THE RELATIONSHIP BETWEEN ENTERPRISE RISK MANAGEMENT AND FIRM PERFORMANCE: EVIDENCE FROM PUBLIC LISTED COMPANIES IN BURSA MALAYSIA

CHEAH MAN HIN
LEONG ZHI QIN
LIM SI YU
PHANG XIAO HONG
YONG WEN YI

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

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CHEAH MAN HIN
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LIM SI YU
PHANG XIAO HONG
YONG WEN YI

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DEPARTMENT OF FINANCE

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DECLARATION

We hereby that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in the support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each member in completing the FYP.

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Name of Student:	Student ID:	Signature:
1. Cheah Man Hin	17ABB06616	*Cheah Man Hin*
2. Leong Zhi Qin	16ABB03398	*Leong Zhi Qin*
3. Lim Si Yu	17ABB06280	*Lim Si Yu*
4. Phang Xiao Hong	16ABB04481	*Phang Xiao Hong*
5. Yong Wen Yi	16ABB04511	*Yong Wen Yi*

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller Test
BPLM	Breusch-Pagan Lagrange Multiplier Test
COSO	Committee of Sponsoring Organization
ERM	Enterprise Risk Management
ERMI	Enterprise Risk Management Index
FEM	Fixed Effect Model
IoT	Internet of Things
LLC	Levin, Lin and Chu Test
LR	Likelihood Ratio Test
LVG	Leverage
POLS	Pooled Ordinary Least Square
R&D	Research& Development
REM	Random Effect Model
ROA	Return on Assets
ROAE	Return on Average Equity
ROE	Return on Equity
SIZE	Firm Size

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PREFACE

This research project was submitting to meet the requirements of the Bachelor of Finance (HONS) which having Dr. Au Yong Hui Nee (PhD) as supervisor. The topic of this research report was "The Relationship between Enterprise Risk Management and Firm Performance: Evidence from Public Listed Companies in Bursa Malaysia". The research project was written by the authors which include supporting case of research cited by other researchers.

The research topic was chosen as we found that there was not much research on Enterprise Risk Management (ERM), but the business grows and the world interconnects, risk management methods need to be developed. Companies with a deep understanding of risk management techniques and their implications for the enterprise as a whole can handle difficult times such as a recession. Therefore, this may lead to be more profitable and successful in the future. This research will help to know the influence of implementing ERM on Malaysia Public listed companies.

This research will be considered as successful as it can contribute to future research in ERM. Enterprise Risk Management Index (ERMI), Firm Size (SIZE), Return on Equity (ROE), Leverage (LVG) and Research and Development (R&D) were used in this research as a proxy for ERM. In this research, we need to test whether Enterprise Risk Management Index (ERMI), Firm Size (SIZE), Return on Equity (ROE), Leverage (LVG) and Research and Development (R&D) are significant or insignificant influenced firm performance. This research report will help future researchers to have a better understanding of ERM.

ABSTRACT

This research report was to study the effect of the selected independent variables on the firm performance of Malaysia Public Listed Companies from the period of 2009 to 2018. The selected independent variables are Enterprise Risk Management Index (ERMI), Firm Size (SIZE), Return on Equity (ROE), Leverage (LVG) and Research and Development (R&D). Breusch-Pagan Lagrange Multiplier (BPLM) Test, Unit Root Test, Pooled Ordinary Least Square (POLS) Regression, Fixed Effect Model (FEM) and Random Effect Model (REM) were comply to this research report to test the relationship between firm performance and the selected independent variables by using 141 public listed companies from Bursa Malaysia. From the empirical results, Enterprise Risk Management Index (ERMI), Return on Equity (ROE) and Research and Development (R&D) had showed there was a positive significant effect on firm performance. On the other hand, Firm Size (SIZE) and Leverage (LVG) had showed that there was a negative significant effect on firm performance.

CHAPTER 1 : RESEARCH OVERVIEW

1.0 Introduction

This study is to investigate the relationship among enterprise risk management (ERM) and firm performance which evidence from public listed company in Bursa Malaysia. Moreover, the general purpose of this study in chapter one is included background of research, problem statement, research objectives with general objective and specific objectives, research questions. In addition, it is included hypothesis and significance of the study and chapter layout in this chapter.

1.1 Research Background

1.1.1 Risk Management

Risk management emphasizes the pure risk which is hazard risk (Carroll, 2016).Risk management included four functional process such as planning, organizing, leading and controlling the organization activities that can minimize the unfavorable effect of incidental and business losses for organization at rational cost (Bessis, 2011).

The decision making of risk management can be composed by five steps process which are identifying and analyzing, examining, choosing, implementing technique and ensure results of selected technique risk management efficiency and effective (Simona, 2014). Based on Ogutu, Bennett and Olawoyin (2018), the study had showed that risk manager difficult to get the attention and approvement from administrator in the traditional risk area because the board may not aware about it or difficult to differentiate between traditional risk and other business risks.

Risk management approaches clearly showed that cannot adequate to identify, analysis and manage risk due to traditional approaches treated risks separate and differentiated. These risk managements mostly focus on uncertainty around physical and financial assets because mainly focus on loss prevention rather than appreciate value so risk management will not provide comprehensive framework that must be defined again the risk management value proposition by the organizations (Chakraborty, 2013).

1.1.2 Enterprise Risk Management Index (ERMI)

In 2004, Committee of Sponsoring Organization (COSO) introduced ERM as a risk management tool which provides understandable assurance about the accomplishment of entity purpose. Many researches in past shows that ERM can improve the organization performance specifically in profit. (Muslih, 2018). Adopting ERM strategy can increase risk awareness of board of director. Hence, they will enlarge

their knowledge in decision making to obtain better result that bring firm performance become more efficiency. Next, ERM is a systematically process that involved planning, organizing, leading and controlling the firm's operating activities to assist the firm to minimize risks exposure such as financial risk, strategic risk and operational risk. Furthermore, ERM is an integrated and dependable program, the firm can avoid major losses when the firm manages overall risks. Besides, the firm can improve integrating risk communication among departments through ERM (Damiati & Sriraam, 2017).

Adopting ERM can reduce volatility of risk over from dissimilar source and improved firm's risk profile information (Bertinetti, 2013). ERM empowers senior management can utilize top management technique to manage and quantify the risk-return trade-off of entire firm at the company-wide level to create firm value. In contrast, business-unit level will consider suggestions from business manager and senior management throughout the firm. Then, all material risks and returns throughout the firm bear by operating manager and employees (Nocco & Stulz, 2006).

ERM adoption is positive relative to high turnover and having chief risk officer especially Malaysian public companies that very rely on the existence of chief risk officer when adopting ERM. Companies those internationally diversified and big mostly with high leverage and ownership of 30 percent shares will not adopt ERM (Razali & Tahir, 2011). In contrast, companies which are small, high leverage and high dividend payment will implement ERM to solve problems (Lundqvist, 2015). According to Soltanizadeh (2014), found that only 17 percent of firms fully adopted ERM, 37 percent of companies

partially adopted ERM and 23 percent of companies just about to adopt ERM from 1431 risk manager of United State firms but it still had 20 percent of companies didn't plan to adopt ERM. The better ERM strategies implemented by company, the better converge risk with the company's strategic decision-making.

1.1.3 Firm Performance

Firm performance can be defined as outputs or results of business that obtained at a certain period (Gurel, 2017). Performance is qualitative or quantitative estimation of results for achievement of objectives (Akman & Yilmaz, 2008). Maximization on financial gain, capital of shareholder and return on assets (ROA) will affect the efficiency of firm performance (Tudose, 2012). Firm characteristic as firm size, age and sector also will affect firm performance (Tam & Tan, 2007).

If the firm operations completed efficiency, the firm performance will become more positive. Thus, operational efficiency strategy is the main fundamental to strengthen firm performance in order to solve agency problem, minimize production cost and enhance firm performance in future (Muharam, 2018). A successful firm performance represents an essential factor for the developing nations because economists consider firm performance is important to determine economic, social and political development. Hence, every firm should attain their performance in order to survive in a competitive business environment (Taouab & Issor, 2019).

Various kind of measurement available to measure firm performances such as earning per share, return on equity and Tobin's Q but most performance measurement techniques didn't suitable for decision making because they do not consider market volatility and time value of money in assessing investment return or performance (Vuong, Vu & Mitra, 2017). Tobin's Q widely used as proxy to evaluate firm performance if the firm implements ERM (Hoyt & Liebenberg, 2008). ERM adoption among the public listed companies can reduce firm's specific risks, convince debt market lower than cost debt which lead to reduction in risk premium and cut down cost of capital (Shad & Lai, 2015).

1.2 Problem Statement

The Bursa Malaysia Guidelines 2013 is developed to improve authority implementation and increase the transparency. The guidelines are provided supervision on main component that required to support risk management system and encourage the firms to reveal the ways that they managed the risks. Basically, the duties of administration to implement risk management and internal control is spontaneous (Togok and Zainuddin, 2016).

However, some researchers argued that implementation of ERM has no significant value on firm achievement. Besides, they also indicated that firm performance is depending on circumstantial factors (Alawattegama, 2018). For example, Malaysia economy in tourism sector, aviation sector and construction sector are affected the most

by Covid-19 pandemic. On the other hand, some of the firms in manufacturing sector may take advantage on this unexpected event such as medical related sector as their products and services are high demand in market (Sean, 2020). Likewise, the share price of rubber manufacturer, Hartalega Holdings Bhd and Top Glove Corporation Bhd has increased 1.21% and 1.06% respectively because of high demand for their products such as gloves (Chong, 2020).

The Covid-19 pandemic is occurred around the world since the first quarter of 2020, most of the sectors and companies are affected. The Covid-19 pandemic is speeding up digital transformation for company operations to adapt new behavior of consumer in order to sustain their business. For example, food& beverages companies provided online ordering and contactless delivery to maintain their operations. The companies invested in new technology for their business operations before Covid-19 pandemic might have more advantage compared to those companies do not invested in new technology because they able to response instantly to the changes of market and meet the market demand. For example, some manufacturing companies have invested in new technology for manufacturing operation are able to increase their production and introduce new products to meet the market demand. However, some manufacturing companies still struggle with uncertainties and slowdown their production.

Besides, there are many studies used ERM implementation as dummy variable to study the relationship among ERM practice and firm performance. The studies like Ping and Muthuveloo (2015), Anton (2018) and Abdullah, Janor, Hamid and Yatim (2017). These results are not consistent because some study indicated that ERM is positive and insignificant relationship while other indicated that ERM have a decisive and important contact with the firm performance.

Nevertheless, there are many criticisms on measurement of ERM in dummy variable because the model is too simple that cannot capture actual ERM implementation in real practice. Hence, this study will adopt ERM index (ERMI) as the proxy and modify ERMI formula from Gordon, Loeb& Tseng (2009) to measure ERM implementation among companies.

By reviewing articles and journals, ERM index (ERMI) is the common variable, research and development (R&D) is the gap variable because a few journals to support this variable. The intention of this study is to straighten out the major investigation of how ERMI have positive impact towards firm performance. This analysis is intended to find out the relationship among ERMI and non-financial firms' performance especially manufacturing companies which is industrial products and services sector. It is because majority of prior research mainly targeted on insurance or banking sector (Abdullah, Janor, Hamid and Yatim, 2017).

Furthermore, this study will further study on whether ERM implementation has any relationship between public listed companies' performance in Bursa Malaysia. The variables involved ERM index (ERMI), leverage (LVG), return on equity (ROE) firm size (SIZE), research and development (R&D). The expected signs for ERMI, ROE and R&D are positive and significant while LVG and SIZE are negative and significant towards firm performance. This research is designed to check out whether manufacturing firms are efficient in creating value when ERM practice is implemented.

1.3 Research Question

1.3.1 General Questions

A study that conducted to investigate the relationship among ERMI and firm performance that evidence from public listed companies in Bursa Malaysia.

1.3.2 Specific Questions

Headers of this analysis are to response the following research questions.

1. What is the relationship among ERMI and firm performance of public listed companies in Bursa Malaysia?
2. What is the significant relationship among SIZE and firm performance of public listed companies in Bursa Malaysia?
3. Is there any relationship among ROE and firm performance of public listed companies in Bursa Malaysia?
4. What is the relationship among LVG and firm performance of public listed companies in Bursa Malaysia?
5. How does R&D influences by firm performance of public listed companies in Bursa Malaysia?

1.4 Research Objectives

1.4.1 General Objectives

This study intends to identify independent variables which include ERMI, SIZE, ROE, LVG, and R&D that influence firm performance of public listed companies in Bursa Malaysia.

1.4.2 Specific Objectives

Thus, there are five variables that affect firm performance of public listed companies in Bursa Malaysia:

1. To investigate the relationship among ERMI and firm performance.
2. To identify the relationship among SIZE and firm performance.
3. To examine the relationship among ROE and firm performance.
4. To investigate the relationship among LVG and firm performance.
5. To examine the relationship among R&D and firm performance.

1.5 Significance of study

Firstly, this study focuses on non-financial sector which is the companies from industrial products and services sector that listed in Bursa Malaysia since there were many past studies focus on financial sector.

The findings of this study will lead to factors that affecting firm performance of public listed companies in Bursa Malaysia. This research has selected ERMI, SIZE, ROE, LVG, and R&D as determinants in this research. This research would like to analyze the relationship among these variables and firm performance.

Furthermore, as this research need to identify many companies and minimum 10 years data, so this research will use panel data analysis. Panel data analysis is a time series analysis combine with cross-sectional data to identify the data in large number of companies and years in this research. Moving on to the goals, one of the key goals of this study is to help readers to have a better comprehension on firm performance issue whether it could be a leading problem in some countries. After that, it might be used as a guidance to define different directions for economists to impact firm performance.

Besides, this research will examine in detail on factors that affecting firm performance with explanation on five variables that affecting firm performance which are ERMI, SIZE, ROE, LVG, and R&D. In addition, as there is lack of literature review on research and development, hence, this research would help readers to obtain a better grasp on the reasons why research and development is considered as one of the determinants for firm performance. By providing public with appropriate data and up-

to-date information, it can also improve their comprehension of the variables and they might lead to a deeper interpretation and therefore draw a far clearer inference.

In general, this research is significant because it can be a source for companies to fulfill their requirement such as increase their company's profit. Moreover, this research also can help government to improve their decision making in insurance and financial industries. It also can be a reference for future researcher when they are doing same topic or using same variables with this research. Since there are not many researches in Malaysia doing title of the relationship among ERMI and firm performance, so this research is useful for those Malaysia researches who are doing research for this topic. Furthermore, it also can help other researches that doing this topic to have a greater grasp on the relationship among independent variables which include ERMI, SIZE, ROE, LVG, R&D and dependent variable which is firm performance.

1.6 Chapter Layout

In general, there are five chapter in this research. Chapter one is a guide on describing research background and presenting reasonable choice of research field with research objectives, research questions, problem statement and significance of study. The second chapter is studying literature review that which included analysis of model and framework that has been discussed in the research area previously. Chapter three reflects on methodology, discusses research process, studies design and implements data collection methods. This chapter also discusses on additional information like sampling aspects of research and discussion of ethical considerations. Chapter four studies on research goals and accomplishment of results since it is the key discussion and analysis. The results of literature review are contrasted with data results for the

main components in this chapter. In fact, an in-depth review has been undertaken on each particular purpose. In chapter five, the study summarizes the research goals and the level of achievement of the goals.

1.7 Conclusion

To conclude, this research is going to analyze the relationship among the independent variables which include ERMI, SIZE, ROE, LVG, and R&D and dependent variable which is the firm performance.

CHAPTER 2 : LITERATURE REVIEW

2.0 Introduction

This chapter introduces a literature review, a review of relevant theoretical models, a theoretical perspective and a proposed theoretical framework. Various previous studies have been used to introduce literature reviews of the dependent and independent variables. The dependent variable is firm performance and its independent variables are ERMI, SIZE, ROE, LVG, and R&D. The summaries of journals, previous studies provide information and description of the relationship among the dependent variable and its determinants. Therefore, it can help outsiders to learn more about this research.

2.1 Theoretical Perspective

2.1.1 Agency theory

There are some researchers elaborate and develop the agency theory (Alchian & Demsetz, 1972; Jensen & Meckling, 1976). The company reduce to two mangers & shareholders is one of the factors that can affect the agency theory. Moreover, the other factor is recommended the workers or mangers become selfish (Daily, Dalton & Canella, 2003). The agency theory talks about the decision making in the interest need to be done by the agents that order by shareholders. Instead, the best interest cannot decide obligatory byagents (Padilla, 2000). Although the

understanding of risk affects its method, agents may succumb to their own interests, speculation, and fail to agree between the wishes of principal and the persuing of the agents (Bhimani, 2008).

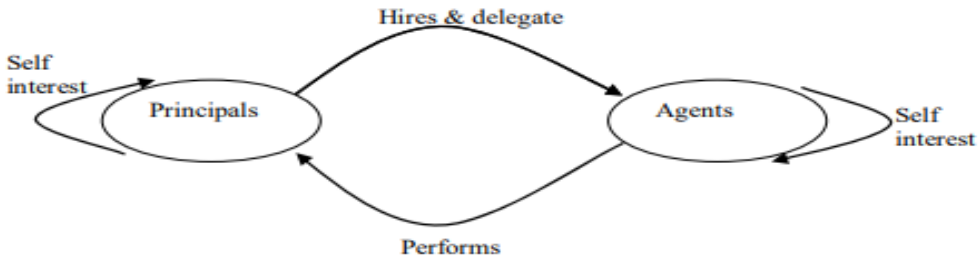

Figure 2.1 Agency theory model

Sources: Fundamental and Ethics Theories of Corporate Governance (Abdullah & Valentine, 2009)

2.1.2 Tobin's Q

Tobin's Q is common measurement instrument. James Tobin, founder of this theory in 1969 (Miller, 2000). Worth of firm's market shows by this ratio for example asset spend replacing the assets of the firm. According to Lovero (2000), "Q" is different explanation for companies to measure performance as includes compose of market information and accounting. Major fact is that it is not managed by management (Hoyt, 2006). Tobin's Q was familiarized by researcher such as Lang (1989), Chung (1994) and Lindenberg (1981) which known as the L-R approach. Lindenberg (1981) was first use the complex measurement and it change

to the simplest technique by Chung (1994), and each shows important results in determining value.

Furthermore, those researchers use Tobin's Q as a standard proxy for measuring values(Hoyt, 2008; Abdelgalil, 2004). This mathematical model has been used to determine certain economic finding for example cross-sectional research on the differences among diversification and investment; the link among firm performance and manager equity and; Relationship between tender offer revenue and operating results; Relationship between offer response and investment opportunity, dividend, financing and problems in policies of compensations (Chung, 1994).

According to this theory, a firm is increase value if the profit on investment is larger than expense of investment. Thus, the limit of "Q" exceeds one. However, if the firm cannot achieve its goal of maximizing value, the margin "Q" must be less than one. According to Miller (2000) and Sang (1998), normally the margin "Q" will always equal to one at equilibrium.

2.2 Review of the Literature

2.2.1 Firm Performance

Firm performance is an economic indicator that reflects a company's market value. In today's complex business environment, a company's primary goal is to increase its value in order to attract more investors

and maximize shareholder wealth. However, investors and shareholders often make negative decisions about low-value companies. This can affect a company's performance and future growth. Different researchers may use different tools to measure the firm performance (Marsha, 2017).

According to Asiri (2014), firm performance was measure by using market to price-earnings ratio and book ratio. A firm with a high price to earnings ratio will lead the shareholders to have a greater confidence to the future of the firm while the market to book ratio will indicate how investors value the firm. The researchers said that the higher the price to earnings ratio and higher market to book ratio, the higher the value of the firm. Moreover, Dimisyqiyani (2017) had used ROE as a measurement tool to calculate the firm performance. ROE is a measure of a firm's ability to profit from shareholder investments in the firm. As maximizing shareholder's return is the primary target of all firm, ROE will be the true last line for measuring firm performance from an accounting perspective.

Besides that, Tobin's Q use as measurement instrument to calculate the firm performance (Sucuahi, 2016). As Wernerfelt (1988) said, Tobin Q is suitable for measuring firm performance. When there is an empirical research, Tobin's Q will usually been use by the researcher. According to Bhagat (2002), a high Tobin's Q indicates that the firm manager has generated a greater market value from the assets.

In addition, many researchers are studying the relationship between ERM and the firm performance as calculated by using Tobin's Q.

Hoyt (2011) found that there was a positive effect of the ERM on Tobin's Q. Those researchers found that there was a negative effect of ERM on Tobin's Q (Abdullah, 2017; Lin, 2012). In addition, Tahir (2011) found that the ERM has proved positive but is insignificant to the firm performance. Therefore, this research examines the relationship among the ERM and the firm performance by using Tobin's Q as a proxy of the dependent variable which was the firm performance.

2.2.2 Enterprise Risk Management Index (ERMI)

ERMI developed to manage firm objectives relative to operations, strategy, compliance and reporting (Gordon, Loeb & Tseng, 2009). Strategy effectiveness can be calculated by the standard deviation of firm sales divided by the standard deviation of industry sales. Second method for strategy can be referred to the ability of firm to lower its undiversifiable risk. This is because in the ERM practice, the strategy to manage the undiversifiable risk is very important. Next, operations can be calculated by the input and output ratios within the firm operation process which is sales divided by the number of employees. Second method for operations is calculated by the turnover of assets. Moreover, reporting can be calculated by the proportion of auditor's fees to total assets. The key finding of the study showed that ERM is positive and significant towards firm performance. Besides, Panicker (2016) also indicated that ERMI has a positive and significant impact on firm performance.

However, researchers use ERMI as a proxy for the analysis (Ramlee & Normah, 2015). The study suggested that there is insignificant relationship among ERM practice among non-financial firms in Malaysia with firm performance.The regression results for the main firms show a positive insignificant result between ERM practice and firm performance while for the control firms, there are insignificant reverse impact on ERM implementation and firm performance. There is insignificant relationship among ERM implementation and firm productivity supported by other researches (Tahir & Razali, 2011; Quon, Zeghal & Maingot, 2012; Ballantyne, 2013).

Soliman and Mukhtar (2017) used ERMI and additional five manipulate variables include log total assets, leverage, beta change in revenue and log institutional effect to calculate the firm performance by using Ordinary Least Square (OLS) method. In fact, ERMI has a positive relationship but insignificant to the firm performance. The researcher argued that the unpredictable practice of total asset in their data set is subjected to expend impact on firm performance. Consequently, ERMI is insignificant to the firm performance. While other performance calculates like return on average equity (ROAE) and return of share price from the identical data set but have a significant relationship with ERMI.

2.2.3 Firm Size

As a reasonable argument, the threat of size, style and measure of the events will be different when there is an enhance in the firm size. Based on same finding, larger firm size of firm is able to use more resources for performing ERM and the smaller firm size of an organization is less likely to implement comprehensive risk management concepts than larger size of firm (Golshan & Rasid, 2012). Based on the research that had found, most of the research show that there are most of the relationship among firm size and firm performance are significant. Besides, effect of firm size on firm performance is positively significant with the result B-value equal to 0.713 and P-value smaller than 0.01 (Ping & Muthuveloo, 2015). Relationship between ERM and firm performance based on multiple factors when analyzing the relationship among ERM, firm performance and size of firm is one of the considerations (Gordon, 2009). By study the relationship between ERM and firm performance, this research found that there is a positive relationship among size of firm and firm performance (E.Hoyt & P.Liebenberg, 2011). In enterprise risk management, large number of firm sizes will get benefit from better resources and economies of scale (Brustbauer, 2014).

According to Tahir and Razali (2011), there is a reverse significant relationship among size of firm and firm performance. There are two possible reasons to support this result, which are the larger firm size of firm have no appreciation effect when adding the asset and the smaller firm size of firm will attract the investment of stakeholders because it

generates more profit and creating more value. Based on Abdullah, Janor, Hamid and Yatim (2017), there are three variables have shown significant relationship among firm performance, one of the variables is firm size. Due to this it shows size of firm has a very strong impact on the firm performance. Negative sign of firm size coefficient indicates that size of the firm is expand in year before, value of the company decreases in the next few years. There is a significant relationship among size and firm performance (Bertinetti, Cavezzali & Gardenal, 2013). Furthermore, the firm size also has a negative impact on firm performance because the larger size of firm will get the higher risk of the company.

2.2.4 Return on Equity (ROE)

ROE, indicator of business performance that evaluate return available for shareholders of companies on capital invested (Lin, 2011). High ROE will attract investors increase the capital invested. ROE was very important for investors because capacity of company to provide remuneration or rewards to shareholders and finance business growth can determined through ROE. Tobin's Q required market value so only available used by publicly traded firm. According to Wu, Marshall, Chipulu, Li and Ojiako (2014), a direct relationship among firm performance and ROE under linear homogeneity assumptions.

A significant, positive effect on Tobin's Q when company's financial performance used ROE to measure (Bidhari, Salim, Aisjah & Java,

2013). The higher the ROE, the higher the returns that received by investors. Investors can easier and better assess company that will enhance the shareholder value. It means higher ROE will affect higher on company performance. The evidence showed stock price and number of shares outstanding sustained greatest effect of ROE (Catapan et al., 2012). In addition, there also had evidence show that, ROE had a mediating significant positive affect to firm's performance (Mai, 2017).

2.2.5 Leverage

Leverage refer to total debt divided by total assets (Anton, 2016). Firm will bankruptcy if had higher leverage. Larger financial leverage represented that firm is relying more liabilities to payouts financial obligation (Golshan & Rasid, 2012). It leads the companies unable or difficulties to find the lender in the future. (Liargovas & Skandalis, 2010).

According to Anton (2018) and Clark and Mefteh (2010), found that higher leverage will lead default risk became greater and cost of financial distress will be higher. In contrast, a lower-level leverage can enhance firm performance when the manager invested sub-optimal projects by self-interested or reduces the free cash flow. Leverage had negatively significant effects the firm performances because of the risk arising from the borrowing (Senol & Karaca, 2017). Normally, there is not expectation sign for leverage because leverage can be positive or negative due to the risks not only has threats it also has opportunities.

Leverage and firm performance had significant positive relationship because high leverage will increase firm performance (Tahir & Razali, 2011). Based on Raza (2013), agency costs of equity can reduce high leverage thence force manager boosts up firm performance that act behalf the interest of shareholders. Different measures of leverage will get different result such as use taxes and firm age to command tax effects and the existence of firms (Ibhagui & Olokoyo, 2018). On the empirical evidences, some authors showed significant reverse linkage impact on leverage and Tobin's Q (Mukras, 2015; Abdullah et al., 2017; McShane, Nair & Rustambekov, 2011). Therefore, ERM implementation encourage to adopt among the firm to reduce the risk of debt-payout defaults especially for those firm had higher amount of leverage (Golshan & Rasid, 2012).

2.2.6 Research and Development (R&D)

According to the Xu, Sim and Jin (2016), this research shows that there is a significant positive relationship between the coefficient of R&D and firm performance, and the positive relationship shows between the R&D and firm performance means that give for effort on R&D can increase the firm performance. Besides, due to the same journal, research and development is affecting the firm performance of China's energy conservation and environmental protection sector. Furthermore, the 1%-point change in the R&D brings 4.38%-point increase in firm performance, so there is a positive relationship influence of R&D on firm performance (Gupta, Banerjee & Onur, 2017). Based on the Ayaydin and Karaaslan (2014), there is a significant positively effect of

R&D on firm performance, the positive relationship between R&D and financial performance is further corroborated by equilibrium framework whereby R&D is considered as a vital aspect of a company's competitive advantage especially internationally. In theory, R&D could and should improve product's innovation and also pave the way for new and better products in terms of technology and even cost saving or at the very least maintain a certain degree of minimal product enhancement with that improvement in the end products, it would spur the company's financial growth in an upward trajectory.

Chen, Guo, Chen and Wei (2019) identify that there is a negatively relationship between R&D and recently firm performance of 96 quasi-conductor Taiwan's companies between year 2005 and 2006, this result can cause a lower operating performance while the research and development expenses which also known as operating expenses rising in the year given.

In this finding, there is a positive insignificant relationship between R&D and firm performance (Xu & Jin, 2016). According to the same journal, in the China's internet of thing sector, without the effective trade barriers, there is an intense increasing of competition which has led to a decrease of company's profit.

2.3 Proposed theoretical framework

2.3.1 Conceptual Framework

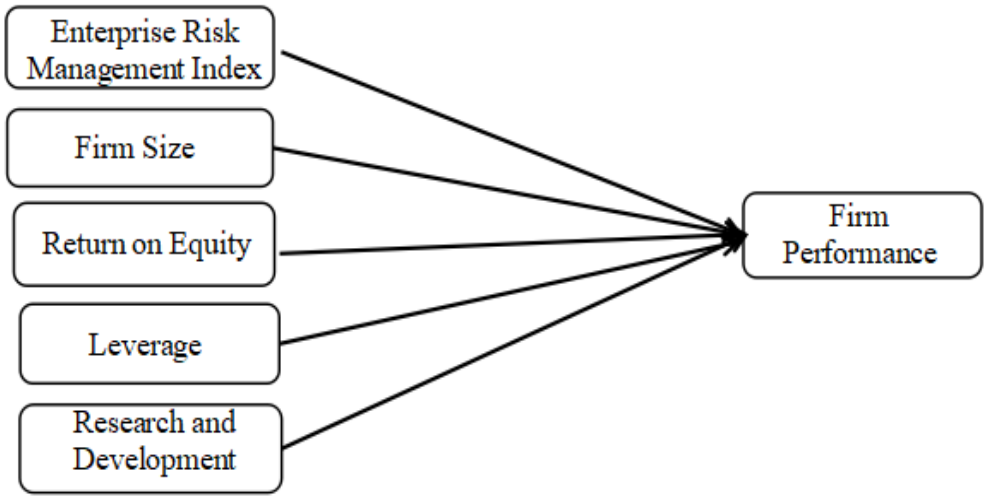

Figure 2.3.1 Conceptual Framework

Figure 2.3.1 above show that five independent variables will be examine in this research which are enterprise risk management index, firm size, return on equity, leverage and research and development. Furthermore, the dependent variable that will be test in this research is firm performance.

2.4 Hypothesis of study

This study is intended to examine the relationship among independent variables which include ERMI, SIZE, ROE, LVG and R&D and dependent variable, firm performance of public listed companies in Bursa Malaysia. Hence, there are some assumption about this framework.

2.4.1 Enterprise risk management index (ERMI)

H_{01}: There is no positive relationship among ERMI and firm performance.

H_{a1}: There is positive relationship among ERMI and firm performance.

2.4.2 Firm Size

H_{02}: There is no negative relationship among SIZE and firm performance.

H_{a2}: There is negative relationship among SIZE and firm performance.

2.4.3 Return on equity (ROE)

H_{03}: There is no positive relationship among ROE and firm performance.

H_{a3}: There is positive relationship among ROE and firm performance.

2.4.4 Leverage

H_{05}: There is no negative relationship among LVG and firm performance.

H_{a5}: There is negative relationship among LVG and firm performance.

2.4.5 Research and development (R&D)

H_{07}: There is no positive relationship among R&D and firm performance.

H_{a7}: There is positive relationship among R&D and firm performance.

2.5 Summary Table

Table 2.5:

Summary table for literature review

Variables	Author & year	Result	Sign
ERM index (ERMI)	(Gordon, Loeb& Tseng, 2009)	significant	+
	(Panicker, S, 2016)	significant	+
	(Ramlee& Normah, 2015)	insignificant	+
	(Soliman& Mukhtar, 2017)	insignificant	+
Firm size	(Ping & Muthuveloo, 2015)	significant	+
	(Hoyt & Liebenberg, 2011）	significant	+
	(Tahir & Razali, 2011)	significant	-
	(Abdullah, Janor, Hamid & Yatim, 2017)	significant	-
	(Bertinetti, Cavezzali & Gardenal, 2013)	significant	-
Return on equity (ROE)	(Wu, Marshall, Chipulu, Li & Ojiako, 2014)	significant	+
	(Bidhari, Salim, Aisjah & Java, 2013)	significant	+
	(Mai, 2017)	significant	+

Leverage	(Senol & Karaca, 2017)	significant	-
	(Tahir & Razali, 2011)	significant	+
	(Mukras, 2015)	significant	-
	(Abdullah et al., 2017)	significant	-
	(McShane, Nair & Rustambekov, 2011)	significant	-
Research and Development (R&D)	(Xu, Sim & Jin, 2016)	significant	+
	(Gupta, Banerjee & Onur, 2017)	significant	+
	(Ayaydin & Karaaslan, 2014)	significant	+
	(Chen, Guo, Chen & Wei, 2019)	significant	-
	(Xu & Jin, 2016)	insignificant	+

Table 2.5 is the table that shows the author and year, result and sign of the relationship between the five independent variable includes ERMI, SIZE, ROE, LVG and R&D and the dependent variable firm performance.

2.6 Conclusion

This research has used five independent variables to determine the firm performance. As the refer to previous research, researches define the variables above as important factors to determining firm performance. So, researches will collect database for research methodology to get the correct analysis to prove that their research is no mistake and reliable.

CHAPTER 3 : METHODOLOGY

3.0 Introduction

The chapter predicts data collection methods, study designs, study frameworks, model specifications, and the types of diagnostic tests used. Therefore, we will describe and explain how to apply this technique in this empirical study, including econometric methods and diagnostic tests that are suitable for use.

3.1 Research design

Purpose of this research paper is to investigate the relationship of firm performance and its determinants such as ERMI, LVG, ROE, SIZE and R&D. The scope of this study is focus on the non-financial sector which is the companies from industrial products and services sector that listed in Bursa Malaysia.

In this research, panel data was used. There were 141 public listed companies from sector of industrial products and services had been used in this project. Moreover, we had also used the data of 10 years of each listed company which is from the year 2009 to the year 2018 for this research.

3.2 Data Collection Method

The data sources used as secondary sources for conducting research. Typically, secondary data is usually data obtained from publicly which retrieved from researchers. This study uses secondary data to study Tobin's Q value and assess value of companies in manufacturing sector. Determinants for the firms are ERMI, LVG, ROE, SIZE and R&D. Data sources can be retrieved from annual reports and data available in Bursa Malaysia and Bloomberg Data Base.

3.3 Sampling Design

The study starts with choosing the companies which are adopting with Enterprise Risk Management. Firstly, a total of 141 public listed company from Bursa Malaysia which was listed in sector of industrial products and services are selected. Next, the elimination process selected companies for 10 years, which is from the year 2009 to the year 2018, using keywords like "risk management", "enterprise risk management" and "internal control".

3.4 Variable Specification

3.4.1 Model Specification

$$Y_{it} = \beta_0 + \beta_1 ERMI_{it} - \beta_2 SIZE_{it} + \beta_3 ROE_{it} - \beta_4 LVG_{it} + \beta_5 R\&D_{it} + \mu_{it}$$

Where Y=*f* (ERMI, SIZE, ROE, LVG, R&D)

Where:

$\boldsymbol{Y_t}$= Firm performance (Tobin's Q)

$\boldsymbol{ERMI_{it}}$= ERM Index

$\boldsymbol{SIZE_{it}}$= Firm Size

$\boldsymbol{ROE_{it}}$= Return on Equity

$\boldsymbol{LVG_{it}}$ = Leverage

$\boldsymbol{R\&D_{it}}$ = Research and Development

$\boldsymbol{\mu_{it}}$= Error term

3.4.2 Dependent Variable

In one research, dependent variable will be influenced by independent variables. Firm performance was set to be the dependent variable in this research.

3.4.2.1 Tobin's Q

In this research, firm performance will be dependent variable which Tobin's Q will be proxy. Tobin's Q is used to determine the overall market valuation of the company's total assets. Tobin's Q is the combination of market value of the firms on the stock market. Calculation is total market value of firm divided by the total asset value.

Calculation formula:

$$\text{Firm Performance} = \frac{Total\ Market\ Value\ of\ Firm}{Total\ Asset\ Value}$$

3.4.3 Independent Variable

In one research, independent variable is variable that will influence the dependent variable. In this research, seven independent variables had been applied which are ERMI, SIZE, ROE, LVG and R&D.

3.4.3.1 ERM Index (ERMI)

The data was analyzed using the COSO framework. In developing the ERM Index, we used COSO's four objectives of ERM. In other words, we developed a measure of a company's ERM effectiveness based on an organization's ability to relate with strategy, operations, reporting, and compliance. The basic goal of ERM Index is to combine the realization of the above four goals into one metric. Next, to construct an ERM Index by aggregating all eight indicators from the above four objectives,

Calculation formula:

$$\text{ERM Index} = \sum Strategies + \sum Operation + \sum Compliance$$

3.4.3.2 Firm Size

According to Tongli (2005), scale is related to performance. As large companies grow value instantly based on foretime performance, which is relevant to value of the company. For instance, a firm can increase

value by 1.5 million, which means that the company is performing well. Simultaneously, 1.5 million value had been created for its shareholders. From a shareholder's point of view, this is a good outcome and will be reflected in dividend payments as more dividends will allow more investment.

Calculation formula:

Total Asset is used to determine the firm size.

3.4.3.3 Return on equity (ROE)

ROE is a measure of financial performance by dividing net income by equity (Hargrav, 2019). ROE is expressed as a percentage and any company can calculate ROE if both net profit and owner's capital are positive.

Calculation formula:

$$Return\ on\ Equity\ (ROE)\ = \frac{Net\ income}{Average\ shareholder\ equity}$$

3.4.3.4 Leverage (LVG)

In fact, most companies use debt to finance their business. Financial business sources generated through futures, options, or other financial products. Firm increased leverage by borrowing. Firm has chance to invest in business operations without increasing capital. If companies can generate profits, they will have the opportunity to create value for stakeholders. In addition, companies can deduct interest expense from

corporate income tax, so increasing leverage can actually save tax. As postulated by Aggarwal (2008), firm value will increase by leverage as debt requires the manager to pay the money that would have been available for the negative net present value project. This allows firms to reduce overall capital costs and increase firm performance.

Calculation formula:

$$Leverage = \frac{Total\ debt}{Total\ assets}$$

3.4.3.5 Research and Development (R&D)

R&D are the process by which companies seek new knowledge that can be used to generate new technologies, goods and services, or systems that are used or sold. The most common goal is to increase the profits of the company. Many hear the word "R&D" and link to pharmaceutical and technology companies, but other companies, including manufacture consumer products that invest in R&D. It happens in businesses of all sizes. Companies that create and sell products or services, whether software or spark plugs, require a certain level of R&D investment.

Calculation formula:

$$Research\ and\ Development = \frac{Research\ and\ Development\ Expense}{Total\ Assets}$$

3.5 Data Processing

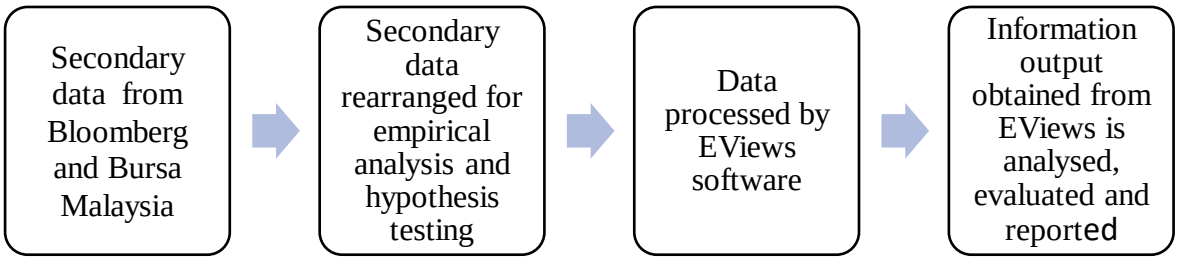

Figure 3.5 The flows of data processing

Figure 3.5 shows the flows of data processing. Firstly, get the secondary data from Bloomberg and Bursa Malaysia. Second, the secondary data is rearranged for empirical analysis and hypothesis testing. After rearranging the secondary data, the data is processed by E-Views software. Finally, the information output obtained from E-Views is analyzed, evaluated and reported.

3.6 Data Analysis

This research discusses the detail of data by using data analysis. These data that which collect from Bloomberg software will be investigated by different types of tests whether the independent variables will significantly affect dependent or not and test the relationship between independent variables. The research's data will have conducted by using E-Views software and interpreting the data. Pooled Ordinary Least Square (POLS) was the test applied in the research.

3.6.1 Breusch-Pagan Lagrange Multiplier (BPLM) Test

BPLM test was established by Trevor Breusch and Adrian Pagan in the year 1979. It is used to test autocorrelation of a linear model (Breusch & Pagan, 1979). It also tests the random effects of linear models that are based on pooled OLS residuals. For an alternative model, it derives least squares to estimate whether it is depending on the maximum likelihood or two step procedure (Breusch & Pagan, 1980). Usually, it uses maximum likelihood based on compute LM statistics to use the result of a restricted model is easier compare to unrestricted model.

3.6.2 Unit Root Test

Unit root test was known as stationary test whereby it is to determine whether the variables has unit root or not. Null hypothesis represents no stationary and alternative hypothesis represent stationary. Unit root test is using in this research because of the large number period of time relevant to the cross-sectional. Main differences of panel unit root test and series unit root test is asymptotic behavior of the cross-sectional dimension and time series dimension. Levin, Lin and Chu test and Augmented Dickey-Fuller test are applied in this research.

3.6.2.1 Levin, Lin and Chu Test

Levin, Lin and Chu (2002) had establish a test whereby the H_1 that the p_i is same and negative. Because of p_i is in fixed across i. So, they face the most complicated problem in the test, because the data was gathering

from different individuals and the data need to combine into one regression. Therefore, to insulate the p_i problem, change of y_{it} and $y_{i,t-1}$ form all the nuisance variables are gain using individual through individual regressions

3.6.2.2 Augmented Dickey-Fuller (ADF) Test

This test was establishing by Dickey and Fuller (1979). It is a process of testing whether a unit root exists in the variable or equivalently, the variables display a random walk. According to Dickey and Fuller (1981), they had launch Augmented Dickey-Fuller test whereby it almost closes to the first Dickey Fuller test. The different between the test is that if the interference occurs, the serial correlation in the disturbance term can be settle out by include m lags dependent variables, so the expenditure can be expanded.

3.6.3 Pooled Ordinary Least Square (POLS) Regression

A pooled model is model that have different individual data pooled together without any provision for individual differences that will cause the different coefficient (Hill, Griffiths and Lim,2011). In Pooled OLS model, the intercepts and slopes are assuming constant in the observation for all time period to avoid heterogeneity occur. It also assumes that did not occurs time effect problem and it is homogeneity. It is important to apply ordinary least square model to estimate pooled data. This is because in OLS assumption, it assumes the model is not

heteroscedasticity and no correlation between individual effects over all period of time.

3.6.4 Fixed Effect Model (FEM)

Fixed effect is the variable which is consistent across the individual. For example, ethnicity, age and sex cannot be modify in the constant rate over the period of time (Stephanie, n.d).

According to Nwakuya and Ijomah (2017), one of the concerns for fixed effect random is it ignore many degrees of freedom. Therefore, it leads to unstable estimates. In addition, the side effect of this model features is the time invariance caused by the dependent variable of the model cannot be studied. One of the important assumptions for fixed effect is those time invariant features different with other individual. Every entity is unique, so the entity's constant and error term might uncorrelated with each other. Otherwise, the fixed effect cannot be recognized.

3.6.4.1 Likelihood Ratio (LR) Test

Table 3.6.4.1:

Summary of diverse poolability hypothesis

Effects	Coefficients, β		
	Name	β	β_i
α	OLS	NT-K-1	N(T-K)-1

α_i	One-way	N(T-1)-K	N(T-K-1)
α_{it}	Two-way	N(T-1)-T+1-K	N(T-K-1)-T+1

From this table, it is a summary for diverse poolability hypothesis. When β_{it} exhausts the current degrees of freedom, it become abnormal. Main interest of this test is examining POLS model contrast with one way and two-way model and examine one-way model against two way model. The test with alternative in β_i tries the wrong specification, not the tool for canonical search. We also examine did the components β are constant or not, while others could base on *i*.

3.6.5 Random Effect Model (REM)

In REM assumption, it assumes all the individual difference is captured based on intercept parameter. However, all individuals in the sample are selected randomly. Therefore, the individual differences are known as random effect. Random individual differences are including in the model by specify the intercept parameters β_{1i} to consist a fixed part that express the mean of population, β_1. u_i represent the random individual differences from the average of population. In the equation below

$$B_{1i} = \beta_1 + \beta_1 \qquad (1.1)$$

u_i represent the differences of random individual, whereby it known as random effects, which is similar with the random error terms. The assumption for the them are zero mean, no correlation with other individuals and the variance is constant σ^2_u,

$$E(u_i)=0, \quad cov(u_i,u_j)=0 \quad i\neq j, \quad var(u_i)= \sigma^2_u \qquad (1.2)$$

Substitute (1.1) into (1.2) and obtain the equation below:

$$y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it} \qquad (1.3)$$
$$= (\beta_{1} + u_i) + \beta_2 X_{2it} + \beta_3 X_{3it} + e_{it}$$

Fixed population parameter, β_1 and random effect, μ_i. Rearrange equation (1.3) to let it resemble the familiar regression equation.

$$y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + (e_{it} + u_i) \qquad (1.4)$$
$$= \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + v_{it}$$

β_1 represent the intercept of parameter and v_{it} represent the error term whereby it is constituting by u_i which is the random individual effect. For e_{it} represent the usual regression random error. The combined error equation is below

$$v_{it} = (e_{it} + u_i) \qquad (1.5)$$

Due to the random effects regression error in equation 1.5 has two components, one is for the regression and another one is for the individuals. Error components model also known as another term for REM (Hill, Griffiths & Lim, 2011).

3.6.5.1 Hausman Test

This test is used to disclose endogenous regressors in the model. The values of endogenous variables are decided by other determinants. When endogenous regression occurs, it will lead to the failure of the ordinary least square estimators. This s because one of the assumptions for ordinary least square is the relationship between error term and the

predictor variables is no correlation. Therefore, instrumental variables estimator is use as an alternative. Therefore, this test is used to investigate the problem of FEM against REM (Stephanie,2017).

3.7 Conclusion

This chapter introduces several research methods to determine the relationship among firm performance and its independent variables ERMI, SIZE, ROE, LVG, and R&D. This chapter described how to apply hypothesis testing and in the next chapter all the hypothesis testing will be perform. These hypothesis tests follow the method described in Chapter 3, and all results of the tests are shown and described in Chapter 4.

CHAPTER 4 : DATA ANALYSIS

4.0 Introduction

An illustration on result will be done from the data that been collected. EViews 11 will be a tool that use in this research to analyze the data. The data are collected in annual basis from year 2009 to year 2018 for 141 companies from industrial products and services sector and in total 1410 observations. Unit root test, Fixed Effect Model (FEM), Random Effect Model (REM), Redundant Fixed Effects Test (Likelihood Ratio), Breusch-Pagan Lagrange Multiplier Test and Hausman Test will be used to test pooled ordinary least square (POLS) regression model for this research.

Table 4.0:

The total number of companies from industrial products and services sector.

Industrial Products and Services Sector		
	Sub Sector	**No of Companies**
1.	Auto Parts	4
2.	Building Materials	18
3.	Chemicals	8
4.	Diversified Industrials	5
5.	Industrial Engineering	6

6.	Industrial Materials, Components& Equipment	24
7.	Industrial Services	13
8.	Metals	28
9.	Packaging Materials	21
10.	Wood& Wood Products	14
	Total	**141**

4.1 Descriptive Analysis

Table 4.1:

Summary Descriptive Statistic.

Variable	Tobin Q	ERMI	ROE	SIZE	LVG	R&D
Mean	95.14110	87.67191	632.0313	5.786031	1764.944	2.767097
Median	79.70110	61.39321	572.0700	5.669501	1471.809	0.000000
Std. deviation	66.29465	118.1585	2794.943	1.155480	1544.385	32.25207
Observation	1410	1410	1410	1410	1410	1410

Notes: The results ae based on the annually basic observations for the period from year 2009 to 2018 for 141 companies.

Descriptive statistic Tobin's Q in Table 4.1, ERMI, ROE, SIZE, LVG and R&D from year 2009 to 2018 for 1410 observations. Mean value for Tobin's Q, ERMI, ROE, SIZE, LVG and R&D are 95.14110, 87.67191, 632.0313, 5.786031, 1764.944 and 2.767097

respectively. Besides, LVG has the highest median value, 1471.809 compared to other variables. While R&D has the lowest value of median which is 0.000000. Next, ROE has the highest standard deviation, 2794.943 which means that ROE is most volatile compared to other variables. On the other hand, log of firm size has the lowest standard deviation, 1.155480 which means that log of firm size is the least volatile compared to other variables.

4.2 Regression model - Pooled Ordinary Least Squares (POLS)

$$Y_{it} = \beta_0 + \beta_1 ERMI_{it} + \beta_2 ROE_{it} - \beta_3 SIZE_{it} - \beta_4 LVG_{it} + \beta_5 R\&D_{it}$$

$$\text{Tobin's } Q_{it} = 124.0168 + 0.117180 ERMI_{it} + 0.004196 ROE_{it} - 5.731435 InSIZE_{it} - 0.005685\ LVG_{it} + 0.504422\ R\&D_{it}$$

P-value = (0.0000) (0.0000) (0.0000) (0.0012) (0.0000) (0.0000)

Prob (F-statistic) = 0.0000 n= 1410 R^2= 0.142083 adjusted R^2= 0.139028

Where:

Y_{it} is representing Tobin's Q ratio

$ERMI_{it}$ is representing enterprise risk management index (%)

ROE_{it} is representing return on equity (%)

$SIZE_{it}$ is representing firm size (Total assets in natural logarithm form)

LVG_{it} is representing leverage (%)

$R\&D_{it}$ is representing research and development (%)

If all independent variables, ERMI, ROE, SIZE, LVG and R&D equals to zero, expected mean value of Tobin's Q is 124.0168 percent. 0.117180 ERMI indicates that if the enterprise risk management index increased by 1 percent, on average, the Tobin's Q increased by 0.117180 percent, ceteris paribus. 0.004196 ROE shows that if the ROE increased by 1 percent, on average, the Tobin's Q will increase by 0.004196 percent, ceteris paribus. -5.731435 InSIZE indicates that if the firm size increased by 1 percent, on average, the Tobin's Q decreased by 0.05731435 percent, ceteris paribus. -0.005685 LVG indicates that if LVG increased beyond 1 percent, on average, Tobin's Q will reduce close 0.005685 percent, with holdings other variables constant. 0.504422 R&D shows that if the research and development increased by 1 percent, on average, Tobin's Q increased beyond 0.504422 percent, ceteris paribus.

After that, 0.142083 R squared shows that there are 14.2083% of variation in Tobin's Q which predicted from ERMI, ROE, SIZE, LVG and R&D jointly. 0.139028 adjusted R squared shows that 13.9028% of variation in estimated the Tobin's Q which predicted from ERMI, ROE, SIZE, LVG and R&D, after taking the degrees of freedom.

P-values of explanatory variables clearly showed that all variables are significant because p-values less than 0.05 significant level. After that, ERMI, ROE and R&D have significant positive relationship while SIZE and LVG have reverse significant on Tobin's Q.

4.3 Unit Root Test

Table 4.3.1:

Results of Unit Root test obtained from Eviews's 11 output.

	Levin, Lin, and Chu Test (LLC)					
	No trend			With trend		
Variables	Level	First difference	Second difference	Level	First difference	Second difference
Tobin Q	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ERMI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SIZE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LVG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R&D	0.9987	0.4492	0.0000	0.9426	0.0532	0.0000

Table 4.3.2:

Results of Unit Root test obtained from Eviews 11's output.

	Fisher Type Test – Augmented Dickey-Fuller regression (ADF)					
	No trend			With trend		
Variables	Level	First Difference	Second difference	Level	First difference	Second difference
Tobin Q	0.1236	0.0000	0.0000	0.0212	0.0000	0.0000
ERMI	0.0343	0.0000	0.0000	0.0111	0.0000	0.0000
ROE	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
SIZE	0.9213	0.0012	0.0000	0.9997	0.2179	0.0000
LVG	0.0047	0.0000	0.0000	0.0365	0.0000	0.0000
R&D	0.2209	0.0133	0.0001	0.6922	0.1865	0.0137

Levin, Lin, and Chu Test (LLC)

H_0: The series is non-stationary.

H_1: The series is stationary.

Decision: If p-value is smaller than significant level at 5% then reject H_0. Else, H_0 is accepted.

Fisher Type Test – Augmented Dickey-Fuller regression (ADF)

H_0: Panel data has unit root.

H_1: Panel data has not unit root.

Decision: If p-value is smaller than 0.05 significant level then reject H_0. Otherwise, H_0 is accepted.

As shown in Table 4.3.1 and 4.3.2, Levin, Lin, and Chu and Fisher-ADF will used to determine unit root and stationary methods. Results will be stated in three different categories which is level form, first difference form and second difference form.

According to the level form in Table 4.3.1 and 4.3.2, p-values of LLC test on all variables are smaller than the significant level of 5% except R&D which is 0.9987 while p-values of all variables in Fisher-ADF test smaller than 5% significant level exclude Tobin's Q 0.1236, SIZE 0.9213 and R&D 0.2209. In contrast, p-values of LLC test with trend do not reject R&D which p-value is 0.9426 while Fisher-ADF test with trend do not reject SIZE and R&D because p-value is 0.9997 and 0.6922 that larger than the significant level of 5%.

After that, for first difference form in Table 4.3.1 and 4.3.2, p-values LLC test smaller than 5% significant level except R&D is 0.4492 while all variables Fisher-ADF test of p-values are smaller than the 0.05 significant level. It can conclude that Fisher-ADF test significant at 5% significant level while LLC test insignificant at 5% significant level. LLC test with trend do not reject R&D because p-value is 0.0532 while Fisher-

ADF test with trend do not reject SIZE and R&D due to p-value is 0.2179 and 0.1865 that larger than significant level at 5%.

According to second difference form in Table 4.3.1 and 4.3.2, p-values of LLC test variables with trend and without trend are 0.0000 and Fisher-ADF test with trend and without trend on all variables are 0.0000 except for R&D is 0.0001 and 0.0137 which smaller than the significant level of 5% that can conclude this series is stationary and does not had unit root.

In addition, if test statistic larger than critical value at 5% significant level null hypothesis is unaccepted. LLC test t-statistic for Tobin's Q is -9.45381, ERMI -8.37660, SIZE -9.58973, ROE -10.5488, LVG -21.7480 and R&D is 3.00705 which all variables are significant at the critical value 0.05. After that, for Fisher-ADF test Tobin's Q is 309.679, ERMI 326.761, SIZE 249.127, ROE 387.854, LVG 329.653 and R&D is 28.9788 which all variables extreme than critical value 0.05. Therefore, reject null hypothesis and conclude this series is stationary.

4.4 Fixed Effects Model

Table 4.4:

Results of FEM obtained from Eviews 11's output.

Independent Variables	Coefficient	Standard Error	t - statistic	Probability
ERMI	0.130226	0.027435	4.746755	0.0000

ROE	0.000880	0.000462	1.906395	0.0568
SIZE	15.24797	4.079430	3.737770	0.0002
LVG	-0.002577	0.001815	-1.420158	0.1558
R&D	0.681269	0.268885	2.533679	0.0114

R-squared	0.612086
Adjusted R-squared	0.567587
F-statistic	13.75488
Prob (F-statistic)	0.000000

Based on the t-test ERMI, SIZE, and R&D are individually statistically significant because their p-value are less than 0.05 significant level. On the other hand, ROE and LVG are not individually statistically significant because their p-value are more than 0.05 significant level. Based on the F test, the model is significant because p-value smaller than 0.05 significant level.

4.5 Random Effects Model

Table 4.5:

Results of REM obtained from Eviews 11's output.

Independent Variables	Coefficient	Standard Error	t - statistic	Probability
ERMI	0.101675	0.021926	4.637225	0.0000
ROE	0.001258	0.000456	2.760484	0.0058

SIZE	1.576063	2.661725	0.592121	0.5539
LVG	-0.003764	0.001495	-2.517639	0.0119
R&D	0.548762	0.099226	5.530439	0.0000

R-squared	0.044271
Adjusted R-squared	0.040868
F-statistic	13.00719
Prob (F-statistic)	0.000000

Based on the t test, ERMI, ROE, LVG and R&D are individually statistically significant because their p-value are smaller than 0.05 significant level. However, SIZE is not individually statistically significant because its p-value larger than 5% significant level. In contrast, if based on F test, the model is significant because the p-value is less than 0.05 significant level.

4.6 Redundant Fixed Effects Test (Likelihood Ratio)

Table 4.6:

Redundant Fixed Effects test obtained from Eviews 11's output.

	Statistic	d.f	Probability
Cross-section random	10.939188	(140,1264)	0.0000

Cross-section Chi-square	1119.151928	140	0.0000

For the null hypothesis, POLS is preferable. On the other hand, the alternative hypothesis concluded that FEM is preferable. Decision rule is to reject null hypothesis, when p-value smaller than significant level. Or else, null hypothesis is accepted. From the result shows p-value (0.0000) that smaller than 5% significant level. Hence, rejected null hypothesis. In conclusion, FEM is preferable, it is the best fit for the 141 companies during the sample period from 2009 to 2018.

4.7 Breusch-Pagan Lagrange Multiplier Test (BPLM Test)

Table 4.7:

Breusch-Pagan Lagrange Multiplier test obtained from Eviews 11's output.

	Cross-section	Time	Both
Breush-Pagan	1341.118	27.89636	1369.015
	(0.0000)	(0.0000)	(0.0000)

Null hypothesis, POLS is preferable while the alternative hypothesis concluded that REM is preferable. H_0 is rejected if p-value less than significant level, else accepted H_0. From the result shows that p-value 0.0000 smaller than 0.05 significant level. Hence, p-value is small enough to reject null hypothesis. In conclusion, the REM is preferable model and it is the best fit for the 141 companies during the sample period from 2009 to 2018.

4.8 Hausman Test

Table 4.8:

Hausman Test obtained from Eviews 11's output.

	Chi- Sq. Statistic	Chi-Sq. d.f	Probability
Cross-section random	71.239149	5	0.0000

For the null hypothesis, REM is preferable. However, the alternative hypothesis is concluded that FEM is preferable. Assume reject null hypothesis, if the p-value smaller than significant level. Otherwise, null hypothesis is accepted. Hausman test result shows that the p-value is 0.0000 that smaller than 5% significant level. Hence, null hypothesis is rejected. In conclusion, Hausman test shows that FEM is preferable model and it is the best fit for the 141 companies during the sample period from 2009 to 2018.

4.9 Conclusion

The data analysis in this chapter shows that ERMI, ROE and R&D have positive significant relationship between Tobin's Q. In contrast, SIZE and LVG have negative significant relationship on Tobin's Q in regression model. Moreover, the results of unit root test are concluded that this panel data set is stationary and did not has unit root. Furthermore, Hausman test is showed that fixed effect model is the best fit for the 141 companies during the sample period from year 2009 until year 2018.

CHAPTER 5 : DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

Conclusion based on Chapter 4 to summarize the results from EViews. It also study summarizes the research goals and the level of achievement of the goals.

5.1 Summary of the Findings

From Table 5.1, it is representing the summary of statistical analysis which is result from EViews for manufacturing sector which is PLC in Bursa Malaysia. According to the table, ERM index, return on equity and research and development are shown a positive and significant relationship with Tobin's Q. However, firm size and leverage have an inverse significant relationship with Tobin's Q.

Table 5.1:

Summary of Findings

Independent Variables	Relationship between Tobin's Q	Result
ERM index	Positive	Significant
Firm Sizes	Negative	Significant

Return on Equity	Positive	Significant
Leverage	Negative	Significant
Research and Development	Positive	Significant

According to the theory in Chapter two, agency theory proves that when the firm size is bigger, company will need to concern on their management level. The reason is company might be faced with agency problems and agency cost include corporate governance, administrative cost and so on that will affect their firm performance.

5.2 Discussion of Major Findings

Table 5.2:

Result and Theoretical Summary

Independent variables	Significant level	Result	Support by
ERM index	5%	Positive	Ramlee and Normah, (2015)
		Significant	Gordon, Loeb& Tseng (2009)
Firm size	5%	Negative	Tahir and Razali, (2011)
		Significant	Bertinetti, Cavezzali & Gardenal (2013)
Return on Equity	5%	Positive	Wu, Marshall, Chipulu, Li and Ojiako, (2014)
		Significant	Bidhari,Salim,Aisjah and Java, (2013)
Leverage	5%	Negative	Senol and Karaca, (2017)

		Significant	Mukras, (2015)
Research and Development	5%	Positive	Xu, Sim and Jin, (2016)
		Significant	Gupta, Banerjee and Onur, (2017)

5.2.1 ERM index

Referring these results in chapter 4, ERM index shows the positive significant impact to Tobin's Q. ERMI was developed according to capabilities with its strategy, operations, reporting and compliance (Gordon, Loeb & Tseng, 2009). In conclusion, there are positive significant relationship among ERMI and Tobin's Q. The firm's ERM implementation is a proper match but contingent upon 5 firm-specific factors which are board of directors, environmental uncertainty, industry competition, firm size and firm complexity. Other than that, Panicker (2016) study show ERMI and Tobin's Q is significant and positive relationship.

5.2.2 Firm Size

Based on the result, it had shown firm size and Tobin's Q illustrate a negative but significant relationship. This result is similar with the findings of Tahir and Razali (2011). According to Abdullah, Janor, Hamid and Yatim (2017) research, firm size has significant relationship with Tobin's Q. It shows that size of firm has a very strong impact for

performance of the firm. The negative sign of firm size coefficient appealed that when increase in the size of firm in last year, the value of company decreases in next few years. Moreover, Bertinetti, Cavezzali and Gardenal, (2013) have shown that firm size and Tobin'Q have not positive significant relationship. This is because when size of firm getting bigger, the company will face a higher risk. When the firm size expanded to a certain level, the company might face agency problems. The agency problem is occurred because of the conflict of goals between the shareholders and managers that may affect the company's firm performance. In the conclusion, the bigger firm size will cause a negative impact towards firm value.

5.2.3 Return on Equity

Referring to the result, ROE is positive significant between Tobin's Q. ROE is a measurement for business performance that evaluate by the return that available to the shareholders of companies on capital invested (Lin, 2011). Tobin's Q and ROE have direct correlation under linear homogeneity assumption (Wu, Marshall, Chipulu, Li & Ojiako, 2014).

Based on Bidhari, Salim, Aisjah and Java (2013) research, Tobin's Q and ROE have positive significant relationship. This is because when the ROE is higher, investor will receive higher return. Therefore, investors can easier and better assess company that will enhance the shareholder value. In short, we can say that the higher return of equity will affect more on company performance.

5.2.4 Leverage

According to the result from chapter 4, it shows that leverage is significant but negative relationship impact on Tobin's Q. Based on Senol and Karaca (2017), it shows that leverage had negative significant affects Tobin's Q due to the risk arising from the borrowing. Firm with higher leverage might face the risk for bankruptcy if unable to settle the debt. For example, manager borrows more money for business expansion may be affect the firm performance in long term. High financial leverage represented the firm is relying more on debts to payouts liabilities (Golshan & Rasid, 2012). It also causes the companies cannot or difficult to find the lender in the future. Leverage not always bad it also can grow the return of shareholder and bring tax advantages associated with borrowing (Liargovas & Skandalis, 2010).

On the empirical evidences, there are some researches showed a negative significant impact on leverage and Tobin's Q which is measures firm performance (Mukras, 2015; Abdullah et al., 2017; McShane, Nair & Rustambekov, 2011).

5.2.5 Research and Development

Based on chapter 4 result, research and development have positive significant relationship with Tobin's Q. This result had supported by Xu, Sim and Jin (2016). The research illustrates that it has a significant positive relationship between the coefficient of R&D and Tobin's Q.

The positive relationship indicates that R&D can improve firm performance. In China, research and development is an important factor that affects their firm performance in the energy conservation and environmental protection sector. Furthermore, the 1%-point change in the research and development brings 4.38%-point increase in firm performance. As the result illustrate, a positive relationship can influence R&D toward Tobin's Q (Gupta, Banerjee & Onur, 2017).

Based on the Ayaydin and Karaaslan (2014) research, it shows a positive significant effect of research and development toward Tobin's Q. The positive relationship between R&D intensity and financial performance is further corroborated by equilibrium framework whereby R&D is considered as a vital aspect of a company's competitive advantage especially internationally. Based on the theory, R&D could enhance product's innovation and also pave the way for new and better products in terms of technology and even cost saving or at the very least maintain a certain degree of minimal product enhancement, with improvement in the end products, it would spur the company's financial growth in an upward trajectory.

5.3 Implication of Study

ERM is an important part of corporate strategy and the most important part of business process and culture (Fraser, 2010). The study provides insights on the performance of listed companies implementing enterprise risk management in key Bursa Malaysia markets. The results of this study provide a platform for scholars, researchers and other

stakeholders to gain a better comprehension of how listed companies manage their financial records and activities. Therefore, this study will allow others to comprehend the importance of implementing ERM in Malaysia and regard it as one of the only benefits to serving the community. ERM is believed as one of the key components of the internal control component. This enables the organization to properly monitor and manage key risks within its organizational structure. Implementing ERM in your organization helps in the process of monitoring, identifying, and identifying risks from a better perspective. This is because most companies today implement ERM in their business activities. Overall, findings of this study can be used as a guide to developing appropriate frameworks and best practices to improve the firm performance or company value.

5.4 Limitation of Study

5.4.1 Small number of sample size

First of all, sampling is a method utilized in statistical research in which a fixed amount of findings is obtained from a larger sample. Moreover, the number of sample size will affect final results. To get a statistically significant and better result, it needs a larger sample size. Besides, it may get a negative result if the sample size is small. In this research, even though it is using panel data analysis but the sample size is still considered small. This research is collecting data from the manufacturing industry with 10 years data but some of the companies does not have the completed data of 10 years so it will cause of

decreasing in sample size. Due to lack of sample size of this research, it may not achieve the best results.

5.4.2 Different measurement tools with the other country's researches

In this research, it focuses on the data that obtain from the companies in Bursa Malaysia. Thus, it may have a different result and the different measurement tools with the researches of other countries. For example, in formula of ERMI it cannot find the measurement tools in Malaysia company's annual report and it is different measurement tools with the studies of other countries.

5.4.3 Using of secondary data

By using the secondary data, it could not have been obtained in the geographical area or in the years needed, even for particular community that the researcher is involved in researching. Since this research collects 10 years data from industrial products and services sector of public listed company, so it may face the limitation of using secondary data. For example, if there is any mistake that done by the companies it will affect the results that done by this research.

5.5 Recommendation

The following recommendations is given based on the findings.

5.5.1 Practical recommendations

5.5.1.1 Focus on R&D

Nowadays, most of the manufacturing companies are facing the revolution of Industry 4.0 and digital transformation. Companies can invest more capital on R&D area in order to develop new digital technology for their production strategy such as Internet of Things (IoT) to increase their efficiency and competitive advantages. For example, during Covid-19 pandemic, people are practicing social distancing and encourage contact less practices in all daily activities to minimize the spread of virus. The machine learning and automation in production can implement to sustain the business operation without slowdown the production. Furthermore, Covid-19 pandemic speeds up all sectors towards digital technology era. Hence, R&D is important for the companies in their business strategies.

5.5.1.2 Reduce the leverage

Companies are recommended to reduce their leverage or maintain their leverage at certain level in order to minimize the probability of taking excessive risk. When the company has high leverage, it will affect its performance in the long run because high leverage will affect the liquidity of cash flow. When companies are affected by some systematic risks such as Covid-19 pandemic that impacts on global economy, the companies that have high leverage will easier go into bankruptcy due to liquidity shortage and default in debt obligations or difficult to survive under Covid-19 crisis environment.

5.5.1.3 Keep company size optimum

Companies are recommended to keep their company size optimum to sustain the business. The larger the company, the easier the company will face agency problem and the cost of agency is higher. When the agency problem is occurred between the shareholders and managers that will affect the quality of decision making for the company. Besides, firm size increase also will lead to high risk exposure. For example, during Covid-19 pandemic, governments around the world is imposed lockdown and movement restriction to control the spread of virus. Most of the companies are forced to postpone their projects and stop their business operations. The companies need to face their losses based on high operating cost and unable to mitigate their losses and risk even

though they are multinational companies. The companies need to maintain their size in optimum level in order to able adapt to the crisis quickly and sustain their business. In contrast, some start-up or moderate size companies is more flexible when they faced economic crisis because they have less financial burden compared to larger firm size companies.

5.5.2 Research recommendations

Future research can be improved to have better result for their research based on the following recommendations.

5.5.2.1 Expand the sample size

By increasing the sample size, it will offer more correct values of mean, spot outliner that could skew the efforts in a smaller sample and have a smaller margin of error. It means that the bigger the sample sizes and results will much better that provide in the research. For example, the future researchers can expand the year of data or increasing the number of sectors when they are doing the same research. Moreover, the future researchers should calculate and make sure the sample sizes are large enough to get the statistically significant and better results.

5.5.2.2 Only refer to Malaysia's studies

This research is focus on the companies in Bursa Malaysia and the data is obtained from annual report and Bloomberg. It may get the difference from the other past studies that from other countries since this research only focus on the case of Malaysia. Moreover, some of the formulas from past studies are difficult to modify. For example, we need to modify the formula of ERMI by ourselves so that we can find the full data from the annual report and Bloomberg. To avoid the limitation of different results from the past studies, future researchers may consider only refer to Malaysia's study.

5.5.2.3 Using primary data

Using primary data, own analysis helps analysts to address and overcome concerns that are special to their own business condition. The information collected is the same specifics that the analyst wants to remember, and it is documented in a way that reflects the unique position of the company. Moreover, future researchers can get the primary data from interviews, observation, surveys and so on. By using the primary data, it can avoid any mistake that done by the companies that will affect the results of the research.

5.6 Conclusion

The main objective of this research to identify the relationship among the explanatory variables which include ERMI, SIZE, ROE, LVG, and R&D which and dependent variable which is the firm performance.

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APPENDICES

Appendix 4.0 Company name list from industrial products and services sector

Auto Parts		
No.	**Code**	**Company Name**
1.	EPMB (7773)	EP MANUFACTURING BHD
2.	JETSON (9083)	KUMPULAN JETSON BHD
3.	MCHEHLDG (7004)	MCE HOLDINGS BHD
4.	WATTA (7226)	WATTA HOLDING BERHAD
Building Materials		
1.	AJIYA (7609)	AJIYA BERHAD
2.	ASTINO (7162)	ASTINO BERHAD
3.	CHUAN (7016)	CHUAN HUAT RESOURCES BHD
4.	CMSB (2852)	CAHYA MATA SARAWAK BERHAD
5.	DOLMITE (5835)	DOLOMITE CORPORATION BERHAD
6.	HUMEIND (5000)	HUME INDUSTRIES BERHAD
7.	JADEM (7043)	JADE MARVEL GROUP BERHAD
8.	KIALIM (6211)	KIA LIM BERHAD
9.	KIM HIN (5371)	KIM HIN INDUSTRY BERHAD
10.	MCEMENT (3794)	MALAYAN CEMENT BERHAD
11.	OKA (7140)	OKA CORPORATION BHD
12.	POLY (8117)	POLY GLASS FIBRE (M) BERHAD
13.	QUALITY (7544)	QUALITY CONCRETE HOLDINGS BERHAD
14.	RESINTC (7232)	RESINTECH BERHAD
15.	SEACERA (7073)	SEACERA GROUP BERHAD
16.	SKBSHUT (7115)	SKB SHUTTERS CORPORATION BERHAD
17.	TASEK (4448)	TASEK CORPORATION BERHAD
18.	WTHORSE (5009)	WHITE HORSE BERHAD
Chemicals		
1.	ANCOM (4758)	ANCOM BERHAD
2.	HEXZA (3298)	HEXZA CORPORATION BERHAD
3.	HIL (8443)	HIL INDUSTRIES BERHAD
4.	IMASPRO (7222)	IMASPRO CORPORATION BERHAD
5.	LUXCHEM (5143)	LUXCHEM CORPORATION BERHAD
6.	NYLEX (4944)	NYLEX (MALAYSIA) BERHAD
7.	SAMCHEM (5147)	SAMCHEM HOLDINGS BERHAD
8.	TOYOINK (7173)	TOYO INK GROUP BERHAD
Diversified Industrials		
1.	BJCORP (3395)	BERJAYA CORPORATION BERHAD

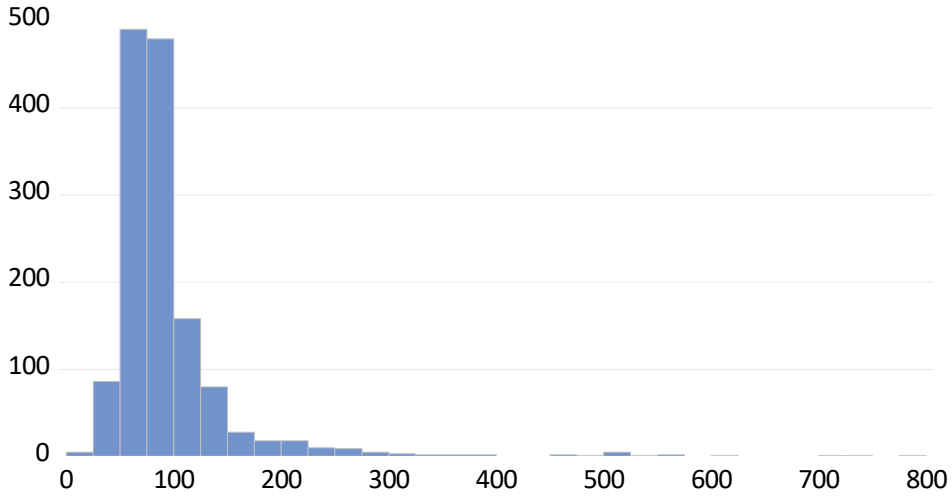
2.	BSTEAD (2771)	BOUSTEAD HOLDINGS BERHAD
3.	KFIMA (6491)	KUMPULAN FIMA BERHAD
4.	KPS (5843)	KUMPULAN PERANGSANG SELANGOR BERHAD
5.	TEXCHEM (8702)	TEXCHEM RESOURCES BERHAD
Industrial Engineering		
1.	APB (5568)	APB RESOURCES BERHAD
2.	BINTAI (6998)	BINTAI KINDEN CORPORATION BERHAD
3.	FAVCO (7229)	FAVELLE FAVCO BERHAD
4.	HIGHTEC (7033)	KUMPULAN H & L HIGH-TECH BERHAD
5.	KKB (9466)	KKB ENGINEERING BERHAD
6.	ROHAS (9741)	ROHAS TECNIC BERHAD
Industrial Materials, Components& Equipment		
1.	AEM (7146)	AE MULTI HOLDINGS BERHAD
2.	CBIP (7076)	CB INDUSTRIAL PRODUCT HOLDING BERHAD
3.	CHINWEL (5007)	CHIN WELL HOLDINGS BERHAD
4.	COMCORP (7195)	COMINTEL CORPORATION BHD
5.	CNASIA (7986)	CN ASIA CORPORATION BHD
6.	DUFU (7233)	DUFU TECHNOLOGY CORP. BERHAD
7.	EG (8907)	EG INDUSTRIES BERHAD
8.	FIBON (0149)	FIBON BERHAD
9.	FITTERS (9318)	FITTERS DIVERSIFIED BERHAD
10.	GESHEN (7197)	GE-SHEN CORPORATION BERHAD
11.	GUH (3247)	GUH HOLDINGS BERHAD
12.	HWGB (9601)	HO WAH GENTING BERHAD
13.	JASKITA (8648)	JASA KITA BERHAD
14.	KOBAY (6971)	KOBAY TECHNOLOGY BERHAD
15.	PIE (7095)	P.I.E. INDUSTRIAL BERHAD
16.	RUBEREX (7803)	RUBBEREX CORPORATION (M) BERHAD
17.	SKPRES (7155)	SKP RESOURCES BHD
18.	UCHITEC (7100)	UCHI TECHNOLOGIES BERHAD
19.	ULICORP (7133)	UNITED U-LI CORPORATION BERHAD
20.	UMS (7137)	UMS HOLDINGS BERHAD
21.	UNIMECH (7091)	UNIMECH GROUP BERHAD
22.	VS (6963)	V.S. INDUSTRY BERHAD
23.	WELLCAL (7231)	WELLCALL HOLDINGS BERHAD
24.	WONG (7050)	WONG ENGINEERING CORPORATION BERHAD
Industrial Services		
1.	ANALABS (7083)	ANALABS RESOURCES BERHAD
2.	AWC (7579)	AWC BERHAD

3.	COMPUGT (5037)	COMPUGATES HOLDINGS BERHAD
4.	CFM (8044)	COMPUTER FORMS (MALAYSIA) BERHAD
5.	EFFICEN (0064)	EFFICIENT E-SOLUTIONS BERHAD
6.	FIMACOR (3107)	FIMA CORPORATION BERHAD
7.	JCBNEXT (0058)	JCBNEXT BERHAD
8.	KNUSFOR (5035)	KNUSFORD BERHAD
9.	KUB (6874)	KUB MALAYSIA BERHAD
10.	LIONPSIM (8486)	LION POSIM BERHAD
11.	SCICOM (0099)	SCICOM (MSC) BERHAD
12.	TIENWAH (7374)	TIEN WAH PRESS HOLDINGS BERHAD
13.	EDGENTA (1368)	UEM EDGENTA BERHAD
Metals		
1.	ALCOM (2674)	ALCOM GROUP BERHAD
2.	ANNJOO (6556)	ANN JOO RESOURCES BERHAD
3.	ARANK (7214)	A-RANK BERHAD
4.	ATTA (7099)	ATTA GLOBAL GROUP BERHAD
5.	CHOOBEE (5797)	CHOO BEE METAL INDUSTRIES BHD
6.	CSCSTEL (5094)	CSC STEEL HOLDINGS BERHAD
7.	EMETALL (7217)	EONMETALL GROUP BERHAD
8.	ENGTEX (5056)	ENGTEX GROUP BERHAD
9.	FACBIND (2984)	FACB INDUSTRIES INCORPORATED BERHAD
10.	HIAPTEK (5072)	HIAP TECK VENTURE BERHAD
11.	KEINHIN (7199)	KEIN HING INTERNATIONAL BERHAD
12.	LBALUM (9326)	LB ALUMINIUM BERHAD
13.	LIONIND (4235)	LION INDUSTRIES CORPORATION BERHAD
14.	LSTELL (9881)	LEADER STEEL HOLDINGS BERHAD
15.	LYSAGHT (9199)	LYSAGHT GALVANIZED STEEL BERHAD
16.	MASTEEL (5098)	MALAYSIA STEEL WORKS (KL) BHD
17.	MELEWAR (3778)	MELEWAR INDUSTRIAL GROUP BERHAD
18.	MSC (5916)	MALAYSIA SMELTING CORPORATION BERHAD
19.	MYCRON (5087)	MYCRON STEEL BERHAD
20.	PANTECH (5125)	PANTECH GROUP HOLIDINGS BERHAD
21.	PERSTIM (5436)	PERUSAHAAN SADAUR TIMAH MALAYSIA (PERSTIMA) BHD
22.	PMBTECH (7172)	PMB TECHOLOGY BERHAD
23.	PMETAL (8869)	PRESS METAL ALUMINIUM HOLDINGS BERHAD
24.	PRESTAR (9873)	PRESTAR RESOURCES BERHAD

25.	TAWIN (7097)	TA WIN HOLDINGS BERHAD
26.	TONGHER (5010)	TONG HERR RESOURCES BERHAD
27.	YKGI (7020)	YKGI HOLDINGS BERHAD
28.	YLI (7014)	YLI HOLDINGS BERHAD
Packaging Materials		
1.	ADVPKG (9148)	ADVANCED PACKAGING TECHNOLOGY (M) BHD
2.	BOXPAK (6297)	BOX-PAK (MALAYSIA) BERHAD
3.	BPPLAS (5100)	BP PLASTICS HOLDING BHD
4.	BRIGHT (9938)	BRIGHT PACKAGING INDUSTRY BERHAD
5.	CANONE (5105)	CAN-ONE BERHAD
6.	CGB (8052)	CENTRAL GLOBAL BERHAD
7.	CYL (7157)	CYL CORPORATION BERHAD
8.	DAIBOCI (8125)	DAIBOCHI BERHAD
9.	DNONCE (7114)	D'NONCE TECHNOLOGY BHD
10.	IQZAN (7183)	IQZAN HOLDING BERHAD
11.	KOMARK (7017)	KOMARKCORP BERHAD
12.	KYM (8362)	KYM HOLDINGS BERHAD
13.	MASTER (7029)	MASTER-PACK GROUP BERHAD
14.	MUDA (3883)	MUDA HOLDINGS BERHAD
15.	ORNA (5065)	ORNAPAPER BERHAD
16.	PPHB (8273)	PUBLIC PACKAGES HOLDINGS BHD
17.	SCGM (7247)	SCGM BHD
18.	SCIENTX (4731)	SCIENTEX BERHAD
19.	SLP (7248)	SLP RESOURCES BERHAD
20.	TGUAN (7034)	THONG GUAN INDUSTRIES BERHAD
21.	TOMYPAK (7285)	TOMYPAK HOLDINGS BERHAD
Wood& Wood Products		
1.	CYMAO (5082)	CYMAO HOLDINGS BERHAD
2.	DOMINAN (7169)	DOMINANT ENTERPRISE BERHAD
3.	EKSONS (9016)	EKSONS CORPORATION BERHAD
4.	EVERGRN (5010)	EVERGREEN FIBREBOARD BERHAD
5.	GPHAROS (5649)	GOLDEN PHAROS BERHAD
6.	KPSCB (9121)	KPS CONSORTIUM BERHAD
7.	MENTIGA (5223)	MENTIGA CORPORATION BERHAD
8.	MIECO (5001)	MIECO CHIPBOARD BERHAD
9.	MINHO (5576)	MINHO (M) BERHAD
10.	NWP (5025)	NWP HOLDINGS BERHAD
11.	PWORTH (7123)	PRICEWORTH INTERNATIONAL BERHAD
12.	SUBUR (6904)	SUBUR TIASA HOLDINGS BERHAD
13.	WOODLAN (7025)	WOODLANDOR HOLDINGS BHD
14.	WTK (4243)	WTK HOLDINGS BERHAD

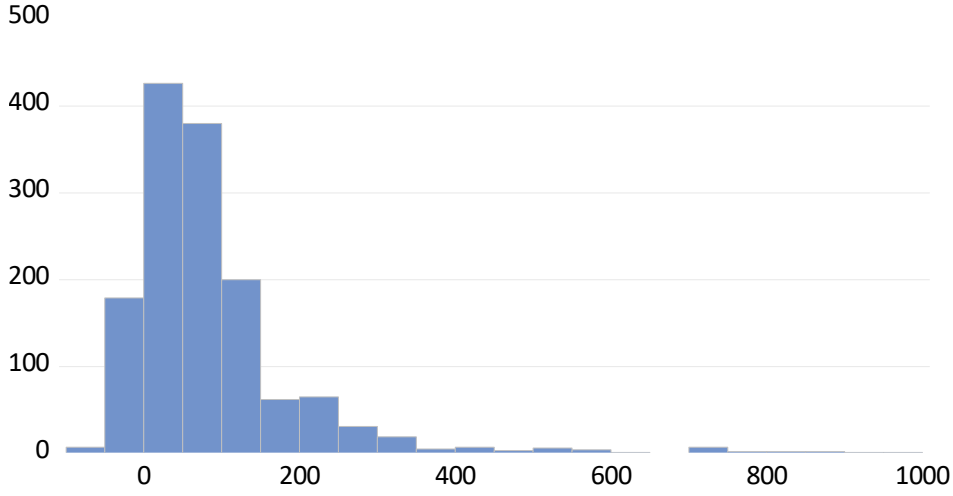
Appendix 4.1 Descriptive Analysis

1. Tobin's Q



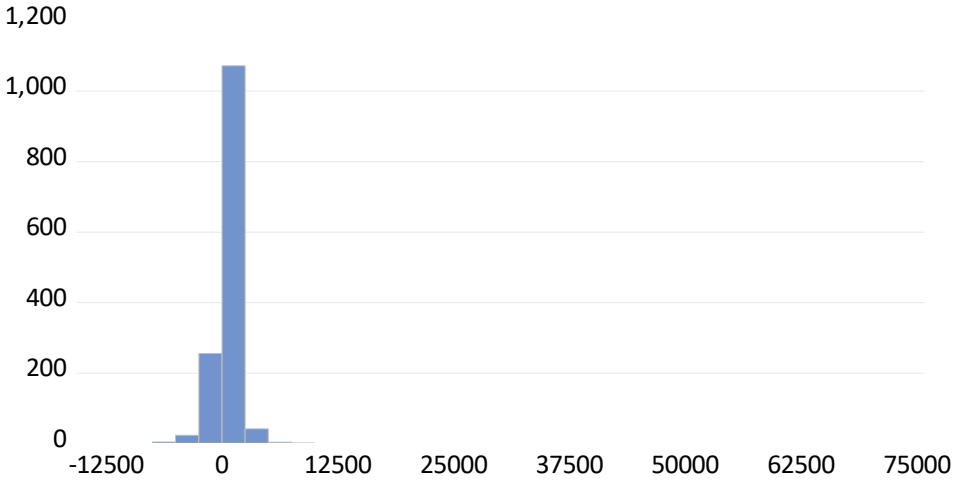
Series: TOBIN_Q	
Sample 2009 2018	
Observations 1410	
Mean	95.14110
Median	79.70110
Maximum	781.6988
Minimum	0.000000
Std. Dev.	66.29465
Skewness	5.025171
Kurtosis	37.77376
Jarque-Bera	76975.64
Probability	0.000000

2. ERM Index (ERMI)



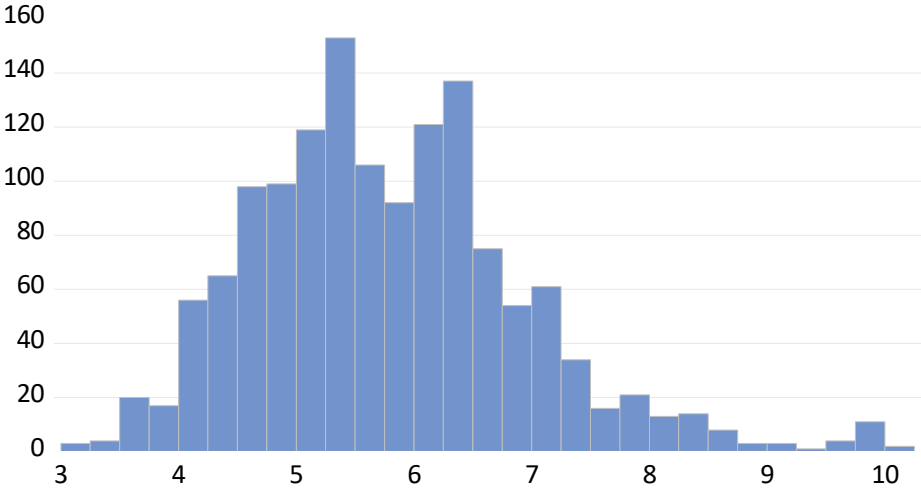
Series: ERMI	
Sample 2009 2018	
Observations 1410	
Mean	87.67191
Median	61.39321
Maximum	966.1686
Minimum	-54.88916
Std. Dev.	118.1595
Skewness	3.189709
Kurtosis	17.76042
Jarque-Bera	15190.81
Probability	0.000000

3. Return On Equity (ROE)



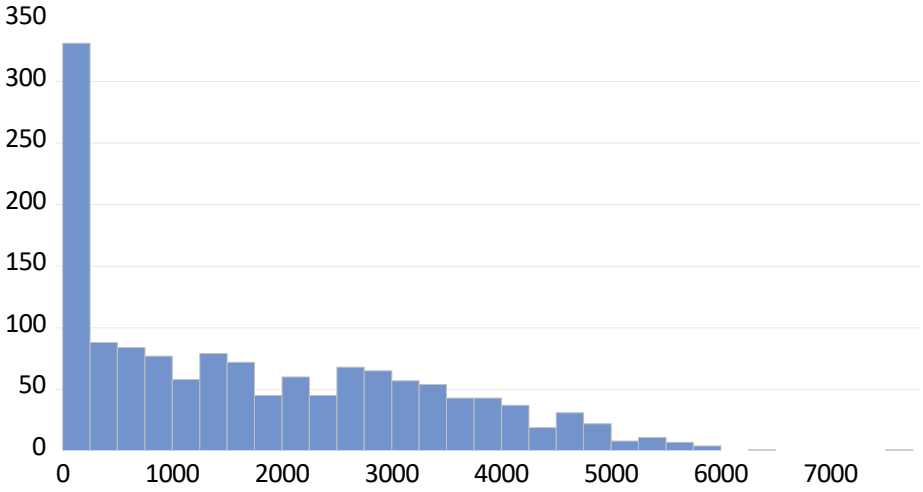
Series: ROE	
Sample 2009 2018	
Observations	1410
Mean	632.0313
Median	572.0700
Maximum	74307.69
Minimum	-13381.27
Std. Dev.	2794.943
Skewness	18.54862
Kurtosis	459.9918
Jarque-Bera	12350288
Probability	0.000000

4. Firm Size (Size)



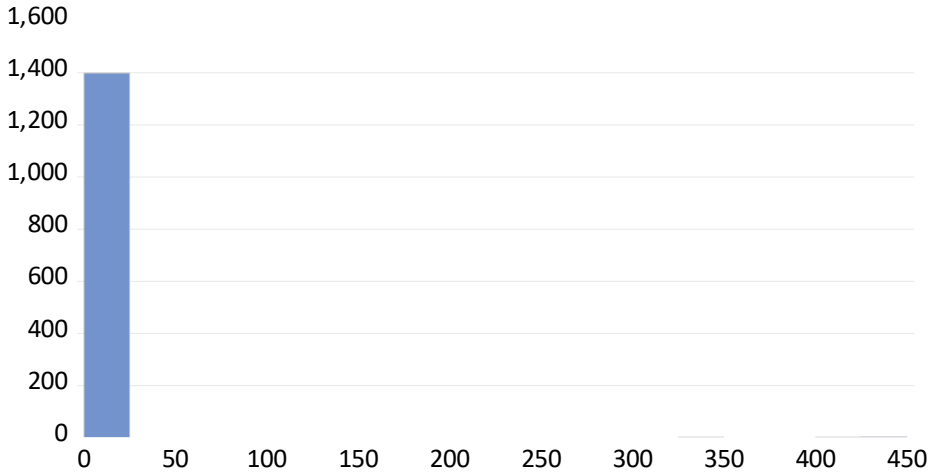
Series: SIZE	
Sample 2009 2018	
Observations	1410
Mean	5.786031
Median	5.669501
Maximum	10.05824
Minimum	3.014456
Std. Dev.	1.155480
Skewness	0.699802
Kurtosis	3.968749
Jarque-Bera	170.2203
Probability	0.000000

5. Leverage (LVG)



Series: LEVERAGE	
Sample 2009 2018	
Observations 1410	
Mean	1764.944
Median	1471.809
Maximum	7568.057
Minimum	0.000000
Std. Dev.	1544.385
Skewness	0.588225
Kurtosis	2.345339
Jarque-Bera	106.4912
Probability	0.000000

6. Research and Development (R&D)



Series: R_D	
Sample 2009 2018	
Observations 1410	
Mean	2.767097
Median	0.000000
Maximum	438.2762
Minimum	0.000000
Std. Dev.	32.25207
Skewness	12.02303
Kurtosis	147.5723
Jarque-Bera	1261912.
Probability	0.000000

Appendix 4.2 Regression Model: Pooled Ordinary Least Square (POLS)

Dependent Variable: TOBIN_S_Q
Method: Panel Least Squares
Date: 07/31/20 Time: 14:56
Sample: 2009 2018
Periods included: 10
Cross-sections included: 141
Total panel (balanced) observations: 1410

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERMI	0.117180	0.017131	6.840214	0.0000
ROE	0.004196	0.000593	7.080766	0.0000
SIZE	-5.731435	1.761874	-3.253034	0.0012
LEVERAGE	-0.005685	0.001158	-4.908932	0.0000
R_D	0.504422	0.051135	9.864525	0.0000
C	124.0168	9.378395	13.22367	0.0000

Root MSE	61.38285	R-squared	0.142083
Mean dependent var	95.14110	Adjusted R-squared	0.139028
S.D. dependent var	66.29465	S.E. of regression	61.51387
Akaike info criterion	11.08065	Sum squared resid	5312675.
Schwarz criterion	11.10299	Log likelihood	-7805.857
Hannan-Quinn criter.	11.08900	F-statistic	46.50435
Durbin-Watson stat	0.538117	Prob(F-statistic)	0.000000

Appendix 4.3 Unit Root Test

1. Tobin's Q

Panel unit root test: Summary
Series: D(TOBIN_S_Q)
Date: 07/24/20 Time: 23:26
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-25.6032	0.0000	141	987
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.92122	0.0000	141	987
ADF - Fisher Chi-square	565.184	0.0000	141	987
PP - Fisher Chi-square	1123.08	0.0000	141	1128

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: TOBIN_S_Q
Date: 07/24/20 Time: 23:27
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.7734	0.0000	141	1128
Breitung t-stat	3.54877	0.9998	141	987
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.10469	0.4583	141	1128
ADF - Fisher Chi-square	332.274	0.0212	141	1128
PP - Fisher Chi-square	595.928	0.0000	141	1269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

2. ERM Index (ERMI)

Panel unit root test: Summary
Series: ERMI
Date: 07/24/20 Time: 23:28
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.37660	0.0000	141	1128
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.26222	0.3966	141	1128
ADF - Fisher Chi-square	326.761	0.0343	141	1128
PP - Fisher Chi-square	441.535	0.0000	141	1269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: ERMI
Date: 07/24/20 Time: 23:29
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.1333	0.0000	141	1128
Breitung t-stat	1.21300	0.8874	141	987
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.29161	0.3853	141	1128
ADF - Fisher Chi-square	339.115	0.0111	141	1128
PP - Fisher Chi-square	567.612	0.0000	141	1269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

3. Firm size (SIZE)

Panel unit root test: Summary
Series: D(SIZE)
Date: 07/24/20 Time: 22:53
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.60154	0.0000	141	987
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.64036	0.0041	141	987
ADF - Fisher Chi-square	359.377	0.0012	141	987
PP - Fisher Chi-square	717.790	0.0000	141	1128

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(SIZE,2)
Date: 07/24/20 Time: 22:55
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-49.4449	0.0000	141	846
Breitung t-stat	1.12945	0.8706	141	705
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.58214	0.0049	141	846
ADF - Fisher Chi-square	414.278	0.0000	141	846
PP - Fisher Chi-square	1278.16	0.0000	141	987

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

4. Return on Equity (ROE)

Panel unit root test: Summary
Series: ROE
Date: 07/24/20 Time: 23:32
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5488	0.0000	141	1128
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.17220	0.0008	141	1128
ADF - Fisher Chi-square	387.854	0.0000	141	1128
PP - Fisher Chi-square	606.190	0.0000	141	1269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: ROE
Date: 07/24/20 Time: 23:35
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.1427	0.0000	141	1128
Breitung t-stat	3.10901	0.9991	141	987
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.89252	0.1861	141	1128
ADF - Fisher Chi-square	365.235	0.0006	141	1128
PP - Fisher Chi-square	685.699	0.0000	141	1269

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

5. Leverage (LVG)

Panel unit root test: Summary
Series: LEVERAGE
Date: 07/24/20 Time: 23:39
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-21.7480	0.0000	133	1064
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.20277	0.0138	133	1064
ADF - Fisher Chi-square	329.653	0.0047	133	1064
PP - Fisher Chi-square	439.898	0.0000	133	1197

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LEVERAGE
Date: 07/24/20 Time: 23:39
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-49.8433	0.0000	134	1072
Breitung t-stat	5.13350	1.0000	134	938
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.86440	0.1937	134	1072
ADF - Fisher Chi-square	310.939	0.0365	134	1072
PP - Fisher Chi-square	530.586	0.0000	134	1206

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

6. Research& Development (R&D)

Panel unit root test: Summary
Series: D(R_D,2)
Date: 07/24/20 Time: 23:27
Sample: 2009 2018
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.84162	0.0000	13	78
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.54432	0.0002	13	78
ADF - Fisher Chi-square	63.5164	0.0001	13	78
PP - Fisher Chi-square	213.335	0.0000	13	91

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: D(R_D,2)
Date: 07/24/20 Time: 23:28
Sample: 2009 2018
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-14.1191	0.0000	13	78
Breitung t-stat	-3.42397	0.0003	13	65
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.04884	0.1471	13	78
ADF - Fisher Chi-square	44.4032	0.0137	13	78
PP - Fisher Chi-square	167.688	0.0000	13	91

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.4 Fixed Effects Model (FEM)

Dependent Variable: TOBIN_Q
Method: Panel Least Squares
Date: 07/31/20 Time: 15:00
Sample: 2009 2018
Periods included: 10
Cross-sections included: 141
Total panel (balanced) observations: 1410

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERMI	0.130226	0.027435	4.746755	0.0000
ROE	0.000880	0.000462	1.906395	0.0568
SIZE	15.24797	4.079430	3.737770	0.0002
LEVERAGE	-0.002577	0.001815	-1.420158	0.1558
R_D	0.681269	0.268885	2.533679	0.0114
C	-2.393883	23.06447	-0.103791	0.9174

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	41.27546	R-squared	0.612086
Mean dependent var	95.14110	Adjusted R-squared	0.567587
S.D. dependent var	66.29465	S.E. of regression	43.59412
Akaike info criterion	10.48551	Sum squared resid	2402166.
Schwarz criterion	11.02926	Log likelihood	-7246.281
Hannan-Quinn criter.	10.68870	F-statistic	13.75488
Durbin-Watson stat	0.976197	Prob(F-statistic)	0.000000

Appendix 4.5 Random Effects Model (REM)

Dependent Variable: TOBIN_Q
Method: Panel EGLS (Cross-section random effects)
Date: 07/31/20 Time: 15:04
Sample: 2009 2018
Periods included: 10
Cross-sections included: 141
Total panel (balanced) observations: 1410
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERMI	0.101675	0.021926	4.637225	0.0000
ROE	0.001258	0.000456	2.760484	0.0058
SIZE	1.576063	2.661725	0.592121	0.5539
LEVERAGE	-0.003764	0.001495	-2.517639	0.0119
R_D	0.548762	0.099226	5.530439	0.0000
C	81.43799	14.80908	5.499194	0.0000

Effects Specification	S.D.	Rho
Cross-section random	37.97965	0.4315
Idiosyncratic random	43.59412	0.5685

Weighted Statistics

Root MSE	44.51561	R-squared	0.044271
Mean dependent var	32.46158	Adjusted R-squared	0.040868
S.D. dependent var	45.55112	S.E. of regression	44.61063
Sum squared resid	2794112.	F-statistic	13.00719
Durbin-Watson stat	0.831065	Prob(F-statistic)	0.000000

Unweighted Statistics

R-squared	0.107036	Mean dependent var	95.14110
Sum squared resid	5529706.	Durbin-Watson stat	0.419930

Appendix 4.6 Redundant Fixed Effects Test (Likelihood Ratio)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	10.939188	(140,1264)	0.0000
Cross-section Chi-square	1119.151928	140	0.0000

Cross-section fixed effects test equation:
Dependent Variable: TOBIN_Q
Method: Panel Least Squares
Date: 07/31/20 Time: 15:03
Sample: 2009 2018
Periods included: 10
Cross-sections included: 141
Total panel (balanced) observations: 1410

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERMI	0.117180	0.017131	6.840214	0.0000
ROE	0.004196	0.000593	7.080766	0.0000
SIZE	-5.731435	1.761874	-3.253034	0.0012
LEVERAGE	-0.005685	0.001158	-4.908932	0.0000
R_D	0.504422	0.051135	9.864525	0.0000
C	124.0168	9.378395	13.22367	0.0000

Root MSE	61.38285	R-squared	0.142083
Mean dependent var	95.14110	Adjusted R-squared	0.139028
S.D. dependent var	66.29465	S.E. of regression	61.51387
Akaike info criterion	11.08065	Sum squared resid	5312675.
Schwarz criterion	11.10299	Log likelihood	-7805.857
Hannan-Quinn criter.	11.08900	F-statistic	46.50435
Durbin-Watson stat	0.538117	Prob(F-statistic)	0.000000

Appendix 4.7 Breusch-Pagan Lagrange Multiplier Test (BPLM Test)

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	1341.118 (0.0000)	27.89636 (0.0000)	1369.015 (0.0000)
Honda	36.62128 (0.0000)	5.281700 (0.0000)	29.62988 (0.0000)
King-Wu	36.62128 (0.0000)	5.281700 (0.0000)	14.12010 (0.0000)
Standardized Honda	37.39263 (0.0000)	5.824663 (0.0000)	23.18991 (0.0000)
Standardized King-Wu	37.39263 (0.0000)	5.824663 (0.0000)	10.66578 (0.0000)
Gourieroux, et al.*	--	--	1369.015 (0.0000)

Appendix 4.8 Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	71.239149	5	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ERMI	0.130226	0.101675	0.000272	0.0834
ROE	0.000880	0.001258	0.000000	0.0000
SIZE	15.247969	1.576063	9.556966	0.0000
LEVERAGE	-0.002577	-0.003764	0.000001	0.2486
R_D	0.681269	0.548762	0.062454	0.5960

Cross-section random effects test equation:
Dependent Variable: TOBIN_Q
Method: Panel Least Squares
Date: 07/31/20 Time: 15:05
Sample: 2009 2018
Periods included: 10
Cross-sections included: 141
Total panel (balanced) observations: 1410

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.393883	23.06447	-0.103791	0.9174
ERMI	0.130226	0.027435	4.746755	0.0000
ROE	0.000880	0.000462	1.906395	0.0568
SIZE	15.24797	4.079430	3.737770	0.0002
LEVERAGE	-0.002577	0.001815	-1.420158	0.1558
R_D	0.681269	0.268885	2.533679	0.0114

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	41.27546	R-squared	0.612086
Mean dependent var	95.14110	Adjusted R-squared	0.567587
S.D. dependent var	66.29465	S.E. of regression	43.59412
Akaike info criterion	10.48551	Sum squared resid	2402166.
Schwarz criterion	11.02926	Log likelihood	-7246.281
Hannan-Quinn criter.	10.68870	F-statistic	13.75488
Durbin-Watson stat	0.976197	Prob(F-statistic)	0.000000