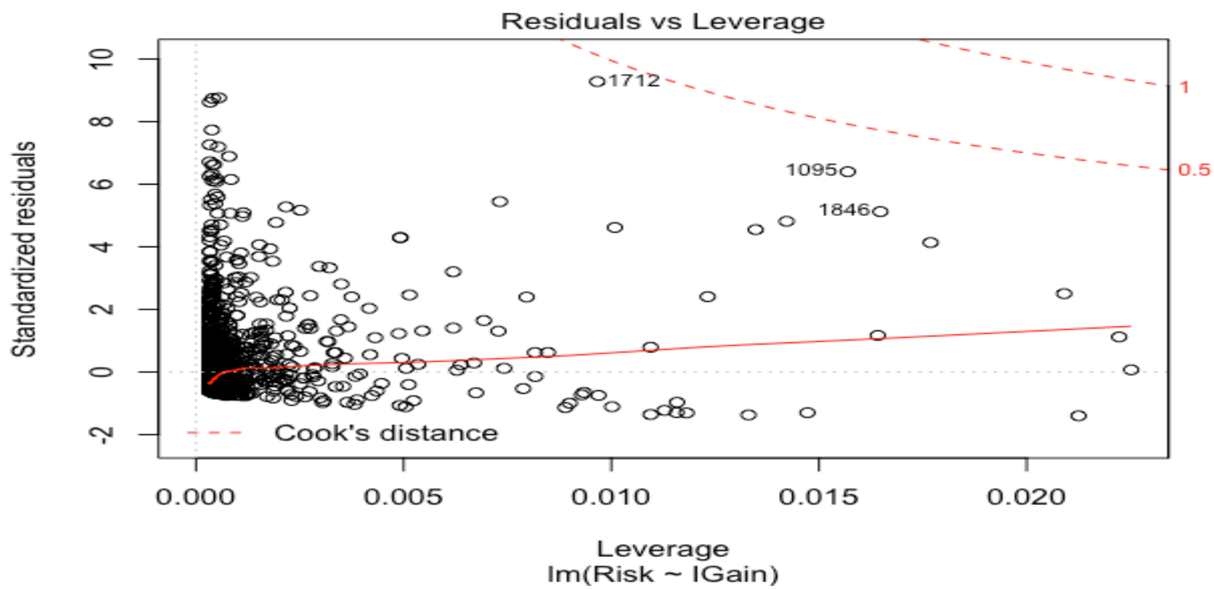

Figure A- 13: Filtered Sample's Residuals vs Leverage

Represents the filtered sample's outliers, high leverage points and the Cook's distance. The x-axis represents leverage points with their positions on the plane. The y-axis represents residuals with their standard deviations. Cook's distance is shown on the plane.