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Growth and Investment: Empirical Evidence at Macro and Firm Level

by

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ABSTRACT

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GROWTH AND INVESTMENT: EMPIRICAL EVIDENCE AT MACRO AND FIRM LEVEL

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This dissertation consists of three empirical essays that focus on growth and investment in aggregate and at firm-level. The first essay focuses on the issue of aggregate economic growth. The purposes of this essay are to re-investigate the effectiveness of government size and quality of institutions to foster economic growth in developed and developing countries. This essay also examines a non-linear relation between government size and economic growth and finally to identify the specific channels of institutions quality that determine economic growth aggregately. The second essay identifies the response of firms' investment to the market interest rate uncertainty and debt holding in Malaysia as one developing country. The sensitivity of firms' investment to the interaction between aggregate uncertainty and debt holding isalso emphasized. This essay also examines the heterogeneity between high- and low-indebted firms groups. The final essay is conducted specifically at firm-level in Malaysia. The aims of this essay are to investigate the effect of financial factors on firms' growth in Malaysia. It also examines the heterogeneity betweenfirms that have been divided into specific groups based on their size and sectors. The results for the first essay show that government size and institutions were ineffective to foster economic growth. It also revealed that government size has a non-linear effect on economic growth, while democracy and law and order play a positive role to foster economic growth. The second essay discovers that firms' investment responds negatively to the aggregate uncertainty and debt holding. However, the effect of the interaction between aggregate uncertainty and debt holding on firms' investment was not significant; these results were quite homogenous for high- and low-indebted firms in Malaysia. The results for the third essay indicate that financial factors, particularly internal funds, play an important role to foster firms' growth in Malaysia. The results also indicate heterogeneity that is categorized by size and sector.

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Declaration of Authorship

I, **Riayati binti Ahmad**

declare that the thesis entitled

Growth and Investment: Empirical Evidence at Macro and Firm Level

and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- none of this work has been published before submission

Signed: ……

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List of Abbreviations

ADF	- Augmented Dickey Fuller
AR(2)	Arellano-Bond Second Order Serial Correlation
ARCH	- Autoregressive Conditional Heteroskedasticity
DEBTU	- The joint effect between the market interest rate uncertainty and debt holding
DEBTU2	- The joint effect between the inflation uncertainty and debt holding
GARCH	- Generalized Autoregressive Conditional Heteroskedasticity
GDP	- Gross Domestic Product
GMM	- Generalized Method of Moments
ICRG	- International Country Risk Guide
IFS	- International Financial Statistics
MIDA	- Malaysian Investment Development Authority
PP	- Phillips Perron

1. INTRODUCTION

The concept of economic development includes increasing per capita income as an indicator of a good standard of living. It also includes fundamental changes in the structure of the economy. These changes are characterized by a growing private sector particularly in industrial sectors, employment opportunities and population growth. Thus, it is not surprising as over the years, many economists and researchers are attracted to study growth theory as it has important implications for the creation of economic development. Economic growth can be defined as along-term expansion of the productive potential of the economy.Moreover, private investment is also believed to play a prominent role as an engine of economic growth.

Thus, the study of the topics of growth and investments are important both in the aggregate and micro-level. In aggregate level, identifying the determinants of economic growth is important to help the country grow rapidly. Understanding the determinants of economic growth is the key to understanding how to increase the standard of living of the people in the country. At the same time, fiscal and monetary policies play a vital role to foster economic growth. Growth is also supported by the social and institutions quality to ensure that the country reaches the concept of economic development. The existence of uncertainty in the economy has to be given more attention as it affects economy activities in the aggregate level as well as the micro level. In micro level (particularly at firm level), the firms' growth is also a vital issue as firms that grow rapidly indicate that they have the capability to increase revenues and to remain in business activities over a sustained period. The growth of firms is not only determined by the number of employees but has also been determined by its financial factors. Therefore, the focus has to be given on this issue as firms play an important role to foster aggregate economic growth and eventually to achieve the concept of economic development.

Based on the above environment, this dissertation consists of five chapters with themain focus on the three empirical chapters in Chapter 2, Chapter 3 and Chapter 4. These three empirical chapters examine the determinants of growth and investment at both macro and firmlevels. The structure of this dissertation starts by the introduction in Chapter 1. It is followed by Chapter 2 which presents the re-investigation at the macroeconomic level. The focus on this chapter is the effectiveness of government and institutions to determine economic growth. Next,

Chapter 3links the issue at the macro level with the issue at firm level. Precisely, Chapter 3 identifies the response of firm investment to macroeconomic uncertainty and debt holding. Chapter 4 focuses specifically on the issue in firm level and the focus is on the effect of financial factors on firm growth. Finally, Chapter 5 covers the conclusions for this dissertation which provides a summary and discussion of overall findings as well as policy implications. The discussion below explains more on Chapter 2, Chapter 3 and Chapter 4.

Chapter 2 is inspired by the recent empirical findings pointing towards an ambiguous effect of government size on economic growth. Some suggests the ambiguous relation between government size and economic growth exist because of non-linearity between them. Thus, it motivates this chapter to re-examine this issue using a recent dataset that covers developed and developing countries. Besides, recent literatures suggest the importance of institutions to foster economic growth. They argue that economics alone cannot fully explain the variance across countries in growth and more generally in economic outcomes and policy choices. It motivates this chapter to address this issue as well.

The main objectives in this chapter are:

i. To re-examine the effectiveness of government size and institutional quality on economic growth in developed and developing countries.
ii. To test the hypothesis suggested by Armey (1995) who states there exists a non-linear relationship between government size and economic growth.
iii. To identify which channels of institutional quality promote economic growth. The quality of institutions cover four components namely corruption, bureaucracy, democracy and law and order.

This chapter contributes to the literature by providing recent evidence regarding the relation between government size, institutions and economic growth. It also takes into account the issue of a non-linear relationship between government size and economic growth thathas been hypothesized by previous researchers such as Armey (1995) and Giavazzi et al. (2000). Also, this chapter contributes to the literature by providing the specific channels of institutions that determine economic growth. Moreover, this chapter estimates the model using recent econometric estimation methods (GMM panel estimator).

In Chapter 3, the focus is on the issue of the effect of aggregate uncertainty on firm investment for a study case in Malaysia. Firm investment has been chosen to focus on as investment particularly from the private sector plays a vital role to stimulate economic growth. Economic theory also suggests that uncertainty plays an important role in determining the value maximization level of firms' investment. Firms become more cautious during an uncertain business environment. Furthermore, it has been assumed that macroeconomic uncertainty has an impact on the financial structure of the firm in real terms. Theoretically, uncertainty in the nominal interest rate because of the high volatility in the inflation rate will lead to a higher interest rate burden. Firm investment will be reduced as the interest rate burden increase. In firm financial structure, a higher interest burden will lower the real value of debt. Thus, it gives the firm an incentive to invest as long as the reduction of the real value of debt exceeds the increase in the interest burden.

Based on the above issue, this chapter focuses on firms in Malaysia as one developing country and tries to answer the questions below:

i. How do firms' investments respond to aggregate uncertainty particularly the market interest rate and debt in Malaysia?
ii. Is there any relations between the cross effect of the market interest rate uncertainty and debt holding on firms' investment?
iii. Does there exist heterogeneity in firms' investment in response to aggregate uncertainty and debt holding particularly for high- and low-indebted firms?

This chapter contributes to the literature for the issue of firm investment, uncertainty and debt particularly for developing countries and specifically for Malaysia. Previous studies, such as Driver and Moreton (1991), Bo and Sterken (2002) and Baum (2010) focus more on developed countries. Thus, the findings in this chapter will identify the firm investment behaviour under uncertainty in developing countries. Moreover, this paper extends the literatures for the issue of the joint impact of aggregate uncertainty and financial structure of firms (based on the debt holding of firms) on firm investment. Based on the author's best knowledge, there is no previous work that has been done for this issue in developing country.

Chapter 4 examines the relation between firm growth and its financial factors in Malaysia. Previous studies have been done to examine the determinants of firm investment. Other studies, on the other hand, have been implemented by focusing on

the issue of size and firms' growth. Based on this issue, small firms grow faster and rapid than large firms as large firms usually are more established. However, recent studies start to focus on the issue of firms' growth and its determinants particularly for firms in developed countries, for examples in Guariglia et al. (2011), Rahaman (2010) and Carpenter and Peterson (2002). Inspired by the work of Fazzari (1988) who studies the determinants of firms' investment, this chapter extends the empirical evidence on the issue of firms' growth and its financial factors in Malaysia as one developing country.

The aims in this chapter are:

i. To investigate the effect of financial factors on firm growth in Malaysia.
ii. To identify the existence of heterogeneity on the effect of financial factors on firm growth for large and small firms.
iii. To examine the relation between financial factors and firms growth for four main sectors, namely consumer products, industrials products, property and services.

The contribution of this chapter is the extension of the empirical evidence on the issue of firms' growth to developing countries. Specifically, this chapter contributes to the literature on firms' growth in Malaysia. As noted, many previous studies of this issue focus more on developed countries.

2. ECONOMIC DEVELOPMENT: DO GOVERNMENT SIZE AND INSTITUTIONS MATTER?

2.1 Introduction

Do government size and institutions play important roles in economic development? The role of government size in the economy has been debated in economic theory for a long time. The objective for this study is to re-examine the issue of the impact of government size and institutional quality on economic development. Specifically, this study identifies the channels to foster economic growth using recent dataset from developed and developing countries. This chapter also examines the hypothesis that suggested by Armey (1995) and Barro (1990) about a non-linear relationship between government size and economic growth. Also, it seeks to identify which channels of institutional quality promote economic growth. Using recent data for the period 1984 to 2008, this study tries to find the answer for this question using recent estimation techniques. Furthermore, the main findings will be checked for robustness.

Theoretically, there are two opinions regarding the role of government size in the economy. Neoclassical economic theory states that government plays an important role as a policy tool to foster economic growth. They argue that the participation of government in the economy helps to correct short term cyclical fluctuations in aggregate expenditure as well as providing the facilities to the private sector to do more investment. In other words, the participation of government in the economy gives a positive effect on both productivity and growth. It is supported empirically by Ram (1986) who finds that there exists a positive relationship between government expenditure and economic growth.

There is also the view that suggests that the government affects the economy negatively. There are two reasons to support this argument. First, some argue that government operations are often conducted inefficiently. As a result, it reduces the overall productivity of the economic system. Second, the excessive government expenditure that usually accompanies a high taxation level will distort economic incentives and results in suboptimal economic decisions. This explanation has been

discussed for example in Barro (1990). Barro (1991) reports that for a cross-section of ninety eight countries between the years 1960 and 1985 increases in the size of government measured as a percent of national income reduce per capita growth. This finding supports the argument about negative impact of government size in economies. Folster and Henrekson (2001) find that the relationship between government expenditure and output growth is negative in rich countries. This finding reveals that the role of government expenditure in developed countries is small or negative in affecting output growth.The small role of the government sector reflects the greater efficiencies resulting from fewer policy induced distortions such as those resulting from a high tax burden.However, there are some views that state that there exists a non-linear relation between government size and economic growth, for examples Armey (1995) and Giavazzi et al. (2000). Armey (1995) suggests a Laffer curve to explain and to hypothesize a non-linear relation between government size and economic growth known as the Armey curve. According to the hypothesis, over-expanding on the government size will lead the crowding out effect to private investment and finally will affect economic growth.

Besides, modern economic theory introduces the role of social capital in economic development. Woolcook and Narayan (2000) explain the concepts of social capital which offers a way to bridge sociological and economic perspectives and to provide potentially richer and better explanations of economic development. It includes the role of institutions to generate development in the economy. Institutions play a vital role and act as an important determinant to economic growth. Institutions can be defined as the rules of the game in a society which the interaction among the society's members will shape the behaviour of agents in economics. The good quality of institutions contributes to greater productivity in the economy. Moreover, Acemoglu et al. (2005) and Acemoglu and Robinson (2010) also explain the importance of institutions to promote long run growth. This argument is supported by the findings of, for examples, Demetriades and Law (2006) and Knack and Keefer (1995). Institutional quality can be measured by the low level of corruption and bureaucracy as well as the good performance of the democracy and law in the country.

The good quality of institutions and the contribution of government to generate the economy in the country will help the economy to grow rapidly and easily. Finally, the good performance of the economy will benefit the people in terms of increasing the standard of living. However, how do the institutions and government perform in the real world particularly in the recent years? Is there any limitation for government to involve in the economy? The motivation in this chapter arises from the

above discussion. Even though the issue of relation between government size and economic growth has been discussed for many years, it is still interesting to re-visit this issue using recent data and estimator. Furthermore, the discussion on the issue of institutions and economic growth will also be focused on this chapter.

As mentioned above, this chapter re-visits the issue of relation between government size, institutional quality and economic growth. The findings in this chapter could contribute to the literature in this issue and to help policy makers to identify recent relation between government size, institutions and economic growth. It is important for policy makers to design the fiscal policy in terms of the presence of government in the economy and to maintain the good quality of institutions for both developed and developing countries. As stated, this chapter uses the recent dataset and recent techniques (GMM estimator) to estimate the model. The GMM estimator used in this chapter has several advantages such as it captures the issue of weak exogeneity or endogeneity in the explanatory variables and controls the country specific effects that arise in the panel data model. Moreover, this chapter uses four indicators for institutional quality namely corruption, bureaucracy quality, democratic accountability and law and order. Thus, it makes this chapter differs from previous studies as institutional quality covers four sub-components above while previous studies focus on a certain component of institutional quality for example Plümper and Martin (2003).

The rest of this chapter is structured as follows. Section 2.2 reviews the existing literature on government size, institutions quality and economic growth. Section 2.3 explains the relation between government size, institutions and economic growth. Section 2.4 shows the estimation procedures. Section 2.5 reports the empirical results and the analysis. Section 2.6 is the conclusion.

2.2 Literature Reviews

There is a substantial theoretical as well as empirical literature on the relationship between economic growth and government variables. It is worth noting that there are three main instruments that are always used to measure government size which are taxation, expenditure and the aggregate budgetary balance. In the neoclassical growth model of Solow (1956), the role of fiscal policy is consigned as one of determining the level of output rather than the long-run growth rate. The fiscal policy can affect only the transition path to the steady state. The steady state growth is driven by the exogenous factors of population growth and technological progress. By contrast, Barro (1990) introduce endogenous growth model who provide mechanisms by which fiscal policy can determine both the level of output and the steady state growth rate.

The relation between government size and economic growth is ambiguous. There are persuasive arguments for both positive and negative impacts on economic growth. The government size could affect economic growth positively by providing the facilities and infrastructures and by solving the problem such as the market failure in the economy. In most countries, particularly in developing countries, government expenditure as a proxy for government size is considered to be an important policy tool to promote economic growth. Barro (1990) introduces endogenous growth models and suggests a possible relationship between the share of government spending in GDP and the growth rate of real GDP per capita. In addition, public services are considered as an input to production which indicates a possible linkage between the size of government and economic growth. He finds a positive relation between productive public spending on economic growth as long as the public sector's efficiency higher than its size and burden. Ram (1986) also finds that the government size affects the economy positively. In his study, Ram (1986) derived an equation for economic growth from two separate production functions that consist of the government sector and non-government sector. He finds that the government size gives a positive impact to the economy through its roles in harmonizing conflicts between private and social interests. His findings have important implications especially in regard to the economic development of the low- and middle-income developing countries by its larger role in these countries. Besides, Ghali (1998) studies the dynamic interactions between government size and economic growth in 10 OECD countries. Using multivariate cointegration techniques that cover the period 1970:1 – 1994:3, the results show that government size Granger causes growth in all countries

studied with some disparities concerning the proportion by which government size contributes to explaining future changes in the growth rates.

On the other hand, there is also the argument which states a negative relation between government size and economic growth. It happens through inefficiency of government in the economy as well as the excess burden that have to be faced by the government. This argument has been supported by the previous studies such as Landau (1985) and Levine and Renelt (1992) and James (1997). Besides,Dar &AmirKhalkhali (2002) argue that expanding government size has the effect of a decreasing return of government expenditure. Over involvement of government size will cause a crowded effect to private investment. Furthermore, government expenditure often turns into inefficient expenditure which will cause a distorted allocation to the resource. When spending government expenditure, a government requires more income (taxes) to support the expenditure. However, excess spending of taxes will damage the economy.

Based on the argument above, Sheehey (1993) explains that there might be a non-linear relationship between government size and economic growth. Sheehey (1993) finds that when government size smaller than 15 percent, its affects to economic growth is positive. However, the impact is a negative when government size larger than 15 percent. Furthermore, Giavazzi et al. (2000) also indicate the possibility that fiscal policy may have non-linear effects in the economy. Then, Armey (1995) proposes the Laffer curve which indicates the existence of non-linear relationship between government size and economic growth. This curve, named the Armey curve considers that government size has a function to protect private property and provide public goods. However, over-expanding on the government size will lead the crowding out effect to private investment and finally will affect the productivity in the economy. It is worth noting that the moderate participation of government is important to provide public goods while in excess it is bad and negatively impact on productivity.

Chen and Lee (2005) summarize the measurements of government size that have been used in the literature. It includes, total government expenditure, net investment expenditure, government consumption expenditure, government non-production expenditure and health care as well as education expenditures. All these variables are as a ratio to GDP.[1] It can be explained that, most of the government size measurement gives ambiguous relation on economic growth. However, a government size tends to

[1] For more details, please refer to Chen and Lee. 2005. Government size and economic growth in Taiwan: a threshold regression approach. Journal of Policy Modelling, 27, 1051-1066.

give a positive impact on economic growth when it is measured by productive expenditure such as investment expenditure and education as well as health expenditure.

Concerning institutional issues, Acemoglu et al. (2005) and Acemoglu and Robinson (2010) discuss the role of institutions as a fundamental cause of long run growth. They state that the differences in institutions are the main cause of differences in economic development. Moreover, Knack and Keefer (1995) examine the relationship between institutional indicators such as property rights, bureaucracy quality and political stability and economic growth for the period 1974 to 1989. The result indicates there is a positive relationship between institutional indicators and economic growth. Dawson (1998) outlines the alternative channels through which institutions affect growth and studies the empirical relationship between institutions (which is measured by political, civil and economic freedom), investment and growth. They study datasets for cross country and panel data that cover the period from 1975 to 1990 based on the Cobb Douglas production function model. The results show that institutions affect growth indirectly by stimulating investment. It also effect growth directly through total factor productivity. While, the empirical results show that economic freedom has a significantly positive impact on growth. Demetriades and Law (2006) study the impact of institutions and finance in the economic growth. They also find a positive relationship between institutions and growth.

Plümper and Martin (2003) examine the issue of institutions and growth by developing a political economic argument for inverse u-shaped relation between the level of democracy and economic performance. Rodrik, Subramaniam and Trebbi (2004) estimate the contribution of institutional, geography and trade in determining income levels for many countries. They use rule of law as an indicator for institutions and find that the institutional quality trumps trade integration and geography

Based on the above literatures, this chapter attempts to re-examine this issue covering developed and developing countries and using recent dataset. The recent finding is very important particularly for policy makers either in developed or developing countries. Current economies show that many countries in the world face the economic problem including the economic recession, increasing in unemployment rates and inflation rates. Thus, it needs the government involvement by increasing government spending in many ways such as by providing the facilities and subsidies to people. For that reason, it is crucial to study recent relation between government size and economic growth and taking into account the impact of institutions on

economic growth. Moreover, the measurement of institutional quality in this chapter differs with previous paper which makes this chapter more interesting.

2.3 Government size, institutional quality and economic growth

The importance of government size on economic growth has been discussed by many researchers; however, the conclusion is ambiguous. Interestingly, recent studies find the possibility of a non-linear relationship between government size and economic growth. Early studies in economic growth, particularly the neoclassical economic growth such as Solow model introduced by Solow (1956) states that long term economic growth is exogenous (or zero), thus government decisions are ineffective in the long run. Then, Mankiw et al. (1992) extend the Solow model to include human capital in the growth model.

Barro (1990) proposes the endogenous growth model where government size can permanently change a country's long run rate of economic growth given the absence of diminishing returns to capital. This model assumes all government spending is implicitly productive. Besides, government size is assumed to complement private inputs and it is included in the production function. The model determines that government size plays a vital role in economic growth via its impact on the rate of technological change. The endogenous growth model has been expanded by allowing different kinds of government expenditures to have different impacts on growth. It can be seen for examples in Lee (1992), Devarajan et al. (1996) and Kneller et al. (1999). On the other hand, there is a political economy view which stresses the importance of institutions in economic growth.

Solow (1956) introduces a growth model based on the Cobb Douglas production function as shown in equation (2.1) below:

$$Y_{it} = K_{it}^{\alpha}(A_{it}L_{it})^{1-\alpha} \qquad (2.1)$$

where Y represents the real output, K is physical capital input and L is labour input. While, A represents labour-augmenting factor reflecting the level of technology and efficiency and i as well as t indicate country and time, respectively.It is assumed that

$A_{it} = A_{i0}e^{g_i t}$ which indicates that the level of technology depends on the exogenous rate of technological progress in the country.

Demetriades and Law (2006) augment the Solow model and assume that $\alpha < 1$, i.e. there are decreasing returns to capital. Labour and labour-augmenting technology is assumed to evolve according to the following functions:

$$L_{it} = L_{i0}e^{n_i t} \quad (2.2)$$

$$A_{it} = A_{i0}e^{g_i t + P_{it}\theta_i} \quad (2.3)$$

where n_i is the exogenous rate of growth of the labor force in country *i*, g_i is the exogenous rate of technological progress in country *i*, P_{it} is a vector of variables that may affect the level of technology and efficiency in country *i* at time *t*. It includes the government size and institutions quality. While, θ_i is a vector of coefficients related to these variables. In this model, it is assumed that the technological index, A_{it} depends not only on exogenous technological improvement, determined by g_i (as in traditional approach assumes) but also on the level of government size, the institutional quality of the country and other factors. Eventually, the productivity in the economy is assumed as a function of a vector of the factors that may affect the level of technology and efficiency in country *i* which may change over time which include the quality of institutions and so on, capital stock and the exogenous technological growth rate of output.

Previous studies have shown that government size affects the economic growth and productivity negatively. It can be seen as in Landau (1985) and Dar and Amir Khalkhali (2002). However, Duggal et al. (1999) argue that government size affects the productivity positively. They use government size as part of the technological constraint that determines total factor productivity. By increasing the technological index, additional government size shifts the production function upward and enhances the marginal products of the factor inputs. Re-examining the causality between government size (fiscal policy) and economic growth will be more interesting. Moreover, the institutional quality is also assumed to affect economic growth and productivity positively such as less corruption in the country will encourage labor to work more without any stress. Besides, good quality of institutions also ensures that labour can be used for productive purposes, instead of being wasted in dealing with red tape and rent-seeking activities. In other words, the technological improvements in

the economy are encouraged by the efficiency of government size and the quality of institutions in the country.

This chapter has been motivated by the Solow growth model and its augmented version above to study the effect of government size and institutional quality on economic growth. Equation (2.4) depicts the specification model for this chapter.

$$y_{it} = \beta_0 + \alpha y_{it-1} + \beta_1 CAPITAL_{it} + \beta_2 OPEN_{it} + \beta_3 GOV_{it} + \beta_4 INST_{it} + \eta_i + \lambda_t + \mu_{it} \quad (2.4)$$

with y is the growth of GDP per capita, y_{it-1} is the logarithm of GDP per capita at the last period (as the initial income for the country), *CAPITAL* represents capital stock in the country *i, OPEN* indicates trade openness which is measured by the ratio between total export and import to GDP, *GOV* is government size which is measured by the general government consumption expenditure to GDP ratio and *INST* shows the institutional quality in the country *i*. The error term in equation (2.4) is assumed to follow two way error components and it is constructed from three components which are η_i indicates an unobserved country-specific effect, λ_t is time specific effect and μ_{it} is the error term. It can be re-written as $\varepsilon_{it} = \eta_i + \lambda_t + \mu_{it}$. The country-specific η_i reflects the differences in the initial level of efficiency among countries include the differences in the technology in the economy.

Based on the equation (2.4), y_{it-1} is included to capture the convergence effect on economic growth. The neoclassical growth model implies that if two economies have the same preferences and technology, the poorer economy will tend to grow faster in per capita income terms. Income converges to its steady state level at the same rate as capital. In other words, it can be explained that the growth of income is a function of the determinants of the steady state level of income (which include government size, institutional quality and trade openness) and the initial level of income. Moreover, trade openness is included in the specification model as it is assumed that trade openness affect technology positively. The theory of comparative advantage states that international trade enables a country to specialize using its comparative advantage. Thus, it encourages a country to get benefits from the international exchange of goods and technology transfers. From the equation (2.4), it is expected that all explanatory variables give a positive effect on economic growth, while the initial level of income is negatively related to the rate of per capita income

growth. A negative coefficient on the initial income would be evidence of convergence of income per capita across countries.

Equation (2.4) is extended as shown in equation (2.5) to identify a non-linear relationship between government size and economic growth. Equation (2.5) can be expressed as follows:

$$y_{it} = \beta_0 + \alpha y_{it-1} + \beta_1 CAPITAL_{it} + \beta_2 OPEN_{it} + \beta_3 GOV_{it} + \beta_4 INST_{it} + \beta_5 GOV^2 + \eta_i + \lambda_t + \mu_{it} \quad (2.5)$$

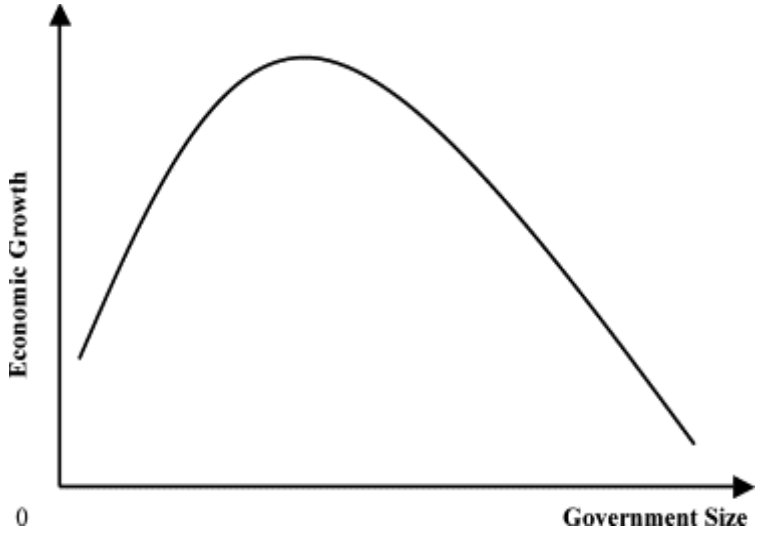
The squared government size *(GOV^2)* is added in the equation (2.5) which indicates that the squared value increase faster than the linear term. Armey (1995) argues that the existence of the squared government size signals the presence of negative effects of government size after exceeds the optimum level and produces the downward-sloping in the relationship between government size and economic growth. Furthermore, it is also assumed that the effect of *GOV* is a positive in the economic growth which indicates the presence of government in the economy gives a positive impact as long as it is not exceed the optimum level. Besides, the endogenous growth model of Barro (1990) also explains that the large size of government in the economy (for example by increasing the tax rate) leads to decrease the output growth rate. On the other hand, the small size of government such as the small level of government expenditure in the economy tends to increase the growth rate. It shows that government size have to be identified optimally to foster economic growth. Furthermore, Barro (1990) identifies that the productive government spending affects economic growth positively as long as the public sector efficiency higher than its size and burden. The nonproductive government expenditure tends to lower the economic growth. This effect arise because a higher share of nonproductive government expenditure in the economy leads to a higher income tax rate and eventually decreases the economic growth. It can be seen that Barro (1990) arguments show the relation between economic growth and government size as non-linear as well. Figure 2.1[2] shows the Armey curve proposed by Armey (1995) who supports Barro (1990).

From the equation (2.4) and (2.5) above, β_1, β_2, β_3 and β_4 are expected to give a positive impact on economic growth. On the other hand, β_5 is expected to give a

[2]Source of figure is from Chen.& Lee (2005)

negative impact on economic growth. The positive sign of government size and institutional quality imply that the effectiveness and the efficiency of government size as well as a good quality of institutions to enhance the technology in the economy and eventually to foster economic growth in the country. A negative sign of the squared government size implies that after certain level, the excessive of government size will affect economic growth negatively.

Figure 2.1 Armey curve



Estimation Procedures

The objective in this study is to re-examine the impact of government size and institutional quality on economic growth. Specifically, this chapter identifies which channels that contributes to economic growth in developed and developing countries. This chapter also examines the impact of the institution components on the economic growth. The dynamic panel data estimation is chosen as the estimator namely the Generalized Method of Moments (GMM) estimator. It is chosen because of several advantages that belong to this estimator. For examples, it captures the issue of weak exogeneity or endogeneity in the explanatory variables and controls the country specific effects as well as allows the inclusion of lagged dependent variable in the model estimation.

This section will discuss more about GMM estimator that has been used to estimate the model specification. However, this chapter starts the discussion with the dataset that has been used and the procedure to detect the potential outliers in the sample.

2.3.1 Data

The data set consists of panel observations for 61 developed and developing countries for the period 1984 to 2008. Annual data on real gross domestic product (GDP) per capita, total population, gross fixed capital formation, general government consumption expenditure, export and import are obtained from the World Bank's World Development Indicators.

Data for real GDP per capita is in natural logarithms and government size is measured by the ratio between government consumption expenditure and GDP. Capital stock is constructed from gross investment figures following the perpetual inventory method. Capital stock at time t is given by:

$$K_t = (1-\delta)K_{t-1} + I_t \qquad (2.6)$$

where K is the capital stock, δ is depreciation rate and I indicates the gross fixed capital formation. Initial capital stocks are calculated using the assumption that over long periods of time capital and output grow at the same rate. The initial capital stock formula can be shown as follows:

$$K_{t-1} = I_t / (g + \delta) \tag{2.7}$$

where δ is assumed to be 6 percent and g is average growth rate of output of the initial five years (Hall and Jones, 1999). Trade openness is measured as a ratio of total export and import to GDP. All data are measured at the constant US prices (2000 = 100).

The dataset on institutions quality indicators is obtained from International Country Risk Guide (ICRG). Four indicators are used to measure the institutional quality namely corruption, bureaucracy quality, law and order and democracy accountability.[3] These indicators are scaled from zero to six where higher values shows the better quality and vice versa. However, the ICRG do not give specific method to calculate the indices for assessing the quality of these subcomponents of institutions. Generally, these subcomponents are taken from the political risk ratings that have been collected by the ICRG staff. The highest number of points is indicating the lowest potential risk and the lowest number (0) is indicating the highest potential risk. The lowest potential risk means a best quality of this component and vice versa. Thus, the institutions quality indicator is obtained by summing the score from variables above. Corruption can be identified when the officials are likely to demand special payments and it is illegal. Bureaucracy quality is measured through the autonomy from political pressure and strength and expertise to govern without drastic changes in policy or interruptions in government services. Law and order indicates the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. Finally, democracy accountability represents the responsiveness of government to its people on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society. The list of countries examined is given in Appendix

[3]The measurement of institutional quality differs to Knack and Keefer (1995) and Demetriades and Law (2006). Knack and Keefer (1995) use property rights, bureaucracy quality and political stability to measure the quality of institutions. Demetriades and Law (2006) put another two different indicators which are the risk of expropriation and government repudiation of contracts.

2.1, while Appendix 2.2 gives the more details about the four components of institutional quality that have been used in this chapter which provided by the ICRG.

Figures 2.2 and 2.3 represent the relationship between growth of real GDP per capita and government size as well as growth of real GDP per capita and institutional quality for the sampled countries, averaged over the whole period (1984-2008). In Figure 2.2, many countries studied have a negative relationship between government size and growth except for some countries for example Korea, Botswana, Chile and Malaysia. Korea has the highest output growth rates at 5.82% with government size contributes 15% from the GDP. On the other hand, Namibia has an output growth at 1.28% but the involvement of government is quite large at 24% from the GDP. However, Figure 2.2 also depicts that the government size in most of the countries in the sample contributes to economic growth positively but moderately in range 10 to 25 percent of GDP.

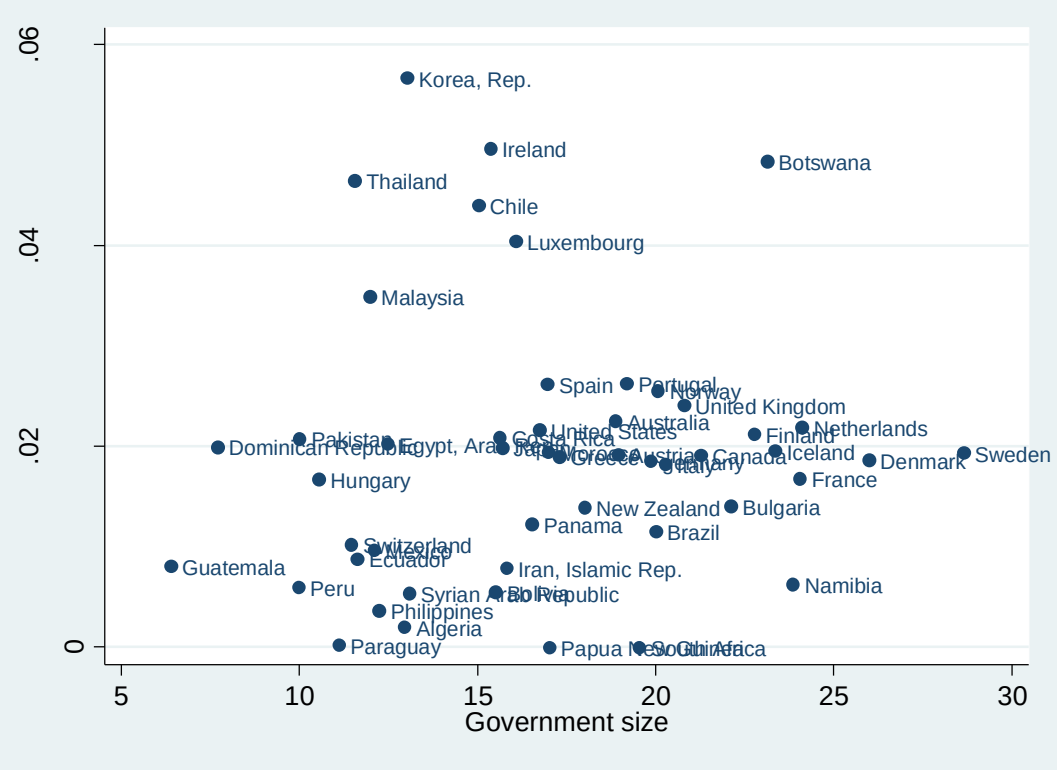


Figure 2.2The relationship between growth and government size

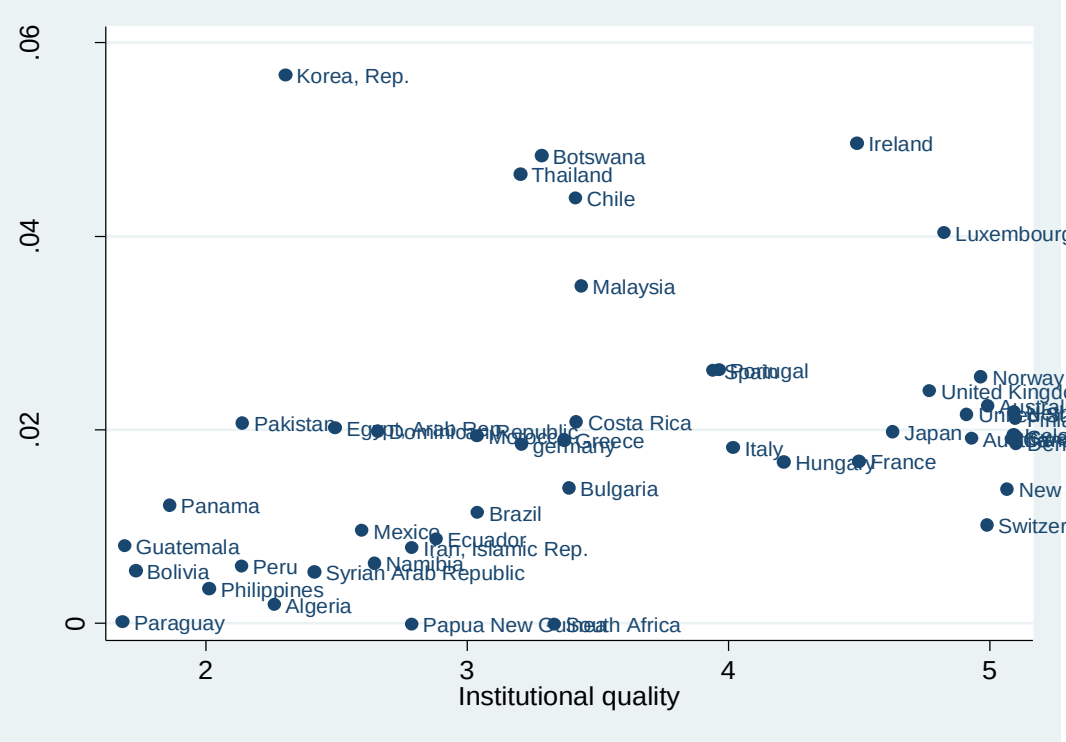


Figure 2.3The relationship between institutional quality and growth

Figure 2.3 indicates the relation between institutional quality and economic growth for countries in the sample. It can be seen that, many developed countries have a good quality of institutions and contribute to economic growth positively. For examples, the United States, the United Kingdom, Japan and other Europe countries depict a good quality of institutions and contribute 2 percent to economic growth, approximately. However, many developing countries have moderate and poor institutions quality. For examples, Paraguay, Bolivia and Guatemala have poor quality of institutions and its contribution to economic growth is very low. On the other hand, Bulgaria, Costa Rica and Malaysia have moderate quality of institutions which contribute to economic growth positively.

2.3.2 Detecting outliers

This chapter implements the DFITS test to detect the potential outliers in the sample. The DFITS test is proposed by Belsley et al. (1980) and can be shown as follows:

$$DFITS = r_i \sqrt{\frac{h_i}{(1-h_i)}} \tag{2.8}$$

where r_i is studentized residual given by $r_i = \frac{e}{\left(s_{(i)}\sqrt{1-h_i}\right)}$ with s_i refers to the root mean squared error (s) of the regression equation with the *i*th observation removed, and h is the leverage statistic. An observation is considered as an outlier if the absolute DFITS statistic is greater than $2\sqrt{k/n}$, where k shows the number of explanatory variables and n is the number of countries.

2.3.3 Generalized Method of Moments Estimator

The estimation method in this chapter is the GMM estimator and it has a number of advantages such as to control the endogeneity of the regressors and to account for unobserved country specific effects as well as allows the inclusion of lagged dependent variable as regressors. Based on the specification model as in equation (2.6), there is potential endogeneity problem in the explanatory variables such as government size and institutional quality. For this reason, the GMM estimator is chosen to estimate the model. The GMM estimator in this chapter is based on Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998).

Arellano and Bond (1991) proposed the first-differenced GMM estimator which can be shown as follows:

$$\begin{aligned}(y_{it} - y_{it-1}) = {} & \beta_0 + \beta_1(y_{it-1} - y_{it-2}) + \beta_2(CAPITAL_{it-1} - CAPITAL_{it-2}) \\ & + \beta_3(OPEN_{it-1} - OPEN_{it-2}) + \beta_4(GOV_{it-1} - GOV_{it-2}) \\ & + \beta_5(INST_{it-1} - INST_{it-2}) + \varepsilon_{it}\end{aligned} \tag{2.9}$$

By transforming the explanatory variables using first differencing, the fixed country-specific effects are removed because they do not vary with time. Arellano and Bond (1991) also suggest that the lagged levels of the regressors are used as instruments to address the possible simultaneity bias of explanatory variable and the correlation between the lag dependent variable and the error term. In this chapter, the government size and institutional quality potentially involve the endogeneity issue. Because causality may run in both directions – from explanatory variables to dependent variable – this regressor may be correlated with the error term. Besides, time-variant country characteristics maybe correlated with the explanatory variables and the presence of the lagged dependent variable $y_{i,t-1}$ give rise to autocorrelation.

Following Arellano and Bond (1991),this chaptersets the following moment conditions:

$$E[y_{i,t-s}.(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for all s } \geq 2\text{; t = 3, ... T} \quad (2.10)$$

$$E\left[CAPITAL_{i,t-s}.\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \text{ for all s} \geq 2\text{; t -3,.....T} \quad (2.11)$$

$$E[GOV_{i,t-s}.(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for all s } \geq 2\text{; t = 3, ... T} \quad (2.12)$$

$$E[INST_{i,t-s}.(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for all s } \geq 2\text{; t = 3, ... T} \quad (2.13)$$

$$E[OPN_{i,t-s}.(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for all s } \geq 2\text{; t = 3, ... T} \quad (2.14)$$

Arellano and Bover (1995) propose the system GMM estimator. The system GMM estimator adds the level equation to obtain a system of two equations which are equations in level and in first difference. Blundell and Bond (1998) support the system GMM and explain a potential problem of first difference GMM estimator. According to Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998), under certain condition the variance of the estimates may increase asymptotically and create considerable bias in three situations. First if the dependent variable follows a random walk which makes the first lags poor instruments for its difference. Second, the explanatory variables are persistent over time which makes the lagged levels weak instruments for their differences. And third, the time dimension of the sample is small. Bond, Hoeffler and Temple (2001) discuss the problem that arises when using first-differenced GMM estimator to estimate cross country growth regressions. They suggest more efficient GMM estimator namely system GMM. By adding the second equation, additional instruments can be obtained. Thus, the variables in levels in the

second equation are instrumented with their own first differences. The additional moment conditions for the second part of the system (the regression in levels) are given by:

$$E[y_{i,t-s} - y_{i,t-s-1}.(\eta_i + \varepsilon_{i,t})] = 0 \text{ for s = 1} \quad (2.15)$$

$$E[CAPITAL_{i,t-s} - CAPITAL_{i,t-s-1}.(\eta + \varepsilon_{i,t})] = 0 \text{ for s = 1} \quad (2.16)$$

$$E[GOV_{i,t-s} - GOV_{i,t-s-1}.(\eta_i + \varepsilon_{i,t})] = 0 \text{ for s = 1} \quad (2.17)$$

$$E[INST_{i,t-s} - INST_{i,t-s-1}.(\eta_i + \varepsilon_{i,t})] = 0 \text{ for s = 1} \quad (2.18)$$

$$E[OPN_{i,t-s} - OPN_{i,t-s-1}.(\eta_i + \varepsilon_{i,t})] = 0 \text{ for s = 1} \quad (2.19)$$

The system GMM in this chapter will use the moment conditions as depicted in equation (2.12) to equation (2.21).[4]This chapter sets the moment condition with assume lagged dependent variable, capital stock and openness as endogenous variables while government size and institutional as predetermined variables. The specification model is estimated using STATA11 and following routine that had been written by Roodman (2009a).

However, there is a proliferation problem in the system GMM. The proliferation problem occurs when there are too many instruments used in the estimation which tends to make some of the asymptotic results about the estimators and related test misleading. Roodman (2009b) argues that too many instruments in the system GMM can weaken the Hansen over identification test and generate results that are invalid to appear valid. Furthermore, numerous instruments also can over fit the instrumented variables and consequently failing to filter out the endogenous component. This will result in biased coefficient estimates. Calderon et al. (2002) and Roodman (2009b) suggest two ways to control the number of instruments in the system. First, they recommend by using certain lags of instruments instead of to put all lags and the second is to collapse the block of the instrumental variables matrix to reduce and to alleviate problems induced by the proliferation of instruments.

[4] In order to identify a non-linear relation between government size and economic growth, this chapter adds additional moment conditions as follows: $E[GOV^2_{i,t-s}.(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$ for all s $\geq$ 2; t = 3, …… T for first difference GMM and $E[GOV^2_{i,t-s} - GOV^2_{i,t-s-1}.(\eta_i + \varepsilon_{i,t})] = 0$ for s = 1 for regression in level.

It is worth emphasizing that the GMM estimators are typically applied in one-step and two-step variants as explained in Arellano and Bond (1991). The one-step estimators use weighting matrices that are independent of estimated parameters, while the two-step GMM estimator uses the optimal weighting matrices in which the moment conditions are weighted by a consistent estimate of their covariance matrix. This makes the two-step estimator asymptotically more efficient than the one-step estimator. However, Bond (2002) points out that the results from one-step estimator are more favorable than two-step results. His argument, based on simulation analysis, it shows that the two-step GMM estimation is less efficient when the asymptotic standard error tends to be too small or the asymptotic t-ratio tends to be too big. Windmeijer (2005) also shows that the two-step GMM estimation with numerous instruments can lead to biased standard errors and parameter estimates. However, this chapter applies one-step system GMM to estimate the specification model.

The consistency of the GMM estimator depends on the validity of the assumption that the error terms do not exhibit serial correlation and on the validity of the instruments. There are two specification tests that can be used to identify the unbiased and consistent result from GMM estimator. The first test is the test for existence of second order serial correlation (AR(2)) for the error term in difference equation such that $E(\Delta\varepsilon_{it}\varepsilon_{it-2})=0$. Baltagi (2005) argues that the AR(2) test is very crucial to identify the consistency of the GMM estimator. Failure to reject the null hypothesis indicates there is no second-order correlation in the estimated model. The second test is the J statistic of Sargan/Hansen test of over-identifying restrictions. The J statistic is distributed as χ^2 with degree of freedom equal to the number of over-identifying restriction;$L - K$ (number of instruments minus the number of independent variables). Under the null hypothesis of joint validity of all instruments, the empirical moments have zero expectation. A rejection of the null hypothesis implies that the instruments are not satisfying the orthogonality condition.

2.4 Empirical results and analysis

In this section, this chapter reports and discusses the empirical results of the effectiveness of government size and institutional to promote economic growth. Table 2.1 indicates the results for the impact of government size and institutional quality on economic growth. It also reveals the results for a non-linear relation between

government size and economic growth. Table 2.2 and Table 2.3 show the results for the specific effect of institutional components. Table 2.4 indicates the results for robustness checking by using first difference and two-step system GMM estimator.

2.4.1 Detecting the outliers

As explained in the Section 2.4.1, this chapter begins the estimation by detecting the outliers in the sample using DFITS test. The sample in this chapter consists of 61 countries in the world for the period 1984 to 2008. These countries have been used as the sample after checking the availability of the all data required. Based on the DFITS test, five countries appear as outliers in the sample namely; China, India, Paraguay, Korea and Cote d'Ivore.[5] Figure 2.4 and Figure 2.5 depict the scatter plot of leverage vs normalized residual squared and residuals vs fitted values, respectively. It can be seen that both figures support the result from DFITS test.

[5] Detecting the outliers is also performed by Cook's Distance test and the results reveal that the numbers of outliers are consistent with DFITS test with the same countries. Appendix 2.2 presents the theory of Cook's Distance briefly.

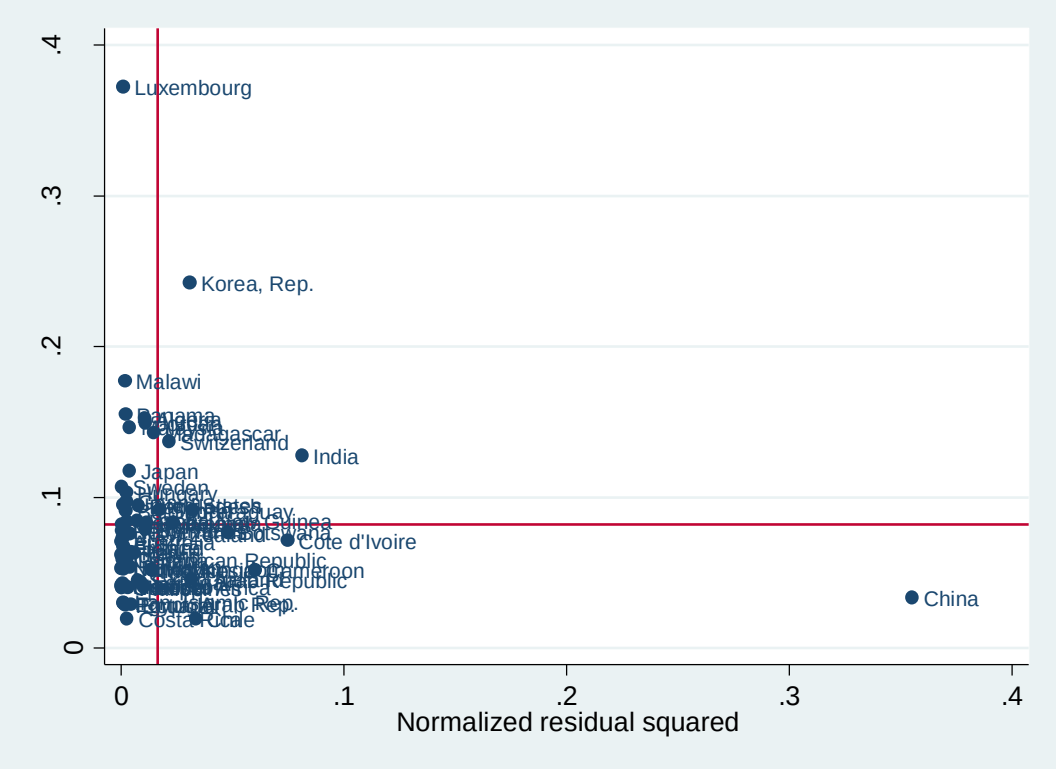


Figure 2.4Scatter plot leverage vs residual

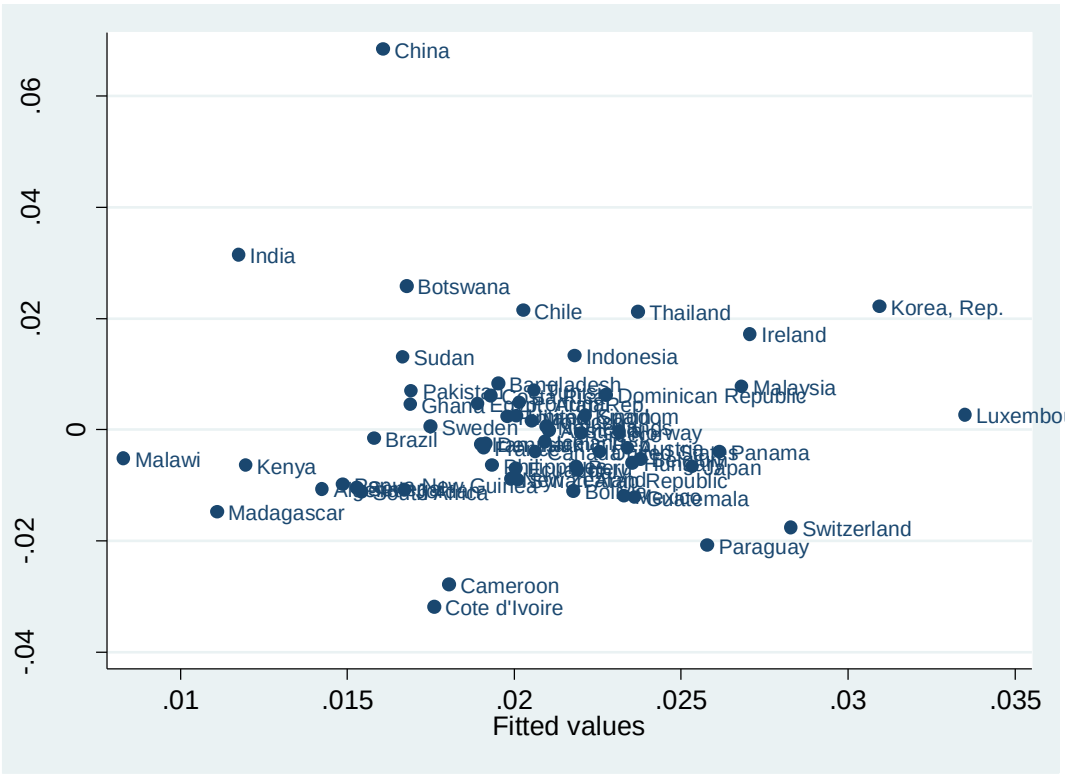


Figure 2.5Scatter plot residuals vs fitted values

2.4.2 The GMM estimator results

In this section, this chapter reveals the results for the impact of government size and institutional quality on the economic growth using the one-step system GMM estimator. The results are reported in Table 2.1, Table 2.2, Table 2.3, Table 2.4, Table 2.5 and Table 2.6. Table 2.1 consists of four models namely Model 1, Model 2, Model 3 and Model 4. Model 1 reports the result for the impact of government size on real GDP per capita without institutional quality variable in the estimation model. On the other hand, Model 2 reveals the result by excluding the impact of government size on the specification model. It followed by the Model 3 which reports the result by putting all explanatory variables in the estimation model and lastly Model 4 which shows the report for a non-linear relationship between government size and the productivity in the economy. It followed by Table 2.2 and Table 2.3 which report the results for the

subcomponents of institutional quality. Table 2.4 and Table 2.5 present the results for the effect of a non-linear of government size and all components of institutional quality. Table 2.6, on the other hand, depicts the robustness results.

The result in Model 1 shows that the government size gives a negative impact on economic growth and statistically significant at 1 percent level. However, other explanatory variables show insignificant impact on economic growth. The results in Model 1 are supported by the two specification tests namely the AR(2) test and the Sargan/Hansen test. These two tests fail to reject the null hypotheses which indicate there is no serial correlation problem in the model and the instruments use in the model is valid. Then, Model 2 shows the results by putting institutional quality variables without government size variable in the model. Model 2 give better result with institutional quality gives a significant and a negative impact on the economic growth. The trade openness also appears with significant effect on the economic growth with positive sign. The AR(2) and the Sargan/Hansen tests depict the supportive evidence that Model 2 is valid without any serial correlation problem in the error term and the instruments are valid.

Next, Model 3 reveals the result by putting all explanatory variables (last period income, government size, institutions and openness) in one estimation model. The result shows that government size remains to give a negative and significant impact on economic growth. It also depicts that the impact of institutional quality is unchanged on economic growth with significant and negative effect. Capital stock also appears to give a positive and significant effect to economic growth. Other explanatory variables are not significant to affect economic growth even though the sign appears as expected (a negative for the initial income and a positive for trade openness).The results in Model 3 are also supported by the AR(2) and the Sargan/ Hansen tests which indicate the rejection of null hypothesis. It means there is no serial correlation problem in the error term and the moment conditions in the model are valid and correctly specified.

Then, Table 2.1 also reports the result for a non-linear relationship between government size and economic growth as depicted in equation (2.5). The result is shown in Model 4 in Table 2.1. The result shows that there exists a non-linear relationship between government size and economic growth. It is depicted by the significant effect of GOV^2 in the estimation model. The GOV variable also appears to give a significant impact on economic growth with a positive sign. On the other hand, institutional quality shows insignificant impact on the economic growth while other

explanatory variables depict as insignificants to economic growth (even though the signs appear as expected). The results in Model 4 are also supported by two specification test; namely AR(2) and Sargan/Hansen tests.

Based on the results in Table 2.1, it can be seen that Model 3 as shown in equation (2.4) give a good explanation of the relationship between government size, institutional quality and economic growth. The negative sign of government size in the economic growth could be explained by existence of inefficiency in the participation of government in the economy. Inefficiency of government size will cause a distorted allocation to the resource and it tends to reduce the productivity in the economy. On the other hand, the negative impact of institutions means that the quality of institutions in the country is not good enough to support and to foster economic growth.

The estimation results as reported above show that government size affects economic growth negatively. The negative relationship between them is contradicted the hypothesis in this chapter. The negative impact of government size on the economic growth implies that inefficient of government to allocate the resources in the economy. For this reason, government participation in the economy has to be determined effectively and efficiently. However, this result is consistent with the crowding out effect hypothesis. Based on the crowding out effect hypothesis, over-expanding government size will lead a crowded effect to private investment. Specifically, if the increase in government spending is not accompanied by a tax increase, government borrowing to finance the increased government spending would increase interest rates, leading to a reduction in private investment. The negative impact of institutional quality on economic growth shows that the existence a bad quality of institutions in the economy. It is also worth noting that the quality of the institutions in the country has to be good enough to promote the economic growth. It means, the good quality of every component of institutions has to be identified to rapid the growth in the country. For examples, the low level of corruption and bureaucracy give the economy to expand rapidly and easily, while the good level of democracy and law will enhance the productivity in the economy.

The results in Model 4 depict that the squared government size gives a negative impact to economic growth. Furthermore, the result for government size also appears as significant with a positive sign. The result supports the arguments of the efficiency of government in the economy which has been proposed by Armey (1995) and Barro (1990). Armey (1995) argues that the excessive level of government in the

economy will reduce the productivity. At the early stage, government acts as a provider for basic needs to the people in the economy. But after certain optimal level, its effect in the economy becomes a negative. In other words, government size does not harm the productivity and indeed even had some positive impact on output. However, it should not exceed the optimum level.

Inefficiency of government size in the developed countries could be explained by the over expense of government to sustain the welfare. For example, subsidies and grant for helping non-working people, poor people and so on. The size of government has to be identified at the optimal level to ensure their efficiency. However, the scenario is quite different in the developing countries. Inefficiency of government size is related to the issue of how government involve to the economy to improve the social welfare. For example, to provide the infrastructure, education and health facilities, to increase the standard of living and finally to ensure the people could contribute to the economic development.

Table 2.1The relation between government size, institutions and economic growth

Explanatory variables	MODEL 1			MODEL 2			MODEL 3[6]			MODEL 4		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
y_{it-1}	-0.107	0.112	0.339	-0.160	0.099	0.106	-0.094	0.116	0.415	-0.197	0.117	0.092
CAPITAL	0.008	0.009	0.388	0.008	0.011	0.433	0.016	0.007	0.027	0.010	0.106	0.923
OPEN	0.002	0.013	0.850	0.036	0.015	0.022	0.017	0.015	0.266	0.008	0.011	0.435
GOV	-0.580	0.168	0.001				-0.489	0.205	0.017	1.086	0.487	0.026
GOV^2										-3.851	1.352	0.004
INST				-0.206	0.067	0.002	-0.113	0.057	0.047	-0.018	0.051	0.723
AR(2) p-value	0.108			0.162			0.147			0.103		
Hansen test p-value	0.138			0.395			0.165			0.114		
No. of observations	1287			1287			1287			1287		
No. of countries	56			56			56			56		

Notes:
The model specification for the Model 1, Model 2 and Model 3 are depicted by equation (2.4), while Model 4 has been estimated by using model specification as in equation (2.5)

This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables, while GOV, GOV^2 and INST as predetermined variables.

The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

[6] Model 3 has been estimated by excluding 5 potential outliers as discussed in Section 2.5.1. Model 3 also has been estimated by excluding two big countries which seems as big potential outliers in the sample. The results are shown in Appendix II with Model 3A reports the result by excluding China only while Model 3B presents the result by omitting China and India in the sample.

2.4.3 Further analysis

In this section, this chapter reports the estimation results for the impact of four components of institutional quality on economic growth. These four components are corruption, democracy, bureaucracy and law and order. It is implemented to identify the specific channels of institutions to foster economic growth. Table 2.2 consists of four models namely, Model 5A, Model 5B, Model 5C and Model 5D. Model 5A and Model 5B report the results by adding corruption and bureaucracy quality in the estimation model, respectively. While, Model 5C and Model 5D represents the results by adding democracy and law and order, respectively.

Based on Model 5A in Table 2.2, it can be seen that government size gives a significant impact on economic growth with a negative sign. The corruption also gives a negative impact on economic growth. However, this result appears as insignificant. Other explanatory variables which are initial income (a negative sign) and trade openness (a positive sign) appear to give insignificant impacts on economic growth while, capital stock gives a significant impact on economic growth with a positive sign. For Model 5B, it shows that government size remains to give a negative and significant impact on economic growth. On the other hand, bureaucracy quality shows a positive and significant impact on economic growth. Capital stock also appears to give a positive impact on economic growth. Other explanatory variables; the initial income (a negative sign) and trade openness (a positive sign) are not significant to foster economic growth.

Model 5C, on the other hand, reports the results by adding democracy quality in the estimation model. The result shows that government size remains to give a negative and significant effect to economic growth. Democracy quality gives a positive impact on the economic growth but it appears as insignificant to promote the growth in the economy. Next, Model 5D presents the result by adding the law and order variable in the specification model. The result shows that government size also gives a negative and significant impact on economic growth. Capital stock also remains to give a positive and significant impact on the growth. The components of institutional quality namely law and order shows insignificant impact on economic growth even with positive sign. Other variables; initial income and trade openness show insignificant impact on economic growth. All results in Table 2.2 are supported by two specification tests namely the AR(2) test and the Sargan/Hansen test. The rejection of null hypothesis for the AR(2) test means there is no second order serial correlation

problem in the error term while, the rejection of null hypothesis for the Sargan/Hansen test indicates that the instruments used in the model are valid. In other words, these two tests show that the models are correctly specified.

Table 2.3, on the other hand, presents the result by putting all components of institutional quality in one specification model. Based on the result, it depicts that government size remains to give a negative and significant effect to economic growth. It is followed by two components of institutional quality namely law and order and democracy quality with positive and significant effect on economic growth. Other explanatory variables which are capital stock and trade openness also affect economic growth significantly and positively while initial income affects the economic growth negatively and it is also significant. Furthermore, the AR(2) test also supports the result by failing to reject the null hypothesis. It means that there is no second order serial correlation in the error term. The Sargan/Hansen test also depicts the failure to reject the null hypothesis which indicates the instruments used in the model are valid and correctly specified.

From the results in Table 2.1, Table 2.2 and Table 2.3, it can be seen that government size consistently gives a negative and significant impact on economic growth. It can be explained that, in recent years, the participation of government in the economy affects the economic growth negatively and supported previous studies for examples in Barro (1991) and Dar and Amir Khalkhali (2002). Furthermore, the effect of institutions on economic growth is also negative. It implies that the quality of institutions in the countries studied as not good enough to promote economic growth. Precisely, it does not help to enhance the technology in the economy. The result for four components of institutional quality shows that corruption affects the economic growth negatively, while other components; bureaucracy, democracy and law and order give positive effects on economic growth. However, the democracy and law and order have significant impact on economic growth, while corruption and bureaucracy are not significant to determine economic growth.

Next Table 2.4 and Table 2.5 report the results for the effect of four subcomponents of institutional quality on economic growth with taking into account the non-linearity of government size as one of the explanatory variable. Table 2.4 consists of four models namely Model 6A, Model 6B, Model 6C and Model 6D, respectively. Model 6A reports that government size and its non-linear effect on economic growth as expected and both of them are significant at 1 percent level. The

results also reveal that initial income and the corruption affect economic growth significantly with expected sign (negative). Model 6B, on the other hand, shows that government size and its non-linearity remain to give significant impact on economic growth as expected. Bureaucracy quality and initial income also give significant effect on economic growth with a positive and a negative signs respectively). In Model 6C, it reports the results by putting democracy alone as a component of institutional quality. Based on the results, it can be seen that democracy is not significant to affect economic growth, while government size and its non-linearity as well as initial income remain to give significant effect on economic growth as expected. The last model which is Model 6D shows that initial income, government size and the squared of government size significantly affect economic growth. These results are unchanged even though the components of institutional quality have been replaced in every model. Interestingly, the capital stock and trade openness are not significant to determine economic growth in all models in Table 2.4.

Table 2.5, on the other hand, reports the results by putting all components of institutional quality as well as the squared of government size in one model specification. Based on the results, it can be seen that the initial income, government size and its squared term as well as law and order give significant impact on economic growth with expected sign (negative). Other explanatory variables namely, the capital stock, trade openness, bureaucracy and democracy are not significant to determine economic growth.

All results in Table 2.4 and Table 2.5 are supported by two main specification tests namely, AR(2) and Sargan/Hansen tests. The model specification fails to reject the null hypothesis for AR(2) test which indicates there is no second order serial correlation problem in the error term. The model also fails to reject the null hypothesis for the Sargan/Hansen test which depicts that the instruments used in the model are correctly specified and valid.

Table 2.2 The effect of components of institutional quality on economic growth

Explanatory variables	Model 5A			Model 5B			Model 5C			Model 5D		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
y_{it-1}	-0.107	0.104	0.303	-0.161	0.108	0.135	-0.120	0.125	0.334	-0.120	0.109	0.271
CAPITAL	0.103	0.033	0.002	0.002	0.001	0.023	0.020	0.007	0.006	0.098	0.030	0.001
OPEN	0.003	0.014	0.814	0.002	0.112	0.985	0.002	0.012	0.867	0.005	0.012	0.663
GOV	-0.547	0.166	0.001	-0.431	0.157	0.006	-0.503	0.154	0.001	-0.626	0.151	0.000
CORP	-0.002	0.003	0.535									
BUREAU				0.077	0.028	0.006						
DEMO							0.002	0.002	0.217			
LNO										0.004	0.003	0.080
AR(2) p-value Sargan/Hansen test p-value No. of countries No. of observations	0.182 0.122 56 1343			0.174 0.145 56 1343			0.114 0.200 56 1343			0.104 0.142 56 1343		

Notes:
The model specification that has been used for Table 2.2 is depicted by equation (2.4)
This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables, while GOV, CORP, BUREAU, DEMO and LNO as predetermined variables.
The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

Table 2.3 The effect of all components of institutional quality on economic growth

Explanatory variables	coefficient	robust st.er	P-value
y_{it-1}	-0.014	0..009	0.012
CAPITAL	0.035	0.013	0.008
OPEN	0.035	0.021	0.092
GOV	-0.490	0.118	0.000
CORP	-0.004	0.039	0.919
BUREAU	0.004	0.007	0.597
DEMO	0.091	0.043	0.035
LNO	0.008	0.003	0.012
AR(2) p-value Sargan/Hansen test p-value No. of countries No. observations	0.671 0.126 56 1343		

Notes:
The model specification that has been used for Table 2.3 is depicted by equation (2.4)
This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables,while GOV, CORP, BUREAU, DEMO and LNO as predetermined variables.
The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

Table 2.4 The effect of non-linearity of government size, institutions and economic growth

Explanatory variables	Model 6A			Model 6B			Model 6C			Model 6D		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
y_{t-1}	-0.212	0.118	0.073	-0.219	0.120	0.069	-0.185	0.102	0.071	-0.202	0.103	0.050
CAPITAL	0.006	0.009	0.470	0.003	0.008	0.649	0.028	0.097	0.772	0.002	0.129	0.985
OPN	0.002	0.010	0.800	0.003	0.011	0.739	0.005	0.011	0.631	0.010	0.994	0.991
GOV	1.270	0.363	0.000	1.329	0.418	0.001	0.882	0.360	0.014	0.788	0.316	0.013
GOV^2	-4.597	1.119	0.000	-4.707	1.207	0.001	-3.339	1.072	0.002	-3.203	0.934	0.001
CORP	-0.007	0.003	0.011									
BUREAU				0.066	0.036	0.064						
DEMO							0.001	0.032	0.967			
LNO										0.003	0.002	0.188
AR(2) p-value Hansen test p-value No. of countries No. of observations	0.125 0.113 56 1343			0.117 0.341 56 1343			0.283 0.134 56 1343			0.273 0.184 56 1343		

Notes: The model specification that has been used for Table 2.4 is depicted by equation (2.5).

This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables, while GOV, GOV^2,CORP, BUREAU, DEMO and LNO as predetermined variables.

The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).

Year dummies and constant are not reported in order to save space.

Table 2.5 The effect of all components of institutional quality and non-linearity of government size on economic growth

Explanatory variables	coefficient	robust st.er	P-value
y_{t-1}	-0.200	0.093	0.032
CAPITAL	0.002	0.116	0.983
OPN	0.001	0.009	0.895
GOV	0.626	0.325	0.054
GOV^2	-2.748	0.967	0.005
CORP	-0.018	0.028	0.510
BUREAU	0.024	0.043	0.569
DEMO	0.009	0.026	0.706
LNO	0.038	0.022	0.094
AR(2) p-value Hansen test p-value No. of countries No. of observations	0.273 0.185 56 1343		

Notes:
The model specification that has been used for Table 2.5 is depicted by equation (2.5)
All variables are as explained in Section 2.4.3
This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables, while GOV, GOV^2, CORP, BUREAU, DEMO and LNO as predetermined variables.
The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

2.4.4 Robustness check

In this section, the robustness checks have been implemented with two tests and focus is given on the specification model as depicted in equation (2.5). Firstly, this chapter estimates the specification model using first-differenced and two-step system GMM estimator. As discussed in Section 2.4.3, the first-differenced GMM estimator has disadvantages particularly when the time series are persistent, while two-step system GMM has also been found to have very modest efficiency gains compared to one-step version even in the presence of considerable heteroskedasticity[7]. However, these two estimators still can be used to check the robustness result in Section 2.5.

Table 2.6The results for first-differenced and two step system GMM

Explanatory variables	First-differenced GMM			Two-step system GMM		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
y_{it-1}	-0.161	0.096	0.094	-0.009	0.012	0.447
CAPITAL	0.060	0.135	0.654	0.031	0.017	0.077
OPEN	0.038	0.419	0.927	0.042	0.024	0.082
GOV	-0.748	0.436	0.086	-0.263	0.188	0.162
INST	-0.484	0.210	0.021	-0.033	0.080	0.677
AR(2) p-value	0.170			0.649		
Hansen test p-value	0.114			0.148		
No. of countries	56			56		
No. of observations	1343			1343		

Notes:
The model specification that has been used for first-differenced estimator is depicted by the equation (2.9), while the results for two step system GMM have been estimated by the equation (2.4). This chapter assumes that y_{it-1}, CAPITAL and OPEN as endogenous variables, while GOV, CORP, BUREAU, DEMO and LNO as predetermined variables.
The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

[7] More discussions can be found in Arellano and Bond (1991) and Blundell and Bond (1998)

Table 2.4 shows the result for the estimation using the first-differenced GMM estimator. It depicts that lagged dependent variable gives a positive effect on the economic growth. On the other hand, government size and institutional quality show negative impact on the economic growth. Other variables show insignificant effect on the growth of economy. The result is supported by the AR(2) and the Sargan/Hansen tests with both tests failing to reject the null hypothesis. It suggests that there is no second order serial correlation in the error term and the model is correctly specified. Besides, Table 2.4 also reports the result for two step system GMM. The finding shows that government size and institutional quality give negative effects on economic growth but they are not significant. Lagged dependent variable also gives insignificant effect on economic growth, while capital stock and trade openness show significant impact on economic growth with positive signs. It is also worth noting that the result using two step system GMM estimator is supported by two specification tests; the AR(2) and the Sargan/Hansen tests. Both tests fail to reject the null hypotheses which indicate that the models are correctly specified.

It is worth noting that the result for first-differenced GMM estimator is quite similar with the result for one-step system GMM estimator in Table 2.1, Model 3. The government size and institutional quality remain to give negatives impact on economic growth and they are significant at least at 10 percent significant level. For other explanatory variables such as lagged dependent variable and capital stock, the results are varied. However, the result using two-step GMM estimator reveals that government size and institutional quality are not significant to foster economic growth even the signs are remained as negatives. It can be concluded that the result in Model 3, Table 2.1 is robust when it is compared with the result from first-differenced GMM estimator.

2.5 Conclusion

The relation between government size and economic growth has been examined previously with mixed results. The conventional economic theory suggests that government size plays an important role to foster economic growth in the country. On the other hand, there are some studies that found a negative effect of government size on economic growth as pioneered by Barro (1990). Interestingly, there are also views that suggest the existence of a non-linear relation between government size and economic growth for examples as suggested by Armey (1995) and Giavazzi et al.

(2000). It can be said that the effect of government size on economic growth is still ambiguous. Recently, the researchers and economists focus also on the issue of the impact of institutions on economic growth. However, many of them only focus on the certain components of institutions.

Based on the above current situation, this chapter re-examine this issue with different sample countries and time period. Specifically, the objectives in this chapter are to re-examine the relation between government size, institutional quality and economic growth. Besides, this chapter also identifies the existence of a non-linear relation between government size and economic growth. Lastly, to identify the specific channels of institutional quality that fosters the economic growth. The findings show that government size and institutional quality affect the economic growth negatively and statistically significant. Recent findings in this chapter contradict the argument that has been described in Section 2.3. However, it supports previous works such as Levine and Renelt (1992) and Dar and AmirKhalkhali (2002).The results also reveal that there exists a non-linear relationship between government size and economic growth which supports the hypothesis proposed by Armey (1995). The results also reveal that for specific channel of institutions, the corruption gives negative impact on economic growth while other components; bureaucracy, democracy and law and order affect the economic growth positively. However, democracy and law and order are only significant to determine economic growth.

The findings give important implications to the policy makers in several ways. First, the presence of government size in the economy has to be decided and be determined in the economy effectively and efficiently. Inefficient government size in the economy tends to distort the allocation of resources. As discussed in Section 2.3, the technology in the economy is also determined by the government size and institutional quality. Thus, the negative relation between government size, institutions and economic growth supports the argument which states that a negative distortion occurs when the government size presence inefficiently. Dar and AmirKhalkhali (2002) argue that the optimal policy does not mean that the size of government should be minimized. However, it is more important for governments to focus their efforts in areas that give them comparative advantage, such as the provision of public goods and human capital development, incentive to innovations as well as by offsetting market failures in the economy. Moreover, the excess level of government size in the economy will affect the private investment through the crowding out effect which finally affects the growth in the country negatively. The policy makers must ensure that the growth in the country is only influenced by the positive externality in the economy.

Besides, the policy makers have also to ensure the good quality of institutions in the country to help promote rapid economic growth. It includes the low level of corruption and bureaucracy as well as the good quality of democracy and the willingness of people to follow law and order. The low level of corruption and bureaucracy tend to distort the economy negatively as the economic agents tend to involve in illegal payments and the administration in the country involves a bad bureaucracy quality. In other words, the harmonization and good environment in the country have to be determined to ensure the economy grows easily and rapidly.At the same time, these developments have broadened the scope of government action for promoting economic growth because of the potentially significant role that governments would have to play in the development and support of a legal and regulatory infrastructure needed to sustain the revolution in information and communications technology.

3. HOW DO FIRM INVESTMENTS RESPOND TO DEBT AND UNCERTAINTY? A STUDY CASE IN MALAYSIA

3.1 Introduction

The impact of debt and uncertainty on firm investment attracts a lot of attention from researchers studying in this issue. However, there is a little attention is given to study the linkage between the twin effects of debt and uncertainty on firm investment. Thus, the objective of this chapter is to investigate the role of uncertainty and debt holding on firm investment behavior. In particular, this study analyses the effect of debt and macroeconomic uncertainty (the market interest rates uncertainty) on firm investment. This study also tries to identify the cross-effect of macroeconomic uncertainty and debt holding on firm investment. In other words, this study attempts to assess the specific channels that affect firm investment in Malaysia. The final objective in this chapter is to identify the heterogeneous effect for two groups firms in Malaysia namely high- and low-indebted firms.

Theory suggests there is a positive relationship between debt and investment which called the signaling hypothesis as introduced by Ross (1977). Myers (1977) introduced the pecking order theory of financing. This hypothesis states that there are three levels for financing a firm's new investment, which are internal funds, to issue debt and as a last resort to issue equity. This implies that costs of debt financing for investment are higher than those of internal funds. Consequently, it affects firm financing decisions to finance their investment. Furthermore, if the firm issues debt, then the debt payback commitment suggests a lower level of liquidity. In imperfect capital markets, a firm that has a lower liquidity will face higher costs of external capital, which discourages investment. Thus, it shows a negative impact of debt financing on firm investment, which contradicts the signaling hypothesis. So it can be said that the relation between debt and firm investment is ambiguous.

There are studies that focus on the relationship between uncertainty and investment theoretically and empirically. Uncertainty can be divided into two categories which are macroeconomics (aggregate) uncertainty and idiosyncratic

uncertainty. Examples for macroeconomic uncertainty are uncertainty in inflation rates, exchange rates and market interest rates, while idiosyncratic uncertainty is proxied by the uncertainty in the productivity, cost of production and so on. Theory also identifies several channels or factors how uncertainty may affect firms' investment. They include the risk attitude of firms towards risk; risk averse or risk takers, and financing constraints that may arise from asymmetries between borrowers and lenders. Generally, the effect of uncertainty on investment shows an ambiguous relation. The traditional literature assumes that the investment is reversible which suggests a positive effect of uncertainty on investment as explained in Richard (1972). Recent literature suggests that investment is irreversible and firms have the option to wait to invest for example in Dixit and Pindyck (1994). The irreversibility and the option to wait could affect investment negatively.

However, many studies on this topic focus more on the developed countries rather than developing countries. For examples, Aivazian et al. (2005), Byrne and Davis (2004), Bo and Sterken (2002) and Baum (2010) study the relation between uncertainty and investment in developed countries. Bo and Sterken (2002) study this issue for the Netherlands, Byrne and Davis (2004) examine the same issue in the United States and Baum (2010) focuses on the United Kingdom. There are a few studies that focus on the developing country, for example, Aizenman and Marion (1999). Their study focuses on the macro-level data and the main objective is to examine the relationship between various volatility measures and private investment in 46 developing countries. In view of limited empirical evidence for developing countries especially at firm level, this chapter will examine the aspect of investment and uncertainty problems in developing countries using a firm-level dataset. Specifically, this chapter studies the impact of debt holdings and uncertainty on firm investment behaviour in Malaysia as one developing country. Focusing on a developing country is important to identify the behaviour of firm investment in this group, as it may have different behaviour with firm investment in developed countries.

The motivation for this study is based on the argument that many firms are financed by equity and debt. When uncertainty happens in the economy it will affect the investment decision directly. Furthermore, the uncertainty also has an impact on the financial structure of the firm in real terms. For example, uncertainty in the nominal interest rates because of the high volatility in the inflation rates will lead to a higher interest rates burden. Higher interest rates burden will lower the firm investment, however, at the same time it also lowers the real value of debt. This gives the firm an incentive to invest as long as the reduction of the real value of debt exceeds the increase in the interest burden. Firms with a high leverage may

experience a positive cross-effect of debt holdings and the interest rates volatility. While, for firms holding a lower amount of debt, the benefits from the reduction of the real debt probably are too low to cover the increase in interest payments.

To achieve the objectives in this chapter, three hypotheses have been made. The first hypothesis states there is a positive relationship between firm investment and debt, while there is a negative relation between macroeconomic uncertainty and firm investment. It is also hypothesized that the cross effect of debt and uncertainty on firm investment is positive for high-indebted firms and negative for low-indebted firms. Consequently, there exists a heterogeneous effect of the interaction between these two variables to firm investment for both groups of firm.

This study contributes to the empirical evidence in the topic of firm investment, debt and uncertainty relationship particularly for developing countries. Furthermore, based on the author's knowledge, there is no study focusing on relationship between firm investment and cross-effect of uncertainty and debt holdings in developing countries. Specifically, this study extents the literature in the firm investment issue in Malaysia as one small open economy. The findings in this chapter can be used as a guideline for the policy makers in Malaysia to make any decisions related with the uncertainty; particularly uncertainty in aggregate level and firm investment.

This chapter is organized as follows. Section 3.2 and 3.3 presents a literature reviews and the theory on this issue. In section 3.4, the estimation procedures and data collection will be discussed. Section 3.5 shows the empirical results, robustness checking and the analysis, while section 3.6 covers the conclusions from the findings.

3.2 Literature reviews

The impact of debt and uncertainty on firms' investment has been studied by many researchers. However, many of these studies have been focused more on the developed countries such as in the United States, United Kingdom and Netherlands as can be seen in Driver and Moreton (1991), Bo and Sterken (2002), Byrne and Davis (2004) and Baum (2010). Theoretically, there are several hypotheses or theories that can be linked to the relationship between debt and firm investment. Based on the signaling hypothesis as introduced by Ross (1977), there is a positive impact of debt on firm investment. The signaling hypothesis states that managers are issuing debt because they are optimistic about future productivity of firm. Therefore debt issuing signals future profitability and it encourages firms to invest more. Myers (1977) introduced the pecking order theory of financing. This hypothesis states that there are three levels for financing a firm's new investment which are internal funds, to issue debt and as a last resort to issue equity. This implies that costs of debt financing for investment are higher than internal funds and it affects firm investment decisions. Besides, if the firm issues debt, then the debt payback commitment suggests a lower level of liquidity. In imperfect capital markets, a firm that has a lower liquidity will face higher costs of external capital, which discourages investment. It indicates a negative relationship between debt holdings and firm investment. It can be deduced that the relation between debt and investment as ambiguous.

There is also the issue of the relation between uncertainty and firm investment. Early models of a positive linkage between investment and uncertainty rely on the assumption that investment is reversible as in Richard (1972). Based on this assumption, as the new information is available, the existence of uncertainty that affects marginal productivity of capital would increase the optimal stock and also investment. It indicates a positive relation between uncertainty and investment. On the other hand, there is an argument which states that there exists a negative relation between uncertainty and investment as they assume investment as irreversible and there exists the option for waiting for examples in Caballero (1991) and Dixit and Pindyck (1994). It can be deduced that the relation between uncertainty and investment is also ambiguous. Caballero (1991) proves that uncertainty has a negative impact on investment if irreversibility is assumed in combination with decreasing returns to scale or imperfect competition. A positive relation exists between uncertainty and investments when the firm is assumed to have constant return to scale and in the perfect competition. It can be summarized that there are several channels how uncertainty affects the investment which includes the risk attitude

against uncertainty and the non-linearity of technology as explained in Driver and Moreton (1991) and Caballero (1991). It is worth emphasizing that uncertainty and investment also has an ambiguous relationship.

It is also worth noting that there are two types of uncertainty that are faced by firms to do the investment. The first is macroeconomic or aggregate uncertainty which includes uncertainty in the inflation rates, the market interest rates; for examples treasury bills or government bond and exchange rates. Beaudry et al. (2001) explained that macroeconomic uncertainty plays a vital role to affect firm investment decisions. They argue that the stability in inflation as well as interest rates improves the efficiency of allocation of resources. Finally, it allows investment to be more effectively channelled to the projects with the highest returns because the best investment opportunities are more easily identified. Driver and Moreton (1991), Byrne and Davis (2004) and Rashid (2011) also find that macroeconomic uncertainty affects investment negatively in the United Kingdom and the United States. The second is microeconomic or idiosyncratic uncertainty which affects the firm investment through the input decisions. Ghosal and Loungani (2000) examine the impact of profit uncertainty on investment using firm data from the United State of America. The findings show that there exists a negative impact of profit uncertainty on firm and a negative impact is substantially greater in industries dominated by small firms. Bo and Sterken (2002) and Bo (2007) also provide evidence that firms' investment is sensitive to idiosyncratic uncertainty.

Based on the literature, there are several ways to measure an uncertainty proxy in the economy. Pindyck (1986) explains that the uncertainty can be measured as in 'Gaussian' standard deviation if the variance is constant over time. Besides, Carruth et al. (2000) and Bo and Sterken (2002) identify several approaches to measure uncertainty proxy. Among them, first, to compute the unconditional variance of a particular price or macroeconomic aggregate which influences returns and about which investors are presumed to be uncertain and to use this as a proxy for risk. Besides, uncertainty proxy is measured by estimating a statistical model of the process such as Autoregressive Conditional Heteroskedasticity (ARCH) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) to determine the conditional variance of the price level or other aggregates and use this as a proxy for uncertainty. [8] Furthermore, Carruth et al. (2000) concluded that there is no consensus about the appropriate way to proxy uncertainty in an empirical formulation.

[8] For further discussion, please refer to Carruth et al. 2000. What do we know about investment under uncertainty?Journal of Economic Surveys, 14(2), 119-153

Besides, the study in the issue of uncertainty and firm investment will be more interesting when the researcher tries to find the linkage between the uncertainty and the financing resources for the firms, for example, in Bo and Sterken (2002). They identify the interaction effect between idiosyncratic uncertainties; measured by the uncertainty in firm interest rates and debt holdings on firm investment. They find that firm investment responds negatively to the cross effect between idiosyncratic uncertainty and debt holding particularly for high leverage firms.

In fact, many previous studies have been mostly restricted to the United States, United Kingdom and other developed countries. Based on the author's knowledge, the study on this issue for developing countries is still limited. For example, in macroeconomic or aggregate level, Aizenman and Marion (1999) examine the linkage between uncertainty and investment using aggregate data for developing countries. They find that the effect of uncertainty on investment might be more significant in developing countries than in developed market economy. The macroeconomic volatility may be higher because production and trade are less diversified. Moreover, less developed financial markets limit individual agents' opportunity for insuring against idiosyncratic risk. Besides, since incomplete markets in developing countries may make investment less easily reversible, the effect of uncertainty on investment may be more marked than in developed countries. In microeconomic level, on the other hand, Driffield and Pal (2001) study the behavior of corporate investment and financial constraint in four East Asian countries which are Indonesia, Korea, Malaysia and Thailand particularly during the crisis period. Using a dataset for the 1990s, this study finds that a large number of firms in the study depend on cash flow to finance their investment.

Based on the literatures discussed above, this chapter attempts to extent the literatures on this issue by investigating the behavior of Malaysian listed firms as response to debt and uncertainty. Uncertainty in this chapter will be focused on the macroeconomic level instead of the disaggregate level. It is well-known that Malaysia is a rapidly growing a developing country. Certainly, Malaysia faces many challenges and uncertainty to sustain its growth. For example, in 1997 and 1998, Malaysia faced the financial crisis that affect firms' activities including investment decisions. This financial crisis had slowed down the economic activities that involve the private sectors as well as the government. Thus, it is important to identify the effect of uncertainty on firm investment in this country. Besides, this chapter also analyse the behavior of firm investment for two groups of firm namely high- and low-indebted firms. The splitting these two groups will help to identify the heterogeneity between them as responses to debt holdings and macroeconomic uncertainty.

3.3 Theory of investment, debt and macroeconomic uncertainty

Firm investment plays a vital role as a determinant of aggregate output growth. Consequently, many researches have been focused on the determinants of investment particularly the impact of financial factors and uncertainty in the economic environment. Richard (1972) explains that there exists a positive relation between firm investment and uncertainty particularly with the assumption that the investment is reversible. Moreover, Richard (1972) assume that the firms as risk neutral and there is uncertainty in each period including the current period. However, recent literature introduces the concept of irreversibility of and the possibility to delay the investment decisions. Based on this concept, uncertainty affects firm investment negatively for examples in Dixit and Pindyck (1994) and Caballero (1991). Thus, the focus on this chapter is the impact of macroeconomic uncertainty particularly the market interest rates on firm investment. Besides, the joint impact between macroeconomic uncertainty and debt on firm investment will also be focused on.

This chapter follows Bo and Sterken (2002) who assumed that in firm investment behavior, the financial structure of the firm is relevant to the impact of the interest rates uncertainty on firm investment. In the theory, it has been explained that high inflation implies volatility of inflation and it leads to the uncertainty in the inflation. As a result, it also affects the nominal rate of interest where a higherinterest rates will lead to a higher interest rates burden. However, the financial structure of the firm in real terms relies also on the nominal interest rates and the inflation volatility. Inflation reduces the real value of debt, but debt holders are compensated for this by an inflation premium in the nominal interest rates they charge the firm. These higher nominal borrowing costs result in lower net income for the firm. The decline in net income, however, is offset by the decrease in the real value of nominal liabilities. To keep the real value of its debt constant, the firm will increase its nominal borrowing in the presence of inflation. The firm will face the trade-off between the increase in the costs of debt financing and the decrease in the real value of debt. If the magnitude of the decrease in the real value of debt is larger than that in the increase in the interest payments, debt capital gain occurs and the firm will invest more. The debt capital gain in the presence of inflation is more likely to be experienced by firms that have a higher level of debt. When the firm has a lower level of debt, the increase in the interest payments in the presence of inflation will be higher than the decrease in the real value of debt, which means that the internal funds available for investment are

decreased, leading to a negative relationship between debt and investment holding other things unchanged. As high inflation happens, it leads to a higher interest rates. In other words, the firm has an incentive to invest as long as the reduction of the real value of debt exceeds the increase in the interest burden.

Based on the argument regarding the relationship between uncertainty in the market interest rates, debt holdings and firm investment, this chapter augments the model that had been derived by Bo and Sterken (2002) to investigate the relation between variables interest (firm investment, the market interest rates uncertainty and debt holdings) for Malaysia, as one of developing countries. The model that will be tested empirically can be specified as follows:

$$\left(\frac{I}{K}\right)_{i,t} = \beta_0 + \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{CFLOW}{K}\right)_{i,t} + \beta_3\left(\frac{DEBT}{K}\right)_{i,t} + \beta_4 SALE_{i,t} + \beta_5 IRU + \eta_i + \lambda_t + \mu_{i,t} \quad (3.1)$$

Where *I*represents the firm investment and it is measured by the capital expenditure, *K* is capital stock for firms which is the net firm fixed assets excludes depreciation. However, it includes property, plant and equipment. *CFLOW* shows the cash flow for firms and it is defined as operating income plus depreciation. The depreciation includes total depreciation, amortization and depletion. *CFLOW* indicates the reliance of firms on the internal sources for funding their investment. *DEBT* is debt holdings or borrowing of the firms and it is measured by the total debt. Then, *SALE* represents the growth of the firm sales while, *IRU* is the aggregate uncertainty. The aggregate uncertainty has been focused on the market interest rates uncertainty and it is measured by the lending rate uncertainty. Uncertainty in the interest rates is measured using a GARCH model. Besides, the error term in equation (3.1) is also assumed to follow two way error components disturbances with η_i is a firm specific effect and λ_t is a time specific effect, while $\mu_{i,t}$ is the remainder stochastic disturbance term that is assumed to be independent and identically distributed with mean zero and variance σ_μ^2. The error term can be re-written as $\varepsilon_{it} = \eta_i + \lambda_t + \mu_{it}$, while*i* and *t* present the firms in the sample and time, respectively.

Based on the equation (3.1), β_1, β_2, β_3 and β_4 are expected to have value bigger than zero. In other words, the coefficient values for lagged dependent variable, cash flow, debt and growth sales are positive to influence firms' investment. On the other hand, β_5 or the coefficients value of aggregate uncertainty is expected to affect firms' investment negatively. Then, equation (3.1) can be extended as in equation (3.2) to test empirically the response of firm investment on the joint impact between the market interest rates uncertainty and debt holding. It has been done by following Bo and Sterken (2002) who derive the investment model which has been affected by the interaction between interest rate uncertainty and debt holding; $DEBTU = IRU \times DEBT$.

$$\left(\frac{I}{K}\right)_{i,t} = \beta_0 + \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{CFLOW}{K}\right)_{i,t} + \beta_3\left(\frac{DEBT}{K}\right)_{i,t} + \beta_4 SALE_{i,t} + \beta_5 IRU + \beta_6 DEBTU + \eta_i + \lambda_t + \mu_{i,t} \quad (3.2)$$

From the Equation (3.2), *DEBTU* represents the twin effects of the market interest rates uncertainty and debt holding on firm investment. It is expected that the coefficient value for this interaction is a positive for high-indebted firms while, a negative sign is predicted for low-indebted firms.

3.4 Estimation procedures

There are several steps that must be done before estimating the main specification model as shown in equation (3.1) and equation (3.2). It includes measuring aggregate uncertainty; the market interest rates uncertainty and explaining the main estimator which is system GMM estimator.

3.4.1 Data

The data used in this chapter covers all listed firms from Bursa Malaysia, Malaysia. Data for the firms have been collected from Worldscope Full Company Reports in Thompson which can be downloaded from the Datastream database that cover the years 1992 to 2009. The data are:

i. Capital expenditure to measure the firm investment
ii. the total of property, plant and equipment's belong to the firm to measure the firm's capital stock (net fixed asset)
iii. Operating income plus depreciation to measure the cash flow as internal funds for the firms,
iv. Total debt as measure the debt holdings of firms
v. Firm's sales. is used to calculate its growth
vi. The data for macroeconomic uncertainty which is the lending rate has been collected from the International Financial Statistics (IFS) website. The lending rate data covers the period 1990 to 2009 on a monthly basis.[9]

After checking the data particularly the availability issue of required data, the sample in this chapter covers 508 firms. However, after detecting the outliers using DFITS test, the sample in this chapter is only 496 firms excluding firms from financial sector.[10]

3.4.2 Generalized Autoregressive Conditional Heteroskedasticity Model

As discussed in the literature, there are several ways to measure the uncertainty in the economy which include using Gaussian standard deviation as in Pindyck (1986) or estimating using statistical models which include ARCH and GARCH models.

To measure the uncertainty in the interest rates, this chapter uses the market interest rates which have been proxied by the monthly data for the lending rate in Malaysia. This data covers the period 1990:1 to 2009:12. Firstly, the existences of unit

[9] For robustness checking, macroeconomic uncertainty has been proxied by the inflation rates uncertainty. The data for the inflation rates has been collected from IFS website from the period 1991 to 2009 on a monthly basis as well.
[10] Based on the DFITS test, 12 firms have been found as outliers with 10 of them are from high-indebted firms group and 2 of them are from low-indebted firms group. Appendix 3.1 explains more details the theory of DFITS test for detecting the outliers.

root in the series can be tested using the Augmented Dickey Fuller (ADF) test and Phillips and Perron (PP) test. The null hypothesis that there exists a unit root indicates the lending rate is nonstationary, while the rejection of the null hypothesis shows that the lending rate series as stationary. To proceed to a GARCH model, the lending rate series have to reject the null hypothesis which means the series is stationary.

Next, this chapter estimates the aggregate uncertainty using the GARCH model. The market interest rates has been chosen as a proxy for aggregate uncertainty as this chapter is not only focuses on the own effect of aggregate uncertainty, but focuses on the joint effect of the market interest rates and debt holding on firm investment. As noted, the lending rate has been used as a proxy for the market interest rates. In this chapter, GARCH (1,1) has been used to estimate the uncertainty in the market interest rates. The GARCH model is introduced by Bollerslev (1986) who extends the ARCH model developed by Engle (1982) to let conditional variance σ_t^2 depend on its own lags as well as lags of the squared error. Equation (3.3) shows the mean equation for the regression model with *IR* is the natural logarithm for first difference of the lending rate. The lending rate has been calculated as $IR = Log(IR)_t - Log(IR)_{t-1}$[11] . *DU* is the dummy variable with value of 1 indicates during the financial crisis between 1997:7 and 1998:9, while value of 0 represents other periods (not in the financial crisis) and μ_t is the error term.

$$IR_t = \beta_0 + \beta_1 IR_{t-1} + \beta_2 DU + \mu_t \quad (3.3)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \mu_{t-1} + \alpha_2 \sigma_{t-1}^2 \quad (3.4)$$

Equation (3.4) indicates the conditional variance equation that has been assumed to follow an autoregressive GARCH (1,1) process. From equation (3.4), it can be seen that σ_t^2 depends on μ_{t-1} ; the lag of the squared residual from the mean equation and it indicates news about volatility from the previous period (ARCH term), and also σ_{t-1}^2 ; the last period's forecast variance (GARCH term). The first term in parentheses in the GARCH (1,1) model refers to the presence of a first-order autoregressive GARCH term. The second term in parentheses refers to a first-order moving average ARCH term.

[11] Appendix 3.2 shows the behaviour of *IR* which indicates shocks happen during the period 1997 and 1998. It is not surprising as Malaysia was faced with the financial crisis during that period.

3.4.3 Generalized Method of Moments Estimator

The panel data that have been used in this chapter consists of many firms over a short time period. Besides, it shows that there exists the unobservable firm effect which indicates the heteroscedaticity across firms that may be correlated with the explanatory variables. Furthermore, there is also the possibility that some of the explanatory variables such as debt to be weak exogenous or endogenous variable. This chapter is also augmented the model that has been derived by Bo and Sterken (2002) by including the lagged dependent variable as one of the regressor. Thus, it implies that there is correlation between the explanatory variable and the error term. Based on those characteristics, this chapter estimates the specification model using system GMM estimator as it controls for simultaneity bias. GMM dynamic panel estimator in this chapter is based on Arellano and Bond (1991) who proposed the first difference GMM estimator. Then, it has been extended by Arellano and Bover (1995) and Blundell and Bond (1998) who proposed the system GMM estimator that combine the difference and the level equations. The details about the GMM estimator can be found in Section 2.3.3 in Chapter 2.

3.5 The empirical results and analysis

In this section, this chapter reports the estimation results of augmented Bo and Sterken (2002) investment model under uncertainty. Firstly, this chapter presents the result from a GARCH (1,1) model for measuring the market interest rates uncertainty. It followed by the main results that have been estimated using one-step system GMM. The one-step system GMM results cover the results for the whole sample and followed by two groups namely, high- and low-indebted firms.[12] Next, this section also reports the results for robustness checking. The robustness checking has been done by estimating the specification model by replacing the proxy of macroeconomic uncertainty from the market interest rates to inflation rates.

3.5.1 GARCH Result

As noted, the macroeconomic uncertainty has been proxy by the market interest rates uncertainty and it is assumed that the fluctuations in the market interest rates will affect the firms' investment. Table 3.1 reports the unit root test for the market interest rates; lending rate. The result in Table 3.1 indicates that the market interest rates reject the null hypothesis in the level. It indicates the stationary of market interest rates either using the ADF or PP tests.

Table 3.1Unit root test result

Variable	ADF		PhillipsPerron	
	level	1st Dif.	level	1st Dif
IR	-9.596***	-16.107***	-10.047***	-38.432***

The null hypothesis is H_o : presence of the unit root and H_a : stationarity of the series
*** indicates that the rejection of the null hypothesis for presence the unit root and it is significant at 1 percent level.

Next, Table 3.2 reveals the result for GARCH (1,1) model for the market interest rates. In the estimation of GARCH (1,1) model, this chapter put the dummy variables during the shock period (DU). DU is equal to 1 during the financial crisis while DU = 0 for the other periods. Based on the result, it can be seen that all

[12]Appendix 3.3 explains the sample splitting procedures that has been used in this paper.

components of autoregressive and moving average are significant. Then, this chapter proceeds to the next step for measuring the market interest rates uncertainty. First, this chapter obtains the series of the conditional variance of the market interest rates with monthly observations. In order to match these with the annual investment data at hand, this chapter uses the median of the distribution of the conditional variance over each 12-month period as the proxy for the uncertainty of the market interest rates for that year.

Table 3.2The Result for a GARCH (1,1) Model for the Market Interest rates

	Coefficient	Std. Error	Prob.
IR(-1)	0.339	0.085	0.000***
DU	-0.017	0.002	0.000***
C	-0.001	0.000	0.059**
Variance Equation			
C	4.16E-06	1.30E-06	0.001***
μ_{t-1}	0.364	0.081	0.000***
σ^2_{t-1}	0.605	0.058	0.000***

*** and ** indicate the significance of the variables at 1 and 5 percents, respectively.

3.5.2 Firm investment, debt and market interest rates uncertainty

As shown in Table 3.3 in Panel A, all explanatory variables are significant in affecting firms' investment in Malaysia with the signs as expected except for debt holdings which has a negative sign. Sales growth, on the other hand, gives insignificant impact on firms' investment. Specifically, it can be seen that lagged dependent variable (last period's investment) gives a significant impact on current investment with a positive sign. It indicates that last period investment determines current period investment significantly. This supports previous studies such as Baum et al. (2010). Besides, the coefficient value for cash flow also appears as a positive and significant. The result is consistent with the firm financing and investment theory where cash flow plays a vital role as internal funds for firms to finance their investment. It can be said as 1 percent increase in cash flow will lead to increase in firms' investment of 0.013 percent. Furthermore, the small value of coefficient for cash flow indicates that firms in Malaysia rely also on the external funds to finance their investment. The result is consistent with previous studies such as Sean (2006). However, the coefficient value

for debt appears as negative and statistically significant. This finding contradicts the expectation in this chapter and it also does not support the signalling hypothesis as introduced by Ross (1977). However, this result is also not surprising as Bo (2007) argues that there is non-linear relation between debt and firm investment. It means that after a certain point the excess level of debt will affect firms' investment negatively. Lang (1996) also finds that firms' debt affects the investment negatively. As expected, the aggregate uncertainty which is the market interest rates uncertainty affects firms' investment negatively and statistically significant. This result is consistent with previous studies such as Bo and Sterken (2002) and Rashid (2011). The negative effect of market interest rates uncertainty on firm investment indicates that the firms in Malaysia very cautious with the uncertainty in the interest rates and they are not invest more when the uncertainty in the market interest rates happen.

The results in Table 3.3 (Panel A) are supported by two specification tests which are the Arellano-Bond for second order serial correlation and the Sargan/Hansen of over identification tests. The p-value for the second order serial correlation test indicates that the failure to reject the null hypotheses. It suggests there is no second order serial correlation problem in the estimation model. The p-value for the over identification test also shows the failure to reject the null hypothesis. It indicates that the instruments used in the model are valid and correctly specified. It can be concluded that the estimation results for the whole sample are strongly supported by the two diagnostic tests;the AR(2) test and the Sargan/Hansen of overindentifying test.

Next, Table 3.3 in Panel B, on the other hand, reports the result for high-indebted firms in Malaysia. It can be seen that the lagged dependent variable also gives a positive effect on current firm investment. The cash flow also affects firms' investment positively and statistically significant. Furthermore, the small value of coefficient for cash flow is also consistent with the result for the whole sample. It indicates the high-indebted firms rely on external funding which are debt and equity. Interestingly, the effect of debt on firms' investment in this group appears as a negative and significant. It shows that the excess level of debt influence the firms' investment negatively. The market interest rates uncertainty gives negative impact on firms' investment and it is statistically significant. However, the result for sales growth remains unchanged with a positive sign but statistically insignificant. The results in Panel B are also supported by two specification tests namely the AR(2) test and the Sargan/Hansen test. The AR(2) test shows the failure of the estimation model to reject the null hypothesis which indicates there is no second order serial correlation problem in the model. Next, the Sargan/ Hansen test of over-identifying restrictions also

indicates that the moment conditions hold in the GMM estimator such that the instruments used in the model are valid.

In addition, Panel C in Table 3.3 reveals the result for low-indebted firms in Malaysia. Based on the results, it shows that all explanatory variables play important roles to encourage firms to invest more except for the debt. From the result, it indicates that last period's firm investment plays a vital role to determine current investment with a positive sign and statistically significant. It is followed by the cash flow which gives a significant impact on firms' investment with a positive sign. Next, sales growth also shows a significant effect on firm investment, also with a positive sign. The market interest rates uncertainty appears to give a negative impact on firm investment and statistically significant. The results in Panel C are also supported by the AR(2) test and the Sargan/Hansen test for over-identifying of the instruments used in the model. Both tests indicate the acceptance of the null hypotheses which suggest that the model is correctly specified and the instruments used are valid.

Table 3.3 Firms' investment model with the market interest rate uncertainty

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.079	0.012	0.000	0.089	0.017	0.000	0.069	0.022	0.002
LDV	0.506	0.098	0.000	0.508	0.130	0.000	0.578	0.125	0.000
CFLOW	0.013	0.005	0.014	0.014	0.007	0.050	0.040	0.019	0.037
DEBT	-0.117	0.061	0.055	-0.133	0.067	0.050	-0.090	0.088	0.303
SALE	0.004	0.023	0.854	0.001	0.002	0.517	0.010	0.005	0.051
IRU	-0.109	0.047	0.022	-0.126	0.062	0.041	-0.119	0.058	0.042
AR(2) p-value	0.104			0.318			0.144		
Hansen test p-value	0.223			0.214			0.259		
No. of observations	4936			2444			2492		
No. of firms	496			236			260		

Note:
The results in Table 3.3 have been obtained by estimating the model specification as in equation (3.1).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE and IRU as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002).
Year dummies are not reported in order to save space.

3.5.3 The cross effect of the market interest rates and debt on firm investment

In Table 3.4, the main focus in this table is the result for the cross effect between the market interest rates uncertainty and debt on firm investment for the whole sample and two main groups; namely high- and low-indebted firms. It is worth noting that the cross-effect of debt and the interest rates volatility can be shown from two channels. First, an increase in volatility will increase the interest rates burden. Secondly, the higher market interest rates volatility which leads to the uncertainty in the market interest rates will likely decrease the real value of debt holdings. Thus, it encourages firm to do more investment. According to the results in Panel A, it can be seen that all explanatory variables which are lagged dependent variable, the cash flow, the debt and the market interest rates uncertainty affect the firm investment significantly and consistent with the previous results. Specifically, the lagged dependent variable and the cash flow affect the firm's investment positively while, the debt and the market interest rates uncertainty give negative effects on firm investment. The debt holding remains to contradict the hypothesis in this chapter. However, the result for sales growth does not significantly affect firm investment in Malaysia. Besides, the joint effect between the market interest rates uncertainty and debt (*DEBTU)* is positive. The positive impact of the joint impact of these two variables indicates that the firms in Malaysia do more investment when they face the interest rates uncertainty which means the interest rates burden is not excess the reduction in the real value of debt. However, the result is not statistically significant.

Panel B in Table 3.4 reveals the results for high-indebted firms in Malaysia. The results are consistent with the results in Panel A (in the same table). It can be explained that the lagged dependent variable, the cash flow, debt and the market interest rates uncertainty give significant impact on firm investment in Malaysia. The lagged dependent variable and the cash flow give a positive impact on firm investment and there are statistically significant. On the other hand, the debt and the market interest rates uncertainty affect the firm investment negatively and statistically significant. The results for the sales growth and cross effect between the market interest rates uncertainty and debt holding are insignificant to determine the firm investment in Malaysia.

Next, Panel C in Table 3.4 presents the results for low-indebted firms in Malaysia. The results indicate that all explanatory variables give significant impacts on firm investment in Malaysia except for the cross effect between the market interest rates uncertainty and debt holding. In other words, it can be explained that the own

effect of debt and the market interest rates uncertainty are negative in influencing firm investment and are statistically significant at least at the 10 percent level. The result for sales growth indicates the significant impact on firm investment at least at 10 percent as well. Other explanatory variables which are lagged dependent variable and the cash flow consistently give significant impacts on firm investment in Malaysia. However, the cross effect between debt and the market interest rates uncertainty shows an insignificant impact on firm investment.

All results in Table 3.4 are supported by two specification tests to identify the validity of the instruments adopted in the models. First, the AR(2) test indicates the failure to reject the null hypothesis which means the consistent estimates such that $E(\Delta\varepsilon_{it}\Delta\varepsilon_{it-2})=0$ for all panels. Second, the Sargan/Hansen test for over-identifying restriction also shows that the moment conditions hold in the GMM estimator which indicates that the instruments used in the models are valid.

It is worth emphasizing that the results in Table 3.4 indicate that the joint impact between the market interest rates uncertainty and debt holding is insignificant to determine the firm investment in Malaysia for all panels. It might be the firms in Malaysia more sensitive with the firm specific interest rates to determine their investment. On the other hand, the other explanatory variables indicate the important influence on firm investment. Interestingly, the sales growth is only significant to determine firm investment in low-indebted firm group while, the result for high-indebted firm and the whole sample is insignificant. Besides, all coefficients for the cash flow variable indicate the value less than one and relatively low. It also shows that the firms' investment relies on the internal funds to finance their investment. The debt holding gives a negative effect on firm investment and it contradicts the hypothesis in this chapter as well as the signalling hypothesis. As expected as well, the market interest rates uncertainty affects the firm investment negatively. This finding is consistent with previous studies such as Bo and Sterken (2002), Baum et al. (2010), Rashid (2011) and Driver and Moreton (1991) who found that investment responds negatively to macroeconomic uncertainty.[13]

[13] Appendix 3.4 presents the empirical results when excluding sales growth in the model specification. It has been excluded because of its impact on firm investment is insignificant for both the whole sample and for high-indebted firms.

Table 3.4 The effect of the interaction between the market interest rates uncertainty and debt on firms' investment

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.077	0.013	0.000	0.089	0.017	0.000	0.079	0.015	0.000
LDV	0.508	0.095	0.000	0.500	0.123	0.000	0.546	0.109	0.000
CFLOW	0.011	0.005	0.019	0.014	0.007	0.052	0.043	0.018	0.022
DEBT	-0.097	0.052	0.064	-0.129	0.065	0.047	-0.139	0.042	0.001
SALE	0.008	0.019	0.664	0.001	0.002	0.491	0.009	0.005	0.083
IRU	-0.172	0.101	0.091	-0.216	0.123	0.080	-0.192	0.103	0.062
DEBTU	0.222	0.543	0.682	0.484	0.540	0.370	0.631	0.515	0.220
AR(2) p-value	0.102			0.321			0.144		
Hansen test p-value	0.282			0.312			0.105		
No. of observations	4936			2444			2492		
No. of firms	496			236			260		

Note: The results in Table 3.4 have been obtained by estimating the model specification as in equation (3.2).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE, IRU and DEBTU as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002)
Year dummies are not reported in order to save space.

3.5.4 Robustness check

This section reports the result for robustness checking by using two different type of macroeconomics uncertainties. First, this chapter uses inflation rate as other nominal uncertainty instead of the market interest rate. Second, this chapter also checks the robustness using real uncertainty which is measured by the output growth uncertainty.[14]

Theoretically, there exists a positive relation between inflation uncertainty and nominal interest rates where high inflation volatility leads to inflation uncertainty and finally it leads to rise in nominal interest rates. The relationship between these variables can be explained using Fisher equation in equation (3.5) as follows:

$$R_t = r + \beta\pi_t^e \qquad (3.5)$$

Where R_t denotes the nominal interest rates, r is a constant term indicating the real interest rates and π_t^e is expected inflation. For that reason, this chapter uses the inflation uncertainty as a measure of another macroeconomic uncertainty to test for the robustness. Moreover, the inflation uncertainty has been chosen for the robustness checking as the argument for the cross effect between inflation uncertainty and debt holding is similar with the argument for the joint impact between the market interest rates uncertainty and debt holding.[15]Besides, the importance of the effect of output growth uncertainty has also been considered as real uncertainty also plays an important role to determine firms' investment. Thus, in this section, this chapter reports the results with inflation uncertainty as a measure for aggregate uncertainty (in nominal) and output growth uncertainty (in real term). The model specification is also estimated using one-step system GMM.

[14]This chapter also concerns with the effect of real output uncertainty on firms' investment. Thus, the robustness checking has also been done with taking it into account as well as inflation uncertainty as another measurement for nominal uncertainty.

[15]The direct effect of inflation uncertainty on firm investment is expected to be a negative as firms are concerned with the real value of its asset and debt in response to the inflation uncertainty. The indirect impact of inflation uncertainty on firm investment can be seen as it gives an impact on nominal interest rates and nominal interest rates effect the firm investment negatively.

3.5.4.1. Inflation uncertainty, debt and firm investment[16]

Panel A in Table 3.5 reports the results for the whole sample with inflation uncertainty used as a proxy for aggregate uncertainty (in nominal term). Generally, it can be explained that lagged dependent variable, cash flow and inflation uncertainty significantly affect firm investment in Malaysia. More specifically, it shows that lagged (i.e. last period) investment significantly determines current period investment with a positive sign. Besides, the cash flow also affects firm investment positively and statistically significant. It can be said that, these two variables play important roles to encourage and to determine firm to invest more. However, the results for debt and sales growth indicate insignificant effect on firm investment with positive and negative signs. While, the result for inflation uncertainty shows that it affects firm investment negatively and statistically significant at least at 1 percent level.

Next, Panel B in Table 3.5 presents the result for high-indebted firms. The result indicates that lagged dependent variables; previous investment affects the current firm investment positively and statistically significant at 1 percent level. It means last period investment crucially determine firm investment at the present time. Besides, the cash flow also plays a vital role to determine the firm investment in Malaysia and statistically significant at 5 percent level. On the other hand, firm investment is also influenced by the debt negatively and it is statistically significant. Inflation uncertainty also affects firm investment negatively as expected, while the result for sales growth appears as insignificant to determine firm investment (in this group) in Malaysia.

The last panel in Table 3.5 (Panel C) reports the result for low-indebted firms in Malaysia. It is worth noting that the lagged dependent variable and the cash flow remain to affect firm investment positively and both are statistically significant. The result for debt is also unchanged with a negative effect and statistically significant. The same result is also hold by inflation uncertainty which appears to give a negative and significant impact on firm investment. However, the sales growth is still fail to determine firm investment in Malaysia significantly even it indicates a positive sign.

All results in Table 3.5 are supported by two specification tests namely the AR(2) and the Sargan/Hansen tests. The AR(2) test indicates that the null hypothesis of no second order serial correlation problem is not rejected and the estimation is

[16]Appendices3.5a, 3.5b and 3.5c report the figure and the results for unit root tests and the GARCH (1,1) model for inflation rates and real output growth in Malaysia on a monthly basis. This procedure has to be done before calculating the conditional variance as a proxy for inflation uncertainty.

consistent. The Sargan/Hansen test of over-identifying also depicts that the failure to reject the null hypothesis which means that the moment conditions hold in the GMM estimator such that the instruments used in the models are valid.

The results for the effect of macroeconomic uncertainty and debt on firm investment are robust even when the proxy for macroeconomic uncertainty is changed from the market interest rates uncertainty to inflation rates uncertainty. The result for debt also contradicts the hypothesis in this chapter. As noted, this chapter hypothesizes that the firm investment in Malaysia is affected by the debt positively. The macroeconomic uncertainty, on the other hands, remains to give a negative and significant impact on firm investment in Malaysia. The consistent results are hold either for the whole sample or by splitting the firms into two groups' namely high- and low-indebted firms. The results for debt are also unchanged with negative and significant effects on firm investment for these two groups.

3.5.4.2. Output growth uncertainty, debt and firm investment

This section reveals the results for the effect of real uncertainty that has been measured by real output growth uncertainty on firms' investment in Malaysia. Panel A in Table 3.6 depicts the result for the whole sample. It shows that real uncertainty affects firms' investment negatively. This finding supports the main results which used nominal uncertainty as aggregate uncertainty in the economy. Other variables such as lagged dependent variable and debt holding remain to give significant impacts on firms' investment in Malaysia with the consistent signs (positive). Next, Panel B in Table 3.6 reports the results for high-indebted firms in Malaysia. It shows that real output growth uncertainty also gives a significant impact on firms' investment with a negative sign. It also reveals that last period investment and debt holding give significant impacts on firms' investment with a positive and a negative sign, respectively. While, Panel C shows that real out growth uncertainty is not significant to affect firms' investment in Malaysia. Other explanatory variables namely lagged dependent variable, the cash flow, debt holding and sales growth are significant to determine firms' growth with the consistent signs.

All results in Table 3.6 are supported by two specification tests namely, AR(2) test and Hansen over-identification test. Both tests fail to reject the null hypotheses which indicate that there is no second order serial correlation in the residual and the models are correctly specified and the instruments used are valid.

3.5.4.3. The joint effect of inflation uncertainty, real output growth uncertainty, debt and firms' investment.

This section reports the results for the joint impact between inflation uncertainty and debt on firm investment in Malaysia. Concern with the impact of real uncertainty, this chapter also reports the results for the interaction between real output uncertainty and debt holding on firms' investment in Malaysia. Table 3.7 reveals the results for the cross effect between inflation uncertainty and debt holding on firms' investment in Malaysia, while Table 3.8 depicts the results for the interaction between real output uncertainty and debt holding in Malaysia.

Based on the results as depicted in Panel A in Table 3.7, the last period investment affects current firm investment positively and statistically significant. The same result is also hold for the cash flow which indicates a positive and significant to determine firm investment. However, the debt and sales growth appear to give insignificant impact to determine firm investment in Malaysia. The inflation uncertainty, on the other hand, affects firm investment in Malaysia negatively and statistically significant. It is also worth noting that the cross effect of debt and inflation uncertainty (DEBTU2) has a negative effect to determine firm investment but it appears as insignificant.

Next, Panel B in Table 3.7 reveals that firm investment is influenced by the lagged dependent variable and the cash flow with both of them appear to give a significant and a positive effect on firm investment in high-indebted firms. The debt, on the other hand, affects firm investment negatively but it is not significant. The sales growth also appears as insignificant to affect firm investment in Malaysia even with a positive sign. Firm investment, however, is also affected by the inflation uncertainty significantly and negatively. The focus on this section is the result for the cross effect between inflation uncertainty and debt holding on firm investment. The result depicts that the joint effect between these two variables is significant to determine firm investment in Malaysia with a negative sign.

Panel C in Table 3.7, on the other hand, reports the result for low-indebted firms. The result shows that last year investment give a significant impact on present firm investment with a positive sign. It followed by the cash flow and sales growth which indicate a positive and a significant effect on firm investment in Malaysia. However, the debt is remained to give insignificant impact on firm investment even the sign is unchanged as a negative. Inflation uncertainty still effect the firm investment negatively and statistically significant while, the joint impact between

inflation uncertainty and debt gives a positive impact on firm investment and statistically significant.

On the other hand, Panel A in Table 3.8 presents the results for the cross effect between real uncertainty and debt holding on firms' investment for the whole sample in Malaysia. It shows that real uncertainty is not significant to determine firms' investment in Malaysia. The cross effect between real uncertainty and debt holding (DEBTU3) is also not significant to affect firms' investment. Other explanatory variables namely lagged dependent variable and debt holding give significant impact on firms' investment, while the cash flow and sales growth are not significant to determine firms' investment. Panel B in Table 3.8, on the other hand, reports the results for high-indebted firms in Malaysia. The results depict that real uncertainty play a significant impact to determine firms' investment. Other explanatory variables such as the past period investment and the cash flow are also important to determine firms' investment. However, DEBTU3, debt holding and sales growth are not significant to affect firms' investment. Panel C in Table 3.8 depicts the results for low indebted firms in Malaysia. Based on the results, it shows that real output uncertainty, lagged dependent variable and sales growth are important to determine firms' growth, while DEBTU3, the cash flow and debt holding are not significant to determine firms' investment.

The results in Table 3.7and Table 3.8 which consist of Panel A, Panel B and Panel C have been supported by two important specification tests. First is the AR(2) test which depicts the acceptance of null hypothesis. It means there is no second order serial correlation problem in the error term which implies this estimator as consistent. Next, the Sargan/Hansen test for over-identifying which also indicates the failure to reject the null hypothesis which means the instruments used in the models are valid and the moment condition hold.

A negative and significant impact of the interaction between inflation uncertainty and debt in high-indebted firms depicts that inflation uncertainty indirectly affects the firm investment through the real value of debt. As mentioned in the theory, the financial structure of the firm in real terms relies on the nominal interest rates and inflation uncertainty. The higher nominal borrowing costs result in lower net income for the firm. However, the decline in net income is offset by the decrease in the real value of nominal liabilities. To keep the real value of its debt constant, the firms will increase its nominal borrowing in the presence of inflation. Thus, the firm will face the trade-off between the increase in the costs of debt financing and the decrease in the real value of debt. As depicted in Panel B in Table 3.7, the negative relation between

DEBTU2 and firm investment implies that the reduction in the real value of debt is not good enough to encourage firm to invest more in the presence of inflation uncertainty. For low-indebted firms, however, there exists a positive relation between DEBTU2 and firm investment. It indicates that the reduction in the real value of debt has encouraged firms to do more investment as the increase in the cost of debt financing is still low. In other words, the debt capital gain in the presence of inflation happens in low-indebted firms. However, the results for interaction between real output uncertainty and debt holding (DEBTU3) as in Table 3.8 indicate insignificant impact on firms' investment. These results are consistent with the main results in Table 3.4.

The results in this section are quite robust to support the main results as reported in sections 3.5.2 and 3.5.3. As explained, this chapter examines the effect of macroeconomic uncertainty and debt on firm investment. The main proxy for macroeconomic uncertainty is the market interest rates uncertainty, while inflation uncertainty and real output uncertainty have been used to replace the market interest rates uncertainty for robustness checking. It can be seen that both; the nominal uncertainty (which are measured by the market interest rates uncertainty and inflation uncertainty) and real uncertainty (measured by the aggregate output uncertainty) affect firm investment in Malaysia negatively. These findings support previous studies for examples; Rashid (2011), Beaudry et al. (2001) and Byrne and Davis (2004) who focuses on developed countries. Meanwhile, the result for the joint impact between macroeconomic uncertainty and debt holding on firm investment is quite robust. In the main results, the interaction between macroeconomic uncertainty and debt on firms gives a positive effect for both groups; high and low-indebted firms. However, these results are not significant to explain their importance to determine firm investment in Malaysia. On the other hand, the joint effect of inflation uncertainty and debt holding on firm investment appears as a negative for high-indebted firms and a positive for low-indebted firms. These findings against the hypothesis which states that firms' investment for high-indebted firms respond positively to the joint effect of inflation uncertainty (as a proxy for aggregate uncertainty) and debt holding. When the aggregate uncertainty is measured by the real output uncertainty, however, the results support the main results in this chapter.

3.6 Conclusion

The ambiguous effect of debt and uncertainty on firm investment has been largely documented previously and empirically has been focused on the developed countries. The main objective in this chapter is to examine the relation between uncertainty, debt and firm investment in developing countries specifically in Malaysia. Macroeconomic uncertainty has been focused on this study and it is proxied by the market interest rates uncertainty. Besides, the focus is also given on the joint impact between the market interest rates uncertainty and debt holding on firm investment. Finally, this study is also carried out to identify the heterogeneous response of two firm groups; namely high and low-indebted firms

The results indicate that macroeconomic uncertainty affects firm investment negatively, whether it is proxied by the market interest rates uncertainty or the inflation uncertainty as well as real output uncertainty. The consistent results hold in all estimations, both for the whole sample or by splitting the sample into two groups; namely high- or low-indebted firms. These findings are also consistent with previous studies in developed countries such as in Bo and Sterken (2002), Byrne and Davis (2004), Beaudry et al. (2001) and David and Moreton (1991). Furthermore, a negative relation between macroeconomic uncertainty and firm investment supports the recent theory of investment under uncertainty such as in Caballero (1991) and Dixit and Pindyck (1994).

The results for debt holding, on the other hand, contradict the hypothesis in this chapter. This chapter hypothesized that there exists a positive relation between debt and firm investment. However, the findings show that a negative relation between them. These findings do not support the signalling hypothesis as proposed by Ross (1977). It is also not surprising as Bo (2007) argues that the relation between debt and firm investment is non-linear. It means, the debt affects firm investment positively at the first stage. However, if the debt exceeds a certain value, it affects firm investment negatively. These results are also consistent with Lang et al. (1996) who study the effect of debt on firm investment in developed countries.

The final focus in this chapter is on the joint impact between macroeconomic uncertainty and debt holding on firm investment. The results show that the cross-effect between these two variables on firm investment as insignificant. It indicates the own effect of these two variables is more important than the interaction effect.However, the results from robustness checking show slightly different. The own

effect of debt holding and aggregate uncertainty remain to give a negative effect on firms' investment. This is consistent with the main result in this chapter. The result for the interaction between aggregate uncertainty and debt holding on firms' investment differs when the aggregate uncertainty is proxied by the inflation rate uncertainty. The robustness checking results show those high-indebted firms respond negatively with the cross-effect of macroeconomic uncertainty and debt. On the other hand, low-indebted firms respond positively to this interaction. The results reject the hypothesis which states that high-indebted firms respond positively to the joint impact of macroeconomic uncertainty and debt on firm investment.However, the results for the real output uncertainty support the main results with the own effect of real output uncertainty and debt holding remain to give negative effect on firms' investment, while the impact of the interaction term is not significant to determine firms' investment in Malaysia.

Interestingly, the results show that the impact of macroeconomic uncertainty and debt on firm investment is quite similar for both groups. Both groups respond negatively to the macroeconomic uncertainty as well as to the debt. The joint effect of macroeconomic uncertainty and debt on firm investment is also not significant for these two groups. It indicates there are no heterogeneous results between these two groups. It is not surprising as all firms in the sample have been collected from listed companies. The heterogeneity is expecting when the sample consists of the firms from listed and unlisted companies.

It can be concluded that firm investment is known to play a vital role to foster the aggregate output growth in the country. Thus, it is important to study the determinants of firm investment particularly investment under uncertainty. The findings in this chapter have implications to firms as investors and also to the policy makers. For firms, they have to alert with the uncertainty in the economy as uncertainty most probably affect their investment negatively. It leads to decrease their return and profits as well as their position in the business. For government and the policy makers, they should pay more attention on the firm investment behavior particularly under uncertainty. The stability in the country which includes the stability in the market interest rates and the aggregate prices lead to the efficiency of allocation of resources. Thus, it allows the investment to be more effectively channelled to the projects with the highest returns. It is only happens when the best investment opportunities are easily identified in the stable economic environment.

Table 3.5 Firms' investment model with inflation uncertainty

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.039	0.016	0.019	0.063	0.027	0.021	0.039	0.018	0.036
LDV	0.566	0.099	0.000	0.548	0.132	0.000	0.568	0.136	0.000
CFLOW	0.010	0.005	0.043	0.015	0.007	0.031	0.038	0.021	0.075
DEBT	-0.093	0.062	0.136	-0.143	0.070	0.040	-0.120	0.036	0.001
SALE	0.025	0.213	0.904	0.074	0.208	0.722	0.032	0.023	0.159
INFU	-0.145	0.042	0.001	-0.110	0.066	0.096	-0.173	0.055	0.002
AR(2) p-value	0.455			0.277			0.163		
Hansen test p-value	0.950			0.846			0.593		
No. of observations	4936			2444			2514		
No. of firms	496			236			260		

Note: The results in Table 3.5 have been obtained by estimating the model specification as in equation (3.1).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE and INFU as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002)
Year dummies are not reported in order to save s pace

Table 3.6 The effect of output growth uncertainty on firm investment in Malaysia

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.076	0.014	0.000	0.129	0.026	0.000	0.097	0.022	0.000
LDV	0.641	0.105	0.000	0.559	0.102	0.000	0.568	0.099	0.000
CFLOW	0.027	0.020	0.198	0.179	0.143	0.211	0.040	0.019	0.041
DEBT	-0.070	0.025	0.005	-0.161	0.056	0.004	-0.127	0.038	0.001
SALE	0.016	0.014	0.263	0.006	0.007	0.371	0.008	0.004	0.074
IPU	-0.076	0.043	0.079	-1.547	0.627	0.014	-0.884	0.609	0.147
AR(2) p-value	0.349			0.103			0.108		
Hansen test p-value	0.213			0.101			0.121		
No. of observations	4936			2444			2492		
No. of groups	496			236			260		

Note: The results in Table 3.6 have been obtained by estimating the model specification as in equation (3.1).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE, and IPU as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002)
Year dummies are not reported in order to save space.

Table 3.7 The cross effect between inflation uncertainty and debt on firms' investment in Malaysia

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.040	0.014	0.005	0.039	0.020	0.053	0.043	0.018	0.019
LDV	0.550	0.095	0.000	0.475	0.073	0.000	0.567	0.085	0.000
CFLOW	0.096	0.055	0.081	0.086	0.050	0.088	0.038	0.019	0.053
DEBT	-0.034	0.050	0.497	-0.093	0.058	0.109	-0.113	0.019	0.184
SALE	0.017	0.831	0.983	0.013	0.016	0.414	0.009	0.004	0.057
INFU	-0.086	0.043	0.045	-0.141	0.082	0.084	-0.144	0.071	0.045
DEBTU2	-0.185	0.293	0.527	-0.538	0.318	0.091	0.063	0.018	0.019
AR(2) p-value	0.272			0.249			0.198		
Hansen test p-value	0.124			0.211			0.117		
No. of observations	4936			2444			2492		
No. of firms	496			236			260		

Note: The results in Table 3.7 have been obtained by estimating the model specification as in equation (3.2).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE, INFU and DEBTU2 as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002).Year dummies are not reported in order to save space.

Table 3.8 The cross effect between output growth uncertainty and debt on firms' investment in Malaysia

Explanatory variables	Panel A			Panel B			Panel C		
	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.074	0.019	0.000	0.145	0.044	0.001	0.129	0.042	0.002
LDV	0.675	0.102	0.000	0.574	0.097	0.000	0.577	0.096	0.000
CFLOW	0.025	0.021	0.247	0.223	0.134	0.097	0.032	0.020	0.113
DEBT	-0.138	0.081	0.090	-0.391	0.680	0.144	-0.385	0.262	0.143
SALE	0.016	0.014	0.257	0.001	0.002	0.474	0.008	0.005	0.097
IPU	-0.895	0.691	0.380	-2.502	1.329	0.060	-2.387	1.294	0.065
DEBTU3	2.697	3.072	0.380	11.388	8.757	0.193	9.667	8.754	0.269
AR(2) p-value	0.140			0.295			0.107		
Hansen test p-value	0.205			0.190			0.153		
No. of observations	4936			2444			2492		
No. of groups	496			236			260		

Note:The results in Table 3.8 have been obtained by estimating the model specification as in equation (3.2).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while SALE, IPU and DEBTU3 as predetermined variables.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002). Year dummies are not reported in order to save space.

4. FIRM GROWTH AND ITS FINANCIAL FACTORS: EVIDENCE FROM MALAYSIA

4.1 Introduction

Firm growth and its financial factors are two important topics in microeconomics particularly in the area of firm behavior and financing constraints. Firm growth can be determined by the firm size as well as its age. Besides, financial factors also play an important role in stimulating firm growth. Thus, the main objective of this chapter is to investigate the effect of financial factors on firm growth in the context of firms in Malaysia. In other words, this chapter tries to assess whether Malaysian firm growth might be explained by financial constraints and interest burden. Moreover, this chapter tries to identify the heterogeneous effect of financial factors on firm growth for large and small firms. This chapter also tries to identify the financial determinants for firms' growth in four main sectors in Malaysia namely consumer products, industrial products, property and services.

The decision to choose the right financing is very important as the internal funds are costless, unlike external funds such as debt and equity. Thus, it is important to firms to choose their financing correctly for operating any businesses particularly for small and medium firms. Large firms can finance the investment from internal resources, issuance of debt or equity. By contrast, small and medium firms are limited in the extent of their internal resources and the potential for issuing debt or equity. Furthermore, firms from less and developing countries also face additional financing problems as some firms have limited internal funds as well as external funds. These problems include the accessibility to bank loan and the capital market as the tools to finance their investment and to stimulate their growth.

Firm growth has been the focal point of many studies in the literature. Early research in firm behaviour focuses on the relation between firm growth and size. For examples, Evans (1987) and Cooley and Quadrini (2001) study the relation between size, age and firm growth. The proportionate law proposed by Gibrat's (1931) and known as Gibrat's Law can be linked to the relation between firm growth and size. According to this law, the current growth rate of a firm is independent of its current

size and past growth. Many studies such as Evans (1987) and Calvo (2006) find that departure from the Gibrat's law decrease as the firm's size increases.

On the other hand, there are studies focus on the issue of financial factors that determine the firm investment. Myers (1977) introduced the pecking order theory for financing firms by internal funds, to issue debt and to issue equity. Internal funds use the firm's cash flow to finance the investment and to stimulate firm growth. Once internal finance is exhausted, firms must turn to debt finance which may be substantially more costly when capital markets are imperfect. It is quite challenging for small firms as they rely more on the internal funds to stimulate their growth, while large firms have the options to get more financing by using external funds.

The dependency of firms to external financing can also be linked to the issue of financial leverage and its impact to stimulate firm's growth. In a perfect capital market, a firm investment decisions are independent of its financial condition. It means that if all firms have equal access to capital markets, the theory of firm's capital structure is essentially irrelevant because external funds give a perfect substitute for internal sources to stimulate firms' growth. However, in imperfect capital market, internal and external sources are not perfect substitute because of many factors such as transaction costs and agency problems. Thus, firms with good projects grow no matter how its balance sheet looks, because it can always find funding particularly to get financing externally. Lang et al. (1996) argue that firms should choose lower leverage when they have valuable investment opportunities as high level of leverage will affect the firm growth negatively and it is known as the liquidity effect.

It is worth noting that many previous studies have been done by focusing on the issue of firms' investment and its financial factors particularly in developed countries. Recently, some studies have focused on the issue of firms' growth and its financial factors in developed countries for examples in Lang et al. (1996) and Carpenter and Peterson (2002). Thus, it motivates this chapter to examine the same issue but for developing countries by using recent estimation technique.

It is hypothesized that there exists a positive relation between the cash flow and firm growth. It is also hypothesized that the greater value of cash flow coefficient in small firms indicates the stronger relation between cash flow and firm growth. Other financial factors are also included, namely financial leverage and interest rate burden as well as the investment opportunity. The cash flow is studied to measure the role of

internal funds in fostering firm growth. While, financial leverage plays an important role to determine the future growth of firms with positive effect. The interest rate burden and investment opportunities are also predicted to play a vital role to determine firm growth. A low interest rate burden is expected to stimulate more firm growth 9a negative relation), while firms with good investment opportunities (measured by the high value of firm market value compare to its book value) will also help to foster their growth

The contribution in this chapter is to extend the existing literature and to contribute to the empirical evidence for developing countries. In other words, this study focuses on the actual links between growth and specific resources of finance. To the author's best knowledge, many previous studies focus more on the issue of the relationship between firm investment and its financing constraint. Others focus more on the issue of firms' growth according to its size. Thus, it is important to examine the financial determinants of firms' growth particularly in developing countries.

However, recent studies have been carried out for developed countries. Examples can be seen in Evans (1987), Lang (1996), Huynh and Petrunia (2010) and Rahaman (2011). However, Guariglia et al. (2011) study this issue for quite a different situation where they focus on this issue for a study case of China. Recently, China's economy has grown rapidly compared to other countries. So, focusing this issue on China would help the policy makers and the firm managers to identify the determinants of firms' growth in China. Thus, to fill the gap and to reach the objective, this chapter chooses the small open economy of Malaysia as one developing country. Furthermore, little research studies the issue in Malaysia particularly at the microeconomic level. Previous studies focus more on macro-level data, for example, Ang and McKibbin (2007) and Law et al. (2006) examine whether financial development leads to economic growth or vice versa in the small open economy of Malaysia.

4.2 Literature Review

Despite a growing body of literature investigating the role of financial constraints on firm investment, empirical studies on the effect of financing constraints over firm growth are scarce. Firm growth has been the focal point of many studies in the literature and many of them focus more on the issue of the relationship between firm growth and firm size. This issue can be linked to the law of proportionate effects known as Gibrat's law. Gibrat (1931) introduced the law of proportionate effects which assumes that the size of a firm follows a random walk. The law of proportionate effects states that a firm's expected growth should be proportional to its current size. This implies that firm's expected growth rate should be independent of its size.

Besides, Jovanovic (1982) proposes the learning model which is consistent with a negative age-growth and size-growth relationship. This model argues that once firms are established in the industry, they learn about their efficiency. The process of competition forces the least efficient firms to exit and allows more efficient managers to learn about their efficiency and to adjust their scale of operations. Hence, young and small firms which are in the initial process of uncovering their own efficiency level grow faster and their growth rates are more volatile. According to the firm growth and size relationship, previous studies find that there is a negative relation between size and firm growth, for example in Evans (1987) and Dunne at al. (1989). These findings support the learning model proposed by Jovanovic (1982).

Based on the literature, there are several common measurements for firm growth. Evans (1987) and Rahaman (2011) use the employment size (first difference in natural logarithm of employment) to measure the firm growth. The advantage of using firm-level employment growth is that firm-level employment is carefully followed and recorded over time and is less subject to accounting manipulation. However, it is quite difficult to collect employment data for firms in developing countries. For this reason, other measurements can be used to measure the firm's growth. For example, Lang et al. (1996) use capital expenditure growth as the measurement for firm growth while Guariglia et al. (2011) use assets growth. Huynh and Petrunia (2010), on the other hand, use the growth of firm sales as the measurement for firm growth.

On the other hand, there is an issue of relation between firm growth and financial factors or financial constraints such as internal funds and external funds, financial leverage and interest rate burden. This issue has been focused on by the researchers

because of the availability and cost of finance is one of the factors which affect the ability of a firm to grow. The growth of firms is constrained by the availability of the quantity of internal finance. According to the pecking order theory of financing proposed by Myers (1977), there are three steps for financing firm investment namely; internal funds, by issuing debt and by issuing equity. Internal funds are one of the most important sources to finance new projects in emerging economy. However, for firms with investment projects are substantially larger than their current earnings will not have enough finance from internal funds and will face a constraint in their growth project. As a result, they will find other sources of financing which can be funded from the external funds. In other words, once internal fund is exhausted, firms must turn to debt and equity as external funds. Recently, theories of firm dynamics also emphasize the role of financial variables as determinants of firm growth particularly for small and young firms.

Carpenter and Peterson (2002) show that the internal finance theory of growth can help to account for stylized facts of firm growth. Specifically, they investigate how possible finance constraints could affect the firm growth (total assets growth). Their test of the relevance of finance constraints uses the same principle as that applied to the investment model. However, they use static panel data model to estimate the specification model which faces possible biased and inconsistent results.

Besides, the theory of optimal capital structure states that firm managers choose financial leverage based on its private information about future firm growth. Financial leverage is related to the issue of how the firm managers decide to use the debt in their financing. The greater the amount of debt, the greater the financial leverage. Lang (1996) states that firm managers should choose lower leverage when they know that the firms have valuable growth opportunities because these firms might not be able to take advantage of their investment if they have to raise their outside funds. As a result, there exists a negative relation between leverage and firm growth. However, Bo (2007) argue that the relation between firms' investment and its financial leverage as a non-linear. At the first stage, financial leverage gives a positive impact on firms' investment. However, it turns to be a negative after an optimum level. Thus, it is also assumed that Bo (2007) argument could be applied to the relation between firms' growth and financial leverage.

Huynh and Petrunia (2010) examine the firm growth relationships with financial aspects such as financial leverage and initial financial size (assets) where leverage is measured by the debt to asset ratio. The findings show that leverage and initial asset

size give positive impacts on firm growth which indicates the important role of financial factors on firm growth. They conclude that there is a positive and non-linear relationship between firm growth and leverage. The positive relationship between growth and the leverage may proxy for a firm's access to financial markets. Leverage captures productivity differences as higher leveraged firms, controlling for equity, should be more productive with more desire to expand.

Lang et al. (1996) examine the relation between leverage and firm growth over a period of 20 years from 1970 to 1989. Their findings show that there is a negative relation between leverage and firm growth. Specifically, a negative relation between growth and leverage exists only for firms with low Tobin's q. It suggests that a negative effect of leverage on growth affects only those firms with good investment opportunities that the market does not recognize and those firms that do not have good investment opportunities but might want to grow. However, Lang (1996) uses a static model in his regressions which faces the potential endogeneity issue in the explanatory variables and it leads to possible bias and inconsistency in the results.

On the other hand, Guariglia et al. (2011) discuss the role of financial resources on firm growth. According to their argument, once internal finance is exhausted (measured by the firm cash flow), the firm must turn to debt finance. As a result, the more leveraged a firm is, the more incentives it will have to undertake more risky investment projects. In this chapter, Guariglia et al. (2011) use the first difference GMM (dynamic panel data) but they are only concerned with the internal funds without taking into account the impact of other financial factors on firm growth.

However, many of the above studies focus more on developed countries rather than developing countries. Evan (1987) and Dunne et al. (1989) focus on the United States of America, while Huynh and Petrunia (2010) use data from Canada to examine the relation between size and firm growth. It is worth noting that the same situation happens in the study on the relation between financial factors and firm growth. For example, Rahaman (2011) examines the effect of financial structure on firm growth in the United Kingdom, while Lang et al. (1996) use data from the United States to identify the relation between leverage and future growth. Shaffer (2002) even use a dataset from 700 United States cities but the focus is more on the impact of firm size and income growth. On the other hand, Guariglia et al. (2011) use a different data set which focuses on China. As is known, China's growth is faster than other developed countries including Japan. So, this study is very interesting in identifying the role of internal finance to foster Chinese firm growth.

In developing countries, Sleuwaegen and Goedhuys (2002) study the relation between size, age and firm growth in Cote d'Ivoire as one African country, from the period 1989 to 1994. Their results show that firm growth is explained by both size and age. In the Malaysia context, Law et al. (2006) use a macroeconomic dataset to examine the role of financial development in promoting economic growth. For this purpose, they use an aggregate dataset from Malaysia for the period 1980 to 2002. Based on a multivariate framework, their findings show that finance plays a vital role to foster economic growth. Recently, Ma'in and Ismail (2010) study the impact of the debt ratio on firm investment for listed firms in Malaysia. However, their study focuses more on the issue of firm investment and it is contrasted with the issue in this chapter which focuses on the issue of firm growth. Furthermore, explanatory variables are not limited to financial leverage (the debt ratio only) but also focus on other explanatory variables such as internal funds and interest burden as well as investment opportunities.

Motivated by the above literature, this chapter extends the existing work by examining the effect of financial factors on firm growth in a developing country. Malaysia as one small open economy has been chosen for this study and as one representative developing country. Moreover, there are only limited studies that focus on Malaysia particularly by using firm-level datasets. Besides, this chapter also identifies the heterogonous effect between financial factors and firm growth by dividing the firms based on the size and sectors. Moreover, this chapter estimates the model specification with dynamic panel data using the one-step system GMM estimator. The one-step system GMM estimator is suitable for this study as it captures the issue of weak exogenous or endogeneity in the explanatory variables such as cash flow, leverage and interest rate burden. Then, this chapter also checks the robustness of the result using the first difference GMM estimator.

4.3 Firm Growth Theory and Its financial constraints

The explanation about the theory of firm growth and its financial constraints is closed to the explanation of firm investment and its financial constraints. Most of studies in the issue of firm growth and its financial constraints; for examples Carpenter and Petersen (2002), Cooley and Quadrini (2001), Guariglia et al. (2011) and Rahaman (2011) are motivated by the study carried out by Fazzari et al. (1988) who examine the effect of cash flow on investment. They try to show that financial constraints are a significant determinant of firm investment decisions.

In this chapter, the conceptual framework to relate a firm's financing and its growth refers to the framework as explained in Rahaman (2011). According to this framework, it is assumed that in any given period t, firm i receives a productivity shock a_{it} which is positively correlated across time. It can be assumed as:

$$a_{it} = \rho.a_{it-1} + \varepsilon_{it} \text{ where } \rho \in (0,1) \text{ and } \varepsilon_{it} \text{ as in distributed as } N(0,\sigma_{\varepsilon}) \qquad (4.1)$$

It is also assumed that the growth of the firm is proportional to its investment growth. All new investment comes from firm's profits if any external financing sources are assumed to be absent. Any remaining profits after additional investments are distributed to the stakeholders of the firm so that no earnings are retained across time. The additional investment (I_{it}) can be written as:

$$I_{it} = a_{it}.\pi_{it} - D_{it} \qquad (4.2)$$

Here π_{it} is the gross profit of firm i in period t and D_{it} is part of the profit (π_{it}) that is distributed to the stakeholders of firm i in period t. Thus, the investment growth of the firm can be written as:

$$\frac{I_{it}}{I_{it-1}} = \alpha + \beta.\frac{\pi_{it}}{\pi_{it-1}} + \upsilon_{it} \qquad (4.3)$$

where $\alpha = -\frac{D_{it}}{I_{it-1}}$, $\beta = \rho.\left(1 + \frac{D_{it-1}}{I_{it-1}}\right)$ and $\upsilon_{it} = \frac{\pi_{it}}{I_{it}}.\varepsilon_{it}$.

However, if firm has access to external sources of financing, it is no longer constrained by internally generated funds and thus the new investment (I_{it}) can be written as:

$$I_{it} = F_{it} + E_{it} \tag{4.4}$$

Where $F_{it} = a_{it}.\pi_{it} - D_{it}$ is financing from internal sources and E_{it} is financing from external sources. The marginal benefit from each type of financing is exactly equal to the marginal cost of that financing source. It indicates that when the cost of internal financing is exactly equal to the cost of external financing, F_{it} and E_{it} are perfect substitutes. On the other hand, if the external financing is costlier than internal financing, I_{it} and E_{it} become imperfect substitutes and firm growth crucially rely on its access to financing.

This chapter focuses on the cash flow as a source of internal funds, financial leverage of firm to measure the reliance on the debt to stimulate the firm growth as well as the interest burden that is faced by the firms. Furthermore, the investment opportunity is also included as an explanatory variable and is expected to give a significant impact to foster firm growth.

4.4 Estimation Procedures

4.4.1 Model specification

Based on the conceptual framework in Section 4.3 and the previous literature, the model specification in this chapter is adapted from Carpenter and Petersen (2001) and extended from Guariglia et al. (2011). It can be written as follows:

$$FGROW_{it} = \beta_0 + \beta_1 FGROW_{it-1} + \beta_2 CFTA_{it} + \beta_3 LEVE_{it} + \beta_4 IB_{it} + \beta_5 INVO_{it} + \eta_i + \lambda_t + \mu_{it} \tag{4.5}$$

Based on firm growth model in equation (4.5), $FGROW$ indicates growth for firm i in period t. Firm growth is measured by the growth of firm's sales. The growth of firm's sales is defined as follows:

$$FGROW = Log(TotalSales_{it}) - Log(TotalSales_{it-1}) \quad (4.6)$$

While, $CFTA$ indicates the firm's cash flow to total assets ratio to measure internal fund for firm and $LEVE$ represents the financial leverage of firm which has been measured by the ratio of total long term debt to total assets, IB is interest rate burden as a firm-specific indicator and is defined as the ratio of interest payment to total debt. $INVO$ depicts the investment opportunity that firms have to foster their growth and it has been shown by the ratio of book value of equity and market value of equity. Here $\eta_i + \lambda_t + \mu_{it} = \varepsilon_{it}$ indicate two way components of error terms with η_i is unobserved country-specific effects, λ_t is time specific effect and μ_{it} is the remainder stochastic disturbance term that is assumed to be independent and identically distributed with mean zero and variance σ_μ^2.

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Based on the model specification in equation (4.5) above, $CFTA$ captures the sensitivities of the cash flow on firm growth. The impact of $CFTA$ is expected to be positive to foster firm growth as it is costless compared with other sources of financing. It is also expected that the greater the magnitude of this coefficient the stronger the relationship between cash flow and firm growth. On the other hand, a smaller magnitude of the estimated coefficient implies a weaker relationship between these two variables. It is also expected that the coefficient value of cash flow is bigger in small firms than large firms which indicates small firms rely more on internal funds to foster their growth.However, the $LEVE$ effect is expected to be ambiguous as some studies find that there is a negative effect of leverage on firm growth while others find that it gives a positive impact on firm growth; for examples, Lang et al. (1996) and Huynh and Petrunia (2010). Thus, this chapter will identify what is the impact of leverage on firms' investment in Malaysia. IB is expected to give a negative effect to firm growth as high level of interest burden will slow the firm growth and vice versa. While $INVO$ is expected to give a positive effect to firm growth for firms with high market value compare to its book value.

4.4.2 Detecting the outliers

All data in this study are collected from Worldscope Full Company Reports in Thompson which can be downloaded from the Datastream database. The data covers the period from 1990 to 2009 for listed firms in Malaysia. After filtering the data particularly the availability issue for the required data, this chapter uses unbalanced panel data and covers 496 firms.

The first analysis in this chapter is to detect the existence of potential outliers in the sample. This has been done using the DFITS test as proposed by Belsley et al. (1980). This statistic identifies observations with a high combination of (statistical) leverage[17]and residual. The statistic is given by $DFITS = r_i\sqrt{\frac{h_i}{(1-h_i)}}$ where r_i is studentized residual given by $r_i = \frac{e}{\left(s_{(i)}\sqrt{1-h_i}\right)}$ with $s_{(i)}$ refers to the root mean squared error (s) of the regression equation with the ith observation removed, and h is the leverage statistic. Belsley et al. (1980) suggest that a cutoff value of $\left|DFITS_i\right| > 2\sqrt[2]{k/n}$ indicates highly influential observations. On other words, an observation is considered as an outlier if the absolute DFITS statistic is greater than $2\sqrt[2]{k/n}$, where k depicts the number of explanatory variables and n is the number of firms.

4.4.3 Splitting sample procedure

As explained above, this chapter examines the relationship between firm growth and its financial factors for listed firms in Malaysia. One of the specific objectives is to examine and to identify these relationships by splitting the firms based on one characteristic, namely size. Thus, the sample has been divided into two groups which are large and small firms. As noted in the literature, large firms intend to use smaller amounts of internal funds as it is easier to finance their activities by external funds.

[17] Here, statistical leverage definition differs with the financial leverage. Leverage in statistical context is a measure of how far an independent variables deviates from its mean. These leverage points can have an effect on the estimate of regression coefficients. An observation with an extreme value on a predictor variable is called a point with high leverage.

On the other hand, small firms rely more on internal funds to stimulate their growth as external funds are expensive and difficult for them to obtain.

Therefore, the firms have been split by using the net sales, as proposed by Spaliara (2009). The splitting procedure has been implemented using two main important steps. First, the mean value of firm net sales has been computed for every firm. The second step computes the grand median of the average value of net sales. Then, the sample is categorized into two groups namely large and small. A firm is considered as large when its mean value of net sales is larger than the grand median value, and as small when the mean value is smaller than its grand median value. According to this procedure, there are 304 firms in the large group and 181 firms in the small group. The median value has been used as the threshold point in order to split the sample into two groups. Median value has been chosen to split the sample as it is simple to understand and easy to calculate while it also gives a measure that is more robust in the presence of outliers values than the mean value.

4.4.4 Estimation procedure

The inclusion of a lagged dependent variable in the specification model as depicted in equation (4.5) implies that there is correlation between the regressor and the error term. Besides, time-invariant firm characteristics (fixed effects) may be correlated with the explanatory variables. The panel dataset in this chapteralso has a larger firm dimension and a short time dimension. Moreover, there is the possibility that some explanatory variables in the model specification in equation (4.5) to be endogenous. For example Bo (2007) has found that the cash flow and the leverage are likely to be endogenous. Based on the model characteristics above, the OLS, fixed effects and random effects estimators are not suitable to use as they are biased and inconsistent. Thus, this chapter applies the Generalized Method of Moment (GMM) estimator as it controls for a simultaneity bias. The GMM dynamic panel data estimator has been introduced by Arellano and Bond (1991) who propose the first difference GMM estimator and it has been extended by Arellano and Bover (1995) and Blundell and Bond (1998) who introduce system GMM estimator. Specifically, this chapter uses one step system GMM to estimate the model specification. The details about the estimator that has been used in this chapter can be found in Section 2.3.3.

4.5 Results and Analysis

This section reports the estimation results of the augmented specification model in Carpenter and Petersen (2002) and extended the specification model in Guariglia et al. (2010). Carpenter and Petersen (2002) introduce the specification based on a static panel model, while Guariglia et al. (2011) introduce dynamic panel data but the specification model only depends on the lagged dependant variable and the cash flow variable as a proxy for the internal finance. This chapter proposes the dynamic specification model as in Guariglia et al. (2011) and adding other financial factor variables, namely $LEVE$ and IBas in Rahaman (2010) and Spaliara (2010). Then, this chapter also uses the additional variable $INVO$ as in Carpenter and Petersen (2002).

The analyses use a dataset that covers 664 listed firms in Bursa Malaysia from 1990 to 2009 on an annual basis. After screening and filtering particularly because of the availability of the data required only 496 firms remain in this study. Then, after detecting outliers, the number of firms drops to 485 firms. This is followed by separating the sample based on the firms' size which are large and small groups.[18]

4.5.1 Empirical result for the whole sample

As noted above, the main objective in this chapter is to examine the effect of internal finance as well as other financial factors on firm growth. Table 4.1 reports the results from the baseline specification as depicted by equation (4.5). It is followed by Table 4.2 which reveals the results based on the firm characteristics (size) which are large and small groups. Then, Table 4.3 shows the results for four sectors in Malaysia namely property, services, consumer and industrial products. These four sectors have been chosen in this estimation for two reasons. The first is because of the contribution of these sectors to foster aggregate economic growth in Malaysia and the second is there is a small number of a sample for other sectors.[19]

As noted, Table 4.1 depicts the relationship between firm growth and its financial factors for the listed firms in Bursa Malaysia, Malaysia for the period 1990 to 2009.

[18] Appendix 4.1 shows the result for detecting the outliers using DFITS test.
[19] The GMM estimator is suitable for sample with $N \to \infty$ and T is small.

Based on the results, it shows that the coefficient for the lagged dependent variable (lagged of firm growth - $FGROW_{t-1}$) has an important relationship with current firm growth in Malaysia and it is significant at 10 percent level. The estimated coefficient for *CFTA*, on the other hand, gives a positive impact on firm growth and it is significant at 1 percent level while the interest burden (*IB*) shows a negative relationship with firm growth and statistically significant at 10 percent level. Neither the financial leverage (*LEVE*) nor investment opportunity (*INVO*) has any significant impact on firm growth even though both show positive signs.

Table 4.1The relationship between firm growth and its financial factors: Results for the whole sample

	coefficient	**robust st.er**	**P-value**
$FGROW_{t-1}$	0.137	0.070	0.051
CFTA	0.535	0.072	0.000
LEVE	0.137	0.112	0.221
IB	-0.034	0.020	0.086
INVO	0.047	0.080	0.562
AR(2) p-value	0.489		
Sargan/Hansen test p-value	0.102		
No. of observations	4156		
No. of firms	485		

Notes:
The results in Table 4.1 have been obtained by estimating the model specification as in equation (4.5).
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b)
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space.

It is worth noting that the significant impact of past growth to the present growth means that past growth encourages present growth. On other words, firms that grew faster in the past will grow faster in the present. However, the main focus in this chapteris the relationship between firm growth and its financial constraints particularly its internal funds. From the results it can be interpreted that a 1 percent increase in the internal funds is associated with a 0.535 percent increase in firm growth. It shows that the importance of internal funds to foster firm growth and this result supports the internal fund theory in the economy. A negative effect of the interest burden to foster firm growth means that as the interest payments faced by firm increase, it will slow the firm growth, and vice versa. The results in Table 4.1 are supported by two specification test results namely the Arellano-Bond test for the second order (AR(2)) residual serial correlation and the over identification;the Sargan/Hansen test. Both tests fail to reject the null hypothesis which means that there is no second order serial correlation problem in the residual and the instruments used in the model are valid and correctly specified.

4.5.2 Results for large and small firms

In this section, this chapter reports the results for large and small firms. It has been done because of possible concerns with the heterogeneous effect between firm characteristics. Next table (Table 4.2) reveals the results for two different groups of firms (based on the size of firms). As noted above, the sample has been divided into two groups; large and small. In Column 1 in Table 4.2 the result reports for large firms in Malaysia. Based on the results, it can be seen that past firm growth give an important impact on current firm growth and it is statistically significant at 1 percent level. Besides, the cash flow also gives a positive impact on firm growth and it is statistically significant at 1 percent level. While, interest burden shows that it gives a negative impact on firm growth at 1 percent significant level. In Column 2 in Table 4.2, it can be seen that internal financing as shown by the variable *CFTA* gives a positive impact on firm growth for small group and it is significant at 1 percent level. The result of the interest burden indicates a negative relationship with firm growth and it is statistically significant at 10 percent level. Investment opportunity also appears to give significant impact on firm growth at 1 percent level with a positive sign.

The findings are supported by two specification tests namely the AR(2) test and the Sargan/Hansen test. TheAR(2) test for the second order serial correlation in the residual indicates that the failure for the estimation model to reject the null hypothesis. It means that there is no problem of second order serial correlation in the residuals. The second test that supports the result in Table 4.2 is the Sargan/Hansen test of over identification. The p-value depicts that it cannot reject the null hypothesis which means that the instruments used in the model are valid.

Table 4.2The relationship between firm growth and its financial factors: Results for large and small firms

Explanatory variables	Column 1			Column 2		
	Large firms			Small firms		
	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value
$FGROW_{t-1}$	0.398	0.102	0.000	0.081	0.078	0.298
CFTA	0.349	0.130	0.007	0.527	0.086	0.000
LEVE	0.147	0.165	0.374	0.120	0.011	0.290
IB	-0.046	0.010	0.000	-0.020	0.008	0.019
INVO	0.042	0.116	0.718	0.091	0.025	0.000
AR(2) p-value	0.109			0.655		
Sargan/Hansen test p-value	0.257			0.122		
No. of observations	2589			1487		
No. of firms	304			181		

Notes:
The results in Table 4.2 have been obtained by estimating the model specification as in equation (4.5).
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b)
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space

It is also worth noting that the estimated *CFTA* coefficient for large firms is smaller than the corresponding estimated coefficient for small firms. It shows that the small firms rely more on internal funds compare to large firms to stimulate their growth. This finding supports the pecking order theory of financing proposed by Myers (1977) who argues that internal funds is cost less than external fundsand small firms rely more on internal funds to generate their growth. Furthermore, it is quite difficult for small firms to get other sources of finance especially external fundsas it is more expensive and more competitive to access it compare to large firms. This result is also consistent with the results in Carpenter and Petersen (2002) for a developed country (United Kingdom) and Guariglia et al. (2011) for China. The theory of financial constraints explains that large firms are able to obtain easily the external financing

compared to small firms. Cabral and Mata (2003) also support the suggestion that the small firms are unable to raise the source of financing to increase investment. Eventually, this situation will lead the small firms to under invest and grow more slowly than large firms.

4.5.3 Results for four sectors

The focus in this study is not only on the identification of the heterogeneous effect of financial factors on firm growth based on firm characteristic, but it is also identify the heterogeneity between four main sectors. The four main sectors that have been examined are consumer products, industrial products, property and services.[20]Table 4.3 reveals the results for these sectors.

Column 1 in Table 4.3 shows the results for the consumer products sector in Malaysia. These results report that the *CFTA* and *LEVE* coefficients give positive impacts on firm growth and both of them are significant at 1 percent level. The interest burden appears to give a negative impact on firm growth in this sector but its impact is not significant. Other variables namely the past firm growth and investment opportunity are not significant in fostering firm growth. The significance of *CFTA* to stimulate the firm growth shows that firm in consumer products rely on internal funds to expand their activities and to foster their growth. On the other hand, firms in consumer products sector rely positively on the financial leverage (*LEVE*) as their external funding. This result is supported by the previous studies such asRahaman (2011). However, the reliance on financial leverage has to be identified carefully as high level of leverage implies the high ratio of debt. The high level of debt indicates that firms have more commitment to do a payment to the creditors. Eventually, it will give a negative effect on firm investment and growth. It is supported by the finding in Huynh and Petrunia (2010) who show that there is relationship between firm growth and non-linearity of leverage.

Column 2 in Table 4.3 reveals the result for firms in industrial products sector in Malaysia. Based on the result, it shows that the past firm growth significantly affects the present firm growth at 1 percent level. It also reports that the *CFTA* variable

[20]These four sectors have been chosen because each fulfills the requirement for GMM estimator (N > 50 and small T).

affects the firm growth positively and it is statistically significant at 1 percent level. Interest burden, on the other hand, gives a negative impact on firm growth at 1 percent significant level while, investment opportunity is significant to affect firm growth at 10 percent level. From the results, it can be seen that firms in the industrial products sector also rely on the internal funds to finance their activities and to stimulate their growth. Besides, high or excessive levels of interest burden will affect firm growth negatively as shown by the negative sign in the estimated coefficient for *IB*. Thus, firms must identify the optimum level of interest burden that they should bear to ensure they can maintain their activities and to stimulate their growth. Furthermore, firms with good investment opportunity will lead to generate their growth.

Next, the results for the property sector have been shown in Column 3 in Table 4.3. Based on the results both *CFTA* and *LEVE* significantly affect the firm growth at 10 percent, respectively with positive signs. While *IB* affects the firm growth negatively at 10 percent level. Other variables which are past firm growth and investment opportunity show insignificant impact to stimulate firm growth. It can be concluded that internal funds and leverage as well as interest burden play a vital role to determine firm growth in the property sector. Column 4, on the other hand, reports the results for the relationship between firm growth and its financial factors in the services sector. It shows that *CFTA* and *INVO* give positive effects on firm growth. Both are significant at 1 percent level. Other explanatory variables namely past growth, leverage and interest burden, on the other hand, are not significant to affect firm growth.

All estimations above are supported by two specification tests which are the AR(2) test for the second order serial correlation in the error term and the Sargan/Hansen test for over identification. It is worth noting that the AR(2) test fails to reject the null hypothesis for these four sectors. It indicates that there is no second order serial correlation in the residuals for all groups. TheSargan/Hansen test results for all groups also indicate the failure to reject the null hypothesis which means that all instruments are valid for all estimations and the models are correctly specified.

In comparison between these four sectors, it can be seen that all sectors rely on internal funds to stimulate their growth. It can be explained that internal funds play a vital role for the firms in Malaysia as it is costless to finance firm activities and to foster their growth. The *CFTA* coefficient value for property sector is larger than other sectors which indicate that this sector relies more on internal funds compare to other

sectors. *LEVE* , on the other hand, is important for consumer products and property sectors to stimulate their growth with positive effects. It is worth noting that firms in consumer products and property sectors use two channels to finance their activities which are internal funds and leverage (external funds). Once the cash flow is exhausted, they also consider the leverage to foster their growth. Furthermore, it shows that the leverage in consumer products sector has a higher impact on firm growth as depicted by the value of its estimated coefficient. It also can be seen that *IB* gives a significant impact on firm growth for industrial products and services sectors with a negative sign. The industrial products sector is more sensitive to the interest burden as it can be seen from the larger coefficient value than other sectors. For other explanatory variables namely investment opportunity, it gives significant effect on firm growth in industrial products and services sectors.

From the results in Table 4.3, it can be summarized that almost all financial factors in industrial products sector appear to give a vital role to stimulate firm growth (except for financial leverage variable). There is no doubt about the results as Malaysian Investment Development Authority (MIDA) reports that industrial product sectors remained as an important sector in the economy. The performance of industrial products sector has slowed down since the economic crisis in year 1997/1998, however, it still plays an important role to foster the economy. As reported, during the first nine months of 2009, this sector accounted for 26.8 percent of GDP.[21]

[21]Details can be found in the report provided by MIDA.

Table 4.3The relationship between firm growth and its financial factors for four main sectors in Malaysia

Explanatory variables	Sectors											
	Column 1			Column 2			Column 3			Column 4		
	Consumer Products			Industrial products			Property			Services		
	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value
$FGROW_{t-1}$	0.059	0.058	0.308	0.474	0.119	0.000	0.023	0.352	0.947	0.080	0.078	0.302
CFTA	0.376	0.115	0.001	0.384	0.042	0.000	0.737	0.294	0.012	0.422	0.156	0.007
LEVE	0.280	0.082	0.001	0.096	0.163	0.558	0.349	0.192	0.068	0.045	0.086	0.600
IB	-0.012	0.016	0.432	-0.093	0.025	0.000	-0.022	0.013	0.083	-0.051	0.054	0.345
INVO	0.082	0.086	0.341	0.054	0.023	0.020	0.011	0.020	0.588	0.010	0.002	0.000
AR(2) p-value	0.446			0.387			0.804			0.973		
Sargan/Hansen test p-value	0.942			0.121			0.411			0.904		
No. of observations	647			1171			526			772		
No. of firms	78			150			57			95		

Notes:
The results in Table 4.3 have been obtained by estimating the model specification as in equation (4.5).
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b)
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space

4.5.4 Robustness check

This section reports the results for robustness checking. To achieve the objective in this section, the model specification has been estimated using the first difference GMM. Then, the results in this section will be compared with the results from one-step system GMM in previous section and also will be compared with the results from previous studies. Thus, Table 4.4 indicates the results for the whole sample while Table 4.5 shows the results for large and small firms. It followed by Table 4.6 which reports the results for four main sectors in Malaysia.

As shown in Table 4.4, the results for the whole sample have been estimated using the first differenced GMM estimator. It shows that the *CFTA* gives a positive effect on firm growth while the interest burden, on the other hand, affects the firm growth negatively. Both results are significant at 1 and 5 percents, respectively. However, the results for other explanatory variables are not significant to foster firm growth. The results in Table 4.4 are supported by the AR(2) and the Sargan/Hansen tests. Both tests indicate the failure to reject the null hypothesis which means there is no second order serial correlation in the residual and the instruments used in the model are valid.

The results in Table 4.4 have been compared with the results in Table 4.1 in Section 4.5.1 (for the whole sample using one step system GMM estimator). Both results depict that cash flow as an indicator for internal funds play a vital role to foster firm growth with a positive and significant effect. The significant impact of internal funds on firms growth indicates that the cost of financing as a main factor to generate more activities and to stimulate growth (internal funds cost less than other sources of finance). The interest burden also remains to give a negative effect on firm growth which can be explained that the highest value of interest burden will slow down the firm activities and the firm will grow weakly. However, the result for lagged firm growth is only significant in one step system GMM, while in first difference GMM estimator it appears to give insignificant impact on firm growth. Both result are supported by two specification tests; the AR(2) and the Sargan/Hansen tests. In comparison, it can be explained that the results for both tables are quite consistent and robust.

Table 4.4 The effect of firms' financial factors on its growth: Results for the whole sample (First Differenced GMM)

Explanatory variables	**coefficient**	**robust st.er**	**P-value**
$FGROW_{t-1}$	0.377	0.290	0.194
CFTA	0.476	0.036	0.000
LEVE	0.318	0.194	0.101
IB	-0.098	0.044	0.026
INVO	0.085	0.188	0.651
AR(2) p-value		0.258	
Sargan/Hansen test p-value		0.474	
No. of observations		4153	
No. of groups		485	

Notes:
The results in Table 4.4 have been obtained by estimating the model specification as in equation (4.5) in first difference form.
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b).
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space.

Table 4.5 The effect of firms' financial factors on its growth: Results for large and small firms (First Differenced GMM)

Explanatory variables	Column 1			Column 2		
	Large firms			Small firms		
	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value
$FGROW_{t-1}$	0.185	0.086	0.032	0.438	0.094	0.000
CFTA	0.476	0.063	0.000	0.397	0.025	0.000
LEVE	0.064	0.094	0.495	0.548	0.245	0.025
IB	-0.028	0.014	0.051	-0.086	0.034	0.013
INVO	0.018	0.015	0.213	0.047	0.119	0.690
AR(2) p-value	0.44			0.329		
Sargan/Hansen test p-value	0.108			0.279		
No. of observations	2589			1487		
No. of groups	304			181		

Notes:
The results in Table 4.5 have been obtained by estimating the model specification as in equation (4.5) in first difference form.
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b).
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space.

Next, Table 4.5 reports the results for large and small firms which have also been estimated using first differenced GMM. According to column 1, it can be seen that past firm growth plays an important role in stimulating current firm growth for the large firms group and it is statistically significant at 10 percent level. The cash flow shows a positive effect and the interest burden appears to give a negative impact on firm growth. Both are significant at 1 and 10 percent significant level, respectively. On the other hand, the results in column 2 show the relationship between financial factors and firms growth for the small firms. The results reveal that the past firm growth and the cash flow play an important role to foster firm growth and both give positive effect that is statistically significant at 1 percent level. Besides, the estimated coefficient for financial leverage appears to give a positive impact to firm growth at 10 percent significant level while, the coefficient for the interest burden shows that it

affects the firm growth negatively and it is also significant at 10 percent level. However, in term of magnitude of the estimated coefficient, it shows that the cash flow coefficient in large firms is slightly bigger than small firms. It means that large firms rely more on internal funds compare to small firms. This finding is contradicted with the finding based on one-step system GMM. From the both results, it can be concluded that the results are quite robust with the cash flow and the interest burden appear to be consistent and important determinants for firm growth in this group (small size firms).

Table 4.6 reports the results for the relationship between firm growth and its financial factors for four sectors in Malaysia using first differenced GMM. As shown in Table 4.6, the past firm growth affects the present firm growth in the industrial products sector (Column 1). It is indicated by the significant value of the estimated coefficient at 1 percent level. However, the estimated coefficient for the past firm growth is not significant for the other three sectors (consumer products, property and services sectors). On the other hand, the cash flow shows a significant and a positive effect for all sectors and it is indicated by the significant value of estimated coefficient at 1 percent significant level. The financial leverage also gives a positive impact on firm growth. However, it is only significant for consumer products and services sectors at 10 percent level.

It is also worth noting that interest burden shows a negative and significant impact on firm growth in industrial products and property sectors. Both are significant at 1 and 10 percent significant levels, respectively. The effect of interest burden on firm growth is not significant for other two sectors (consumer products and services sectors). Finally, investment opportunity appears to give a positive and a significant effect on firm growth for the industrial products sector (significant at 10 percent level) and services sectors (significant at 1 percent level). While, for the consumer products and property sectors, the results are not significant. The results in Table 4.6 are supported by two specification tests: the AR(2) test and the Sargan/Hansen test. Based on the table, every column depicts that it fails to reject the null hypotheses which mean there is no second order serial correlation in the residuals and the instruments used in the estimated model are valid and correctly specified.

Based on the results in Table 4.6, it seems that the property sector relies more on internal funds rather than other sectors. This is shown by the large value of its estimated coefficient in Table 4.6. The internal funds can be said as a vital determinant on firm growth compare to other financial factors and it is demonstrated by the large value of its coefficient in each column. In comparison with the result in

Table 4.3, it can be explained that the results for consumer products and industrial products sectors are robust and consistent, while, the results for property and services sectors are slightly different. However, it is still worth noting that internal fund appears as an important determinant for firm growth in Malaysia and property sector shows the reliance more on the internal fund to foster the growth compare to other sectors. This finding is consistent with the result in Table 4.3.

4.5.5 Further discussion

As depicted from the empirical estimated results either by using one-step system GMM or first-differenced GMM, it can be seen that the internal funds play an important role to stimulate firm growth. It has been depicted with a positive sign and a significant effectl from both estimators. Carpenter and Petersen (2002) argue that each increase in internal finance should generate additional growth. Furthermore, the coefficient value for the cash flow is greater compare to the coefficient value for other explanatory variables. In comparison between large and small firms, the result shows that small firms rely more on the cash flow than other factors to foster their growth. It can be explained that the costs of financial distress are likely to be particularly severe for small and growing firms because much of their value comes from growth options whose value depreciates rapidly if the firm experiences financial troubles. This finding is consistent with the previous studies on the financial constraints and firm growth or investment, for examples in Carpenter and Petersen (2002), Guariglia et al. (2011) and Rahaman (2010).

Besides, other financial variables such as the financial leverage and interest burden also play important roles to stimulate the firm growth. This supports other studies which find that other financial variables also help to foster firm growth for example in Rahaman (2010). However, the finding for the effect of leverage on firm growth in this chapter contradicts the findings in Lang et al. (1996). Lang et al. (1996) find that leverage affects the firm growth negatively. There are two reasons why the finding in this chapter differs with Lang et al. (1996). First, Lang et al. (1996) use a dataset from a developed country, namely the United States, which differs from a dataset in this chapter which covers the country from small open economy of Malaysia (a developing country). Lang et al. (1996) argue that the leverage affects firm growth negatively. In this chapter, it can be said that firms in Malaysia grow well and leverage give a positive impact on them, Second, the estimation in Lang et al. (1996) has been

carried out using the Ordinary Least Squares estimator which could result in bias in the estimated coefficients.

However, as noted in Section 4.2, previous studies focus more on developed countries such as the United States and the United Kingdom. The findings in this chapter give empirical support for the relationship between firm growth and financial factors in developing countries. Specifically, it contributes to the analysis of Malaysian firms and policy makers in identifying the determinants of firms' growth in Malaysia. Directly, this finding could guide the firm managers to choose their financing and to consider other financial factors that would help to foster their growth. These findings are important as it can be used by the firm managers to adopt strategies for overcoming the financing constraints and to identify the significance of financial factors to determine firm growth. Furthermore, from the policy makers' side, they could use the finding in this chapter to develop or to implement the policy that can support the firms to grow easily. Moreover, the evidence about the reliance of small firms on the internal funds could be used by the policy maker to provide more facilities for financing small firms with good investment opportunities. It includes the participation of the banks to provide the credit facilities particularly for small firms as they have limited sources of financing. Eventually, the facilities provided could help small firms to grow rapidly and steadily.

Table 4.6The effect of firms' financial factors on its growth:for four main sectors in Malaysia (First Differenced GMM)

Explanatory variables	Sector											
	Column 1			Column 2			Column 3			Column 4		
	Consumer Products			Industrial products			Property			Services		
	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value	coefficient	robust st.er	P-value
$FGROW_{t-1}$	0.097	0.075	0.195	0.482	0.118	0.000	0.025	0.383	0.947	0.033	0.105	0.749
CFTA	0.372	0.118	0.002	0.387	0.043	0.000	0.738	0.313	0.019	0.474	0.178	0.008
LEVE	0.130	0.059	0.029	0.100	0.166	0.546	0.357	0.277	0.199	0.256	0.108	0.018
IB	-0.081	0.167	0.624	-0.092	0.025	0.000	-0.022	0.012	0.071	-0.072	0.073	0.321
INVO	-0.043	0.065	0.508	0.073	0.040	0.066	0.011	0.024	0.643	0.013	0.003	0.000
AR(2) p-value	0.446			0.359			0.811			0.358		
Sargan/Hansen test p-value	0.947			0.181			0.612			0.266		
No. of observations	647			1171			526			772		
No. of groups	78			150			57			95		

Notes:
The results in Table 4.6 have been obtained by estimating the model specification as in equation (4.5) in first difference form.
The estimation is implemented by controlling the number of lag of instruments and collapsing the instrument variable matrix as in Calderon et al. (2002) and Roodman (2009b).
The instruments have been assumed as follows: $FGROW_{t-1}$, CFTA and LEVE as endogenous variables while IB and INVO as predetermined variables.
Year dummies and constant are not reported in order to save space.

4.6 Conclusion

What is the final verdict on the effect of financial factors on firm growth in Malaysia? To answer this question, this chapter examines empirically the relationship between the growth rate of firms and its internal funds and other financial factors in Malaysia. Previous literatures investigate the role of financing constraints on firm investment broadly. However, the empirical studies on the effect of financing constraints over firm growth are scare particularly for developing countries. Using an unbalanced panel data for Malaysian firms for the period 1990 to 2009, this chapter finds that internal funds play an important role to foster firm growth in both groups; large and small. Specifically, small firms rely more on internal funds as indicated by the large magnitude of its estimated coefficient compare to large firms.

Financial leverage also indicate the significant impact to stimulate firm growth. As explained in the literature, leverage affects the firm investment and growth positively and negatively. Furthermore, Bo (2007) argues that there is a nonlinear relationship between leverage and firm investment and growth. The findings in this chapter show that there is a positive relationship between financial leverage and firm growth and it is supported by previous studies such as Rahaman (2010). Investment opportunity, which is measured by the ratio of book value of equity and market value of equity, gives a positive impact on the firm growth. This implies that the market value of firms is higher than their book value which induces to firms to get high investment opportunity and finally help them to foster their growth. It can be concluded that the firms in the sample have high investment opportunity and it is consistent as all firms in the sample come from the listed companies in Bursa Malaysia, Malaysia.

Finally, the interest burden also plays an important role to determine firms growth as the results show that there is a negative relationship between interest burden and firm growth. It can be explained that high interest burden tends to slow the firm growth, while the low interest burden will stimulate firm growth. Also, small firms are more sensitive to the interest burden. The estimation for four sectors; consumer products, industrial products, property and services sectors also supports the argument about the importance of internal funds and other financial factors to stimulate the firm growth. Besides, the property sector also indicates the reliance more on internal funds compare to other sectors and the sensitivity of interest burden is higher in industrial products sector than other sectors. Also, investment opportunity in industrial sector has a big impact on firm growth compare to other sectors.

From the results, it can be summarized that firms can overcome finance-induced growth constraints by accumulating more internal funds. Besides, the reliance on internal funds decreases for firms categorized as large firms. Furthermore, the results also suggest that firm growth also determined by other financial factors such leverage and interest burden.

The findings could help the firm managers to identify the determinants of financial factors to foster firms' growth. Moreover, the policy makers also have to ensure that economic environment is always in good condition and to provide the financing facilities to help firms to grow rapidly and steadily. It includes by ensuring that the firms have opportunity to get more financing and the firms face the feasible level of interest rate burden. It is important to ensure the firms are not bear the high level of payback commitments that could affect their growth negatively.

However, this chapter has several limitations suggest for further study in this topic particularly for developing countries and specifically for Malaysia. First, there is no data available for unlisted firms in Malaysia so the comparison between listed and unlisted firm growth cannot be done. Second, there is no data for age for every firm. Thus, this chapter cannot extend the issue by examining the impact of firm age on firm growth as discussed in the literature. This chapter only studies the listed firms in Bursa Malaysia without taking into account the effect of age on firm growth. Thus, further study can be done for unlisted firms in Malaysia with taking into account the effect of size and age as well as the financial factors on firm growth.

5. CONCLUSIONS

Economists agree that economic growth is crucial for all countries striving to reach the concept of economic development. Furthermore, the contributions of the private sector have also to be given attention as it plays an important role to foster aggregate economic growth. Thus, studying growth and investment either in aggregate or firm level is important, despite difficulties in identifying the most salient determinants. This dissertation consists of three essays that focus on growth in both aggregate and firm level as well as firms' investment. Generally, these three essays identify the determinants of growth and investment either in aggregate or at firm level.

Chapter 2 has highlighted the issue of the effectiveness of government size and institutions to promote aggregate economic growth. It examines recent relation between government size and economic growth in developed and developing countries. This chapter also tests the non-linearity of government size as hypothesized by Armey (1995). In addition, the effects of institutional quality (that consists of four components namely corruption, bureaucracy, democracy and law and order) on economic growth have also been emphasized.

The estimation results show that the effects of government size and institutions are negative on economic growth in developed and developing countries. These findings contradicts the hypothesis in this chapter.However, it supports previous works on this issue for example James (1997) and Dar and AmirKhalkali (2002). This chapter also supports the Armey curve for the existence of a non-linear relation between government size and economic growth. It indicates that government size gives a positive effect at the first stage but then its impact turns to a negative when government size is over expanded. The results for four components of institutional quality suggest that democracy and law and order play a vital role to foster economic growth positively while corruption (a negative sign) and bureaucracy (a positive sign) display insignificant impacts on economic growth.

These findings suggest that inefficient and ineffective government size do not promote economic growth. It is supported by the finding of non-linearity for government size which indicates government size must be determined efficiently and optimally. Besides, the importance of institutions to promote economic growth has also to be given more attention. Policy makers should not neglect the role of government size and institutions to ensure there is no distortion in the allocation of

resources in the economy. It is crucial for government to focus their efforts in provision of public goods and human capital development.

Chapter 3 provides evidence about the response of firm investment (private sector) on the aggregate uncertainty and debt holding. This chapter tries to investigate the effect of the aggregate uncertainty (the market interest rate) upon firms' investment in Malaysia. The aggregate uncertainty has been measured by a GARCH model. Besides, the cross effect between aggregate uncertainty and debt holding on firms' investment is also examined as it is assumed that the financial structure of firms is relevance to the aggregate uncertainty. This chapter also examines the heterogeneous effects of aggregate uncertainty and debt holding for high- and low-indebted firms.

The findings depict that the market interest rate uncertainty affects firms investment negatively, both for the whole sample and when splitting the sample into two groups; high- and low-indebted firms. The debt holding affects firms' investment negatively. It does not support the expectation in this chapter and it also does not support the signalling hypothesis. Firms' investment is also not sensitive to the twin effects of the market interest rate uncertainty and debt holding as indicated by insignificant results, both for the whole sample and the two main groups. The findings also reveal that there is no heterogeneity between high- and low-indebted firms. It is not surprising as all firms in the sample have been collected from the listed companies. Therefore, a comparison between listed and unlisted firms has to be done in order to identify any heterogeneity in the results.

Accordingly, policy makers should pay more attention to uncertainty in the aggregate level. It is because uncertainty in the aggregate level affects not only macroeconomic variables such as economic growth, but also influence firms' investment decisions. The stability in the market interest rate and in aggregate prices have to be monitored by the country's authority such as Central Bank (Bank Negara Malaysia in Malaysia's case). It is important to ensure that there is no distortion in the allocation of resources and the best investment opportunities are easily identified in a stable economic environment. Thus, it allows firms to invest in a project with high returns effectively. In other words, the firms have to pay more attention to aggregate uncertainty as its effect plays a vital role in firms' investment decisions. Furthermore, firms have also to be aware of the possibility of existence of a non-linear relation between debt holding and firms' investment. It is important to ensure firms finance

their investment effectively. It would be interesting for further research to investigate the effect idiosyncratic uncertainty on firms' investment in Malaysia.

Chapter 4 examines the role of financial factors to determine firms' growth in Malaysia. This investigation has been done to fill a gap in the literatures on firms' growth particularly in developing countries. Previous researches have been focused on the issue of growth, size and age. Recently, the study on financial constraints has been focused on to determine firms' growth particularly in developed countries. This chapter extends the existing literature by focusing not only on financial constraint but also on other financial factors such as the interest burden.

The findings in this chapter indicate that financial factors play a crucial role to foster firms' growth in Malaysia. Cash flow to total asset ratio as a proxy for internal funds and financial leverage show significant and positive effects on firms' growth, while interest burden affects firms' growth negatively. The results also reveal that there exists heterogeneity as small size firms rely more on internal funds and they also more sensitive to the interest burden. The results for four main sectors (namely consumer product, industrial product, property and services) also support the argument about the importance of internal funds and other financial factors to promote firms' growth. The results also depict that the property sector relies more on internal funds to foster firms' growth, while the industrial product sector is more sensitive to the interest burden. Heterogeneity also exists for these four sectors.

The implication of the study is that financial factors are very important to determine firms' growth. Thus, firms have to identify its determinants to ensure firms exist in the business environment steadily and grow rapidly. Firms have also to monitor the adequacy of their internal funds as it plays a vital role to determine firms' growth. Moreover, the cost of financing is less when firms choose to use internal funds to help them to foster the growth particularly for small firms and firms in the property sector. The study in this chapter could be extended to determine firms' growth from unlisted firms in Malaysia. Besides, it also can be extended to identify the impact of age on firms' growth.

To sum up, it can be explained that the process to achieve the concept of economic development involve all aspects both in the macro and microeconomics level. Furthermore, inter-relations between macroeconomic variables such as economic growth, unemployment and inflation, economic policies (fiscal or monetary) and microeconomic variables such as firm investment and its growth have also to be given more attention.

APPENDICES

Appendices for chapter 2

Appendix 2.1: List of Countries

Developed	Developing	
Australia	Algeria	Morocco
Austria	Bangladesh	Pakistan
Belgium	Bolivia	Panama
Canada	Botswana	Papua New Guinea
Denmark	Brazil	Paraguay
Finland	Cameroon	Peru
France	Chile	Philippines
Greece	China	Senegal
Hungary	Costa Rica	South Africa
Iceland	Cote d'Ivoire	Sudan
Ireland	Dominican Rep.	Syria
Italy	Ecuador	Thailand
Japan	Egypt	Tunisia
Korea, Rep.	Ghana	
Luxembourg	Guatemala	
Netherlands	India	
New Zealand	Indonesia	
Norway	Iran	
Portugal	Jordan	
Spain	Kenya	
Sweden	Madagascar	
Switzerland	Malawi	
United Kingdom	Malaysia	
United States	Mexico	

Appendix 2.2: The details for four components of institutional quality as noted by the International Country Risk Group (2010):

a. Corruption

"It is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for favors', secret party funding, and suspiciously close ties between politics and business. In our view these insidious sorts of corruption are potentially of much greater risk to foreign business in that they can lead to popular discontent, unrealistic and inefficient controls on the state economy and encourage the development of the black market."

b. Law and order

"Law and Order form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the "Order" element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating – 3 – in terms of its judicial system, but a low rating – 1– if it suffers from a very high crime rate if the law is routinely ignored without effective sanction (for example, widespread illegal strikes)."

c. Democratic Accountability

"This is a measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one."

The points in this component are awarded on the basis of the type of governance enjoyed by the country in question. Three types of governance have been identified namely alternating democracy, dominated democracy and de facto one-party state.

d. Bureaucracy quality

"The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points

because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions."

Appendix 2.3: Cook's Distance test

The Cook's distance test measures the effect of deleting a given observation. Data points with large residuals and/or high leverage may distort the outcome and accuracy of a regression. Thus, it is considered as the outliers in the sample. In other words, Cook's distance measures how much the predicted values change when the *j*'th observations is left out of the analysis. The Cook's distance formula can be written as follows:

$$D_i = \frac{\sum_{j=1}^{n} \left(\hat{Y}_i - \hat{Y}_i(j)\right)^2}{pMSE}$$

Where $\hat{Y}_i$ is the prediction for the full regression model for observation *i*and $\hat{Y}_i(j)$ is the prediction for observation *i*from a refitted regression model which *j*'th observations is left out of the analysis. *p*is the number of fitted parameters in the model and *MSE* is the mean square error of the regression. Equivalently, Cook's distance formula can be expressed as follows:

$$D_i = \frac{e_i^2}{pMSE}\left[\frac{h_{ii}}{(1-h_{ii})^2}\right]$$

With e_i is the residual that is obtained from the difference between the observed value and the value fitted by the proposed model. $h_{ii}$is the *i*-th diagonal element of the hat matrix; $X\left(X^T X\right)^{-1} X^T$. An observation is considered as an outlier if the absolute Cook's distance statistics is greater than $4/n$ where *n* is the number of observations in the dataset.

Appendix 2.4: The relation between government size, institutions and economic growth

Explanatory variables	MODEL 3A			MODEL 3B		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
y_{it-1}	0.138	0.103	0.181	0.139	0.103	0.178
CAPITAL	0.111	0.092	0.229	0.115	0.091	0.206
OPEN	0.003	0.014	0.802	0.003	0.014	0.801
GOV	-0.589	0.175	0.001	-0.577	0.177	0.001
INST	-0.022	0.041	0.578	-0.023	0.040	0.561
AR(2) p-value	0.083			0.088		
Hansen test p-value	0.192			0.188		
No. of observations	60			59		
No. of countries	1343			1343		

Notes:
The model specification that has been used in Appendix 2.4 is depicted by equation (2.4)
This chapter assumes that y_{it-1}, CAPITAL AND OPEN as endogenous variables, while GOV, GOV^2 and INST as predetermined variables.
The instruments have been controlled following Calderon et al. (2002) and Roodman (2009b).
Year dummies and constant are not reported in order to save space.

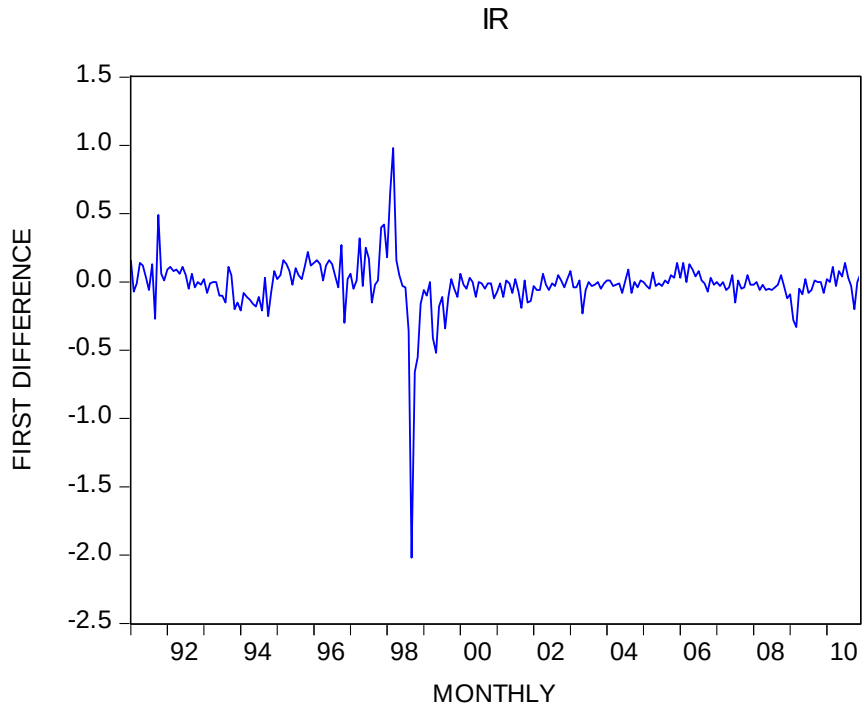
Model 3A is estimated with China has been excluded from the sample, while Model 3B excludes China and India.
The results indicate the existence of other outliers in the sample. It has been proved by the DFITS test.

Appendices for chapter 3

Appendix 3.1:Detecting the outliers

The potential outliers in the sample have been detected using the DFITS test as proposed by Belsley et al. (1980). This statistic identifies observations with a high combination of (statistical) leverageand residual. The statistic is given by $DFITS = r_i\sqrt{\frac{h_i}{(1-h_i)}}$ where r_i is studentized residual given by $r_i = \frac{e}{\left(s_{(i)}\sqrt{1-h_i}\right)}$ with $s_{(i)}$ refers to the root mean squared error (s) of the regression equation with the *i*th observation removed, and h is the leverage statistic. Belsley et al. (1980) suggest that a cutoff value of $|DFITS_i| > 2\sqrt{k/n}$ indicates highly influential observations. On other words, an observation is considered as an outlier if the absolute DFITS statistic is greater than $2\sqrt{k/n}$, where k depicts the number of explanatory variables and n is the number of firms.

Appendix 3.2: The movement of log of first difference of the market interest rates in Malaysia



Appendix 3.3: Splitting the sample

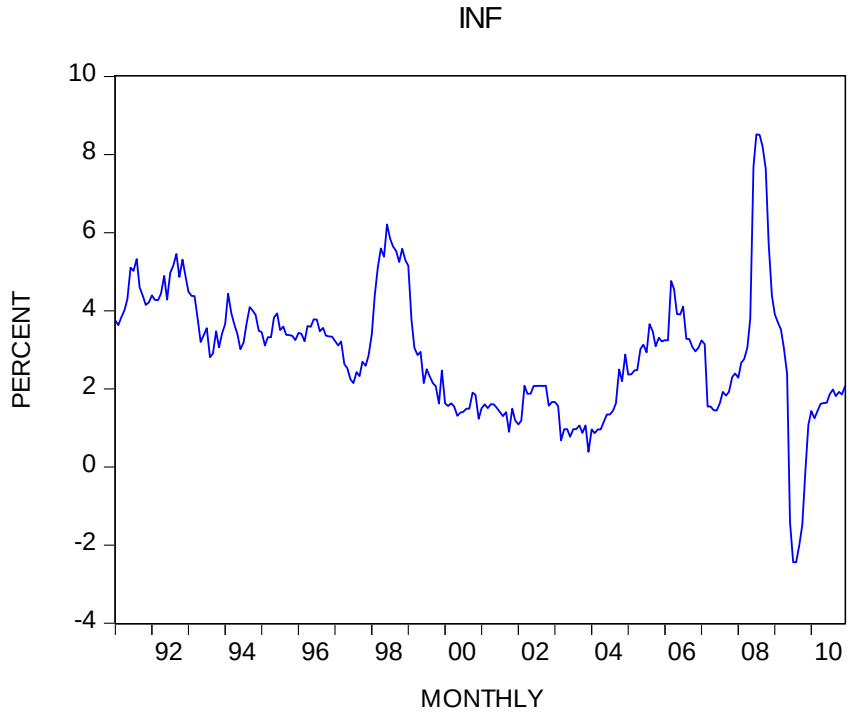
The sample in this chapter has been divided into two groups; namely high- and low-indebted firms. The sample splitting has been done by using two steps. First, the mean value of debt to total asset is calculated for every firm. The second steps is to compute the grand median value of the average value of the ratio of total debt to total asset ratio. It is done to identify the threshold value for the average value of the ratio of total debt to total asset. If a firm's mean value bigger than the median value, so the firm is grouped as high-indebted firm. While, if the mean value is smaller than the median value the firm can be grouped as a low-indebted firm.

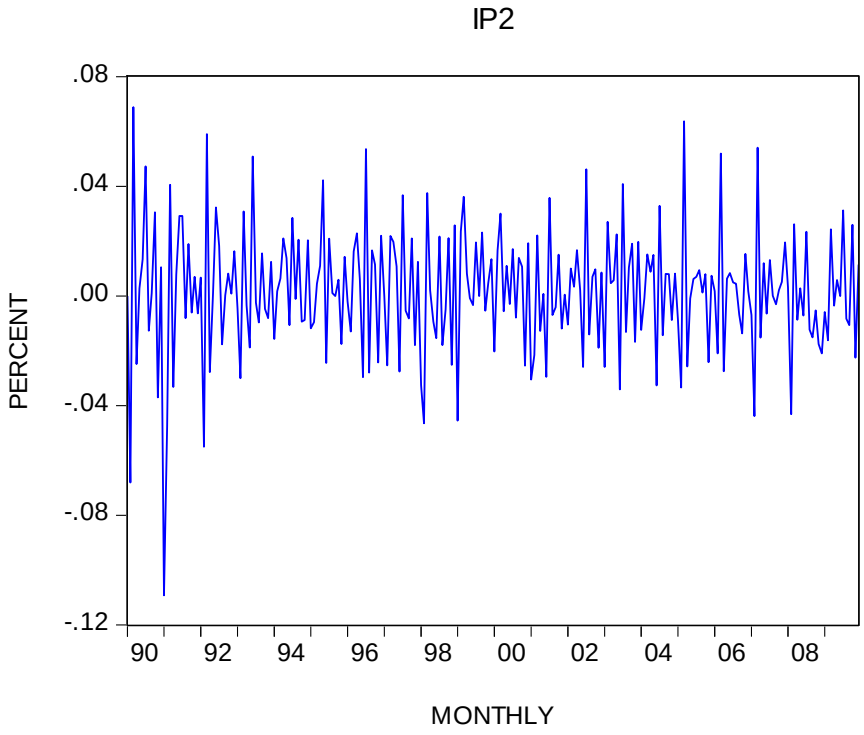
Appendix 3.4: Firm investment under uncertainty: The result without sales growth as a regressor

Explanatory variables	Whole			High-Indebted			Low-Indebted		
	coefficient	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**	**coefficient**	**robust st.er**	**P-value**
CONSTANT	0.070	0.015	0.000	0.051	0.017	0.003	0.095	0.025	0.000
LDV	0.609	0.097	0.000	0.623	0.130	0.000	0.575	0.133	0.000
CFLOW	0.012	0.011	0.288	0.026	0.115	0.816	0.040	0.015	0.010
DEBT	-0.095	0.034	0.005	-0.018	0.032	0.563	-0.135	0.096	0.160
IRU	-0.117	0.027	0.000	-0.185	0.036	0.000	-0.078	0.042	0.068
AR(2) p-value Hansen test p-value No. of observations No. of firms	0.243 0.308 4936 496			0.221 0.494 2444 236			0.126 0.232 2492 260		

Note:
The results in Appendix 3.4 have been obtained by estimating the model specification as in equation (3.1).
The instruments have been assumed as follows: lagged dependent variable (last period investment to capital ratio), CFLOW and DEBT as endogenous variables, while IRU as a predetermined variable.
The estimation is carried out by controlling the number of lag of instruments and by collapsing the instrument matrix as proposed by Roodman (2009b) and Calderon et al. (2002).
Year dummies are not reported in order to save space.

Appendix 3.5a: Inflation and real output growth movement in Malaysia from year 1991:1 to 2010:12 and 1990:1 to 2009:12, respectively.





Appendix 3.5b:Unit root test for inflation rates in Malaysia

Variable	ADF		Philip Perron	
	level	1st Dif.	level	1st Dif
INF	-4.597***	-11.925***	-3.356***	-12.067***
IPU	-3.527***	-12.395***	-23.678***	-23.678***

The null hypothesis is H_o: presence of the unit root and H_a: stationarity of the series

*** indicates that the rejection the null hypothesis for presence of a unit root and it is significant at 1 percent level.

Appendix 3.5c:The GARCH (1,1) result for inflation rates

Inflation rates			
	Coefficient	Std. Error	Prob.
INF(-1)	0.966	0.023	0.000***
DU	2.065	0.130	0.000***
C	0.088	0.080	0.273
Variance Equation			
C	0.023	0.005	0.000***
RESID(-1)^2	0.154	0.041	0.000***
GARCH(-1)	0.769	0.035	0.000***
Industrial production			
	Coefficient	Std. Error	Prob.
IPU(-1)	0.475	0.055	0.000***
DU	0.006	0.005	0.285
C	0.004	0.001	0.000***
Variance Equation			
C	1.34E-05	1.78E-06	0.000***
RESID(-1)^2	0.125	0.068	0.067**
GARCH(-1)	0.697	0.148	0.000***

*** indicates the significance of the variables at 1 and 5 percent, respectively.

Appendices for chapter 4

Appendix 4.1Detecting the outliers

As explained in Section 4.5, this paper carries out the DFITS test to detect the outliers in the sample. It has been implemented before the main estimation. Based on the test, there are eleven firms have been dropped from the sample as they appear as outliers. Table I.1 depicts the list of firms by sectors before and after detecting the outliers. After detecting the outliers, the number of sample is reduced from 496 firms to 485 firms. Table I.2 shows the composition of sectors after detecting the outliers.

Table I.1: List of firms

Sectors	**Number of firms**	
	With outliers	**Without outliers**
Construction	41	40
Consumer products	78	78
Hotel	11	11
Industrial products	153	150
Plantation	32	32
Property	59	57
Technology	22	22
Services	100	95
Total	**496**	**485**

Table I.2: The composition of sectors after detecting the outliers

Sectors	Number of firms*		
	Large	Small	All
Construction	27	13	40
Consumer products	45	33	78
Hotel	10	1	11
Industrial products	86	64	150
Plantation	28	4	32
Property	29	28	57
Technology	15	7	22
Services	64	31	95
Total	**304**	**181**	**485**

*No. of outliers are 11 which are 8 and 3 for large and small firms, respectively
*The outliers are 1 construction sector, 3 industrial products sector, 2 property sector and 5 services sectors.

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