A SEARCH OF THE SOURCES TO THAILAND'S GREAT MODERATION

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DECLARATION

We hereby declare that:

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

2) No portion of this research project has been submitted in support of any application for any other degree of qualification of this or any other university, or learning.

3) Equal contribution has been made by each group member in completing the research project.

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ABSTRACT

There are vast studies have been done on Great Moderation especially for the case of United States. On the contrary, there are very few researches being conducted in the case of Southeast Asia. Furthermore, the attention on Great Moderation has been diverted due to Asian Crisis in 1997. Since then, most of the studies focused on the Asian crisis whereas less attention and consideration were given to the Great Moderation.

The low and stable volatility of output growth exist in Thailand since the beginning of year 1980 has raised our interest in looking into the Great Moderation in Thailand. Therefore, an empirical analysis of sources of Great Moderation has been conducted to determine which sources contribute the most in stabilizing output volatility growth. The three main sources used in this paper are Good Policy, Good Luck, and Good Practice. Using quarterly data spanning from 1980 to 2007, Structural Vector Autoregression (SVAR) Model is applied to capture which shocks contributed the most in stabilizing and lowering the output volatility. Lastly, empirical evidence in this paper suggests that none of the three common explanations: Good Policy, Good Luck and Good Practice play a significant role in explaining Thailand's Great Moderation.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

Over the last two decades, countries across the world have experienced a decline in the volatility of output (De Hart, 2008). This is in line with the findings of Olaberria and Rigolini (2009) that suggested since 1970s, output volatility had steadily declined in almost every region of the world. The Great Moderation is a period of decrease output volatility experienced in the United States since 1980’s. The presence and contributions of the Great Moderation are matters of considerable interest, due to its importance in implementing the analysis of macroeconomic performance and policy. However, the attention on Great Moderation has been diverted during Asian Financial Crisis in 1997 and less research has been done. Although there is by now an enormous literature on the Great Moderation in many countries, unfortunately there has been little work on changes in output volatility of the same or related macroeconomic time series, and without such evidence there is arguably a question mark about just how extensive the moderation actually was.

By referring to Figure 1.1 below, at the beginning of the sample, which is at the start of 1980s, the average output growth volatility in United States is about 0.37 percent. It shows higher percentage of standard deviation of Real Gross Domestic Product (RGDP) growth as compared to other periods in Figure 1.1. There is a clear decline of output volatility from the peak of 0.75 percent during the third quarter of 1982 to about 0.05 percent in the first quarter of 1984. Since then, the average standard deviation of United States RGDP growth falls dramatically to about 0.1 percent. Although there is some fluctuation in between, it shows that the volatility of output in United States is relatively lower and stable since the mid of 1980s. There are times where the standard deviation falls to as low as less than 0.05 percent.

The fluctuation in the beginning of 1990s is due to recession suffered by United States and in the beginning of 2000s is caused by dot com bubble burst. Even though there is some minor rise of standard deviation of GDP growth between 1990s and 2000s, the average standard deviation shown still lower in comparison to period before third quarter of 1984. The significant fall in standard deviation of quarterly RGDP growth which is persistent since mid of 1980s suggest the existence of ‘Great Moderation’.

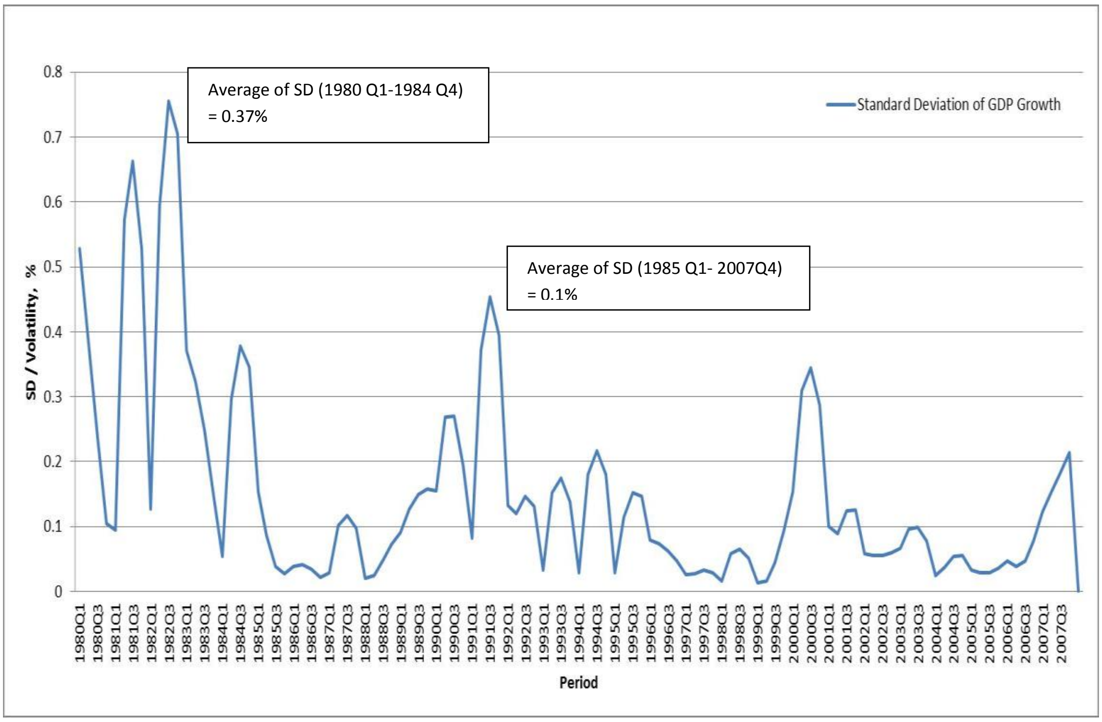


Figure 1.1 Output Growth Volatility in United States is Measured as The Standard Deviation of RGDP Growth using a Quarterly Window.

The most common explanation for the sources of Great Moderation can be categorized in three main groups: good luck, good policy and good practice. Therefore, how much of reduction in volatility is a result of good policies, good practices, and how much is pure “good luck”?

The good luck hypothesis is based on the assumption that macroeconomic shocks are drawn from a time-varying distribution. Over the Great Moderation years, United States economy was simply hit by less severe shocks and particularly by smaller common international shocks.On the other hand, the good policy explanation of the declined volatility is that the Federal changed its monetary policy conduct to enhance its ability to tackle exogenous disturbances. Through a systematic response to fluctuations in economic conditions, since the early 1980s, a credible monetary policy has stabilized inflationary expectations via commitment to a nominal anchor. Finally, the good practice hypothesis holds that various innovations induced by technological progress or financial innovations might have adjusted the transmission mechanism of shocks as well as monetary policy impulses allowing the private sector to better endure the impact of business cycle fluctuations (Lorenzo & Zaghini, 2012).

Many authors have examined the Great Moderation episode in the United States, however, there are very few studies conducted to examine the Great Moderation episode in the Southeast Asia. Hence, this study is motivated to narrow a gap in extant literature on Great Moderation in Southeast Asia. This paper specifically investigates the presence of Great Moderation in Thailand. Besides that, the data needed for all the variables are available from the first quarter of 1981 till fourth quarter 2007.

Furthermore, one of the reasons Thailand has been chosen among all the Southeast Asia countries is due to the unique pattern of its output volatility growth. The graph below (Figure 1.2) shows the volatility of output growth in Thailand. The average level of output growth volatility executed is low and stable. It achieves nearly 0.1 percent on average in the beginning of the first quarter of 1980 till Asian Financial Crisis in 1997. There is no obvious pattern shown before Asian Financial Crisis.

After the Asian Financial Crisis, there is a small change in the average volatility growth which rises to more than 0.1 percent. Volatility of output growth appears to be higher at the end of the sample since the mid of 1990s. The pace of volatility in Thailand appeared to be varied from that of United States (refer Figure 1.1), with volatility appearing to swing at the end of the sample.

The point that makes Thailand so special is that it never show obvious pattern except during Asian Financial Crisis period. In comparison, the standard deviation of RGDP growth in Thailand is even lower than that of United States at the beginning of 1980s.

This generates a brief idea that Great Moderation already present in Thailand as early as at the beginning of 1980s which is earlier than United States. Even if there is no significant pattern suggest that there is a magnitude decline in RGDP growth volatility in Thailand, the low and consistent pattern that it already have since the first quarter of 1980s suggest that there is Great Moderation in Thailand. Thus research has been done to observe the uniqueness of Great Moderation in Thailand.

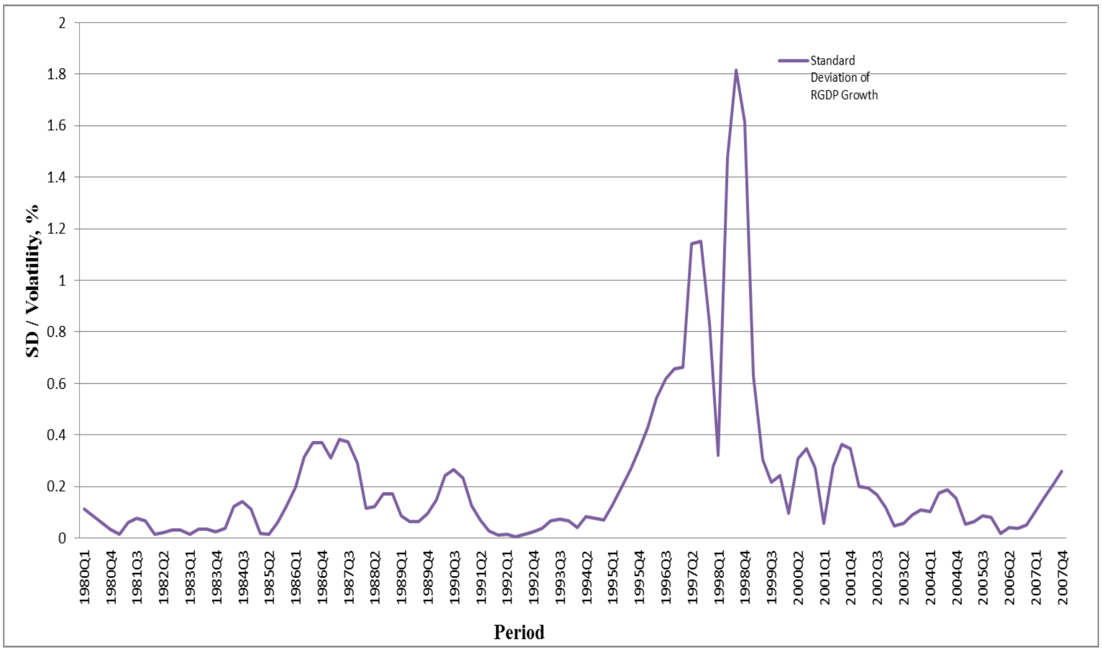


Figure 1.2: Output Growth Volatility in Thailand is measured as the Standard Deviation of RGDP Growth using a Quarterly Window.

1.1 Background of Study

Output volatility is one of the significant business cycle characteristic. Together with trend growth rate, volatility determines the amount of time that economies spend in expansions or recessions (Canova, 2009). Development of output volatility can be divided into several phases. In the 1950s, Korean War and post-war reconstruction in Europe and Japan caused high volatility in developed countries. During the 1960s, volatility declined. However, oil supply disruptions and stop-go macroeconomic policies caused the volatility to rise again in the 1970s. Volatility in developed countries started to decline in a consistent way followed by the disinflation in the early 1980s.

The dropped of volatility over time is varied in emerging market and developing countries. It happened earlier in advanced economies. During the 1960s, output volatility in developing countries is different. Latin America experienced a relatively stable period. Meanwhile in China, the output volatility is high. During the 1970s, increased output volatility experienced by emerging markets and developing countries was due to oil price shocks, increases in other commodity prices and the spill over from advanced economies. Volatility continued to stay high during 1980s and 1990s in developing countries because of debt crises and banking and currency crisis. Although there is a decline in output volatility in developing countries but it is still high as compared to developed countries (Sommer & Spatafora, 2007).

Before one can attempt to investigate the likely sources of output volatility, a question need to be addressed. Why is the study of output volatility important? In most occurrences, the stability of an economic variable is desirable since instability results in uncertainty and risk. Hence, in a stable environment, economic agents are able to make better decisions about their future activities. On the other hand, output growth volatility reduces people's welfare through its effect on the labour market, earnings, and consumption. Households, in particular low income ones, have limited capacity to insure against shocks. Their earnings and consumption patterns follow therefore closely overall macroeconomics trends, increasing in good times and decreasing in bad ones. The very limited ability of these low income households to insure against shocks make them often adopt coping strategies that can have long term harmful consequences, in particular on future generations. Furthermore, output volatility has a negative and robust impact on GDP growth (Olaberria & Rigolini, 2009).

According to Benati and Surico (2009), post-world war II, US shows high volatile inflation and output growth. This period extended up the end of Volcker disinflation. After the end of the Volcker disinflation up to the present day, there is considerably smaller volatilities for both inflation and output growth. This reduction in volatility in US economy over the last several decades has been known as "Great Moderation" period. Great Moderation is a period in which the economy experiences a decreasing trend in volatility. The decrease in volatility is believed to be caused by structural change in the economy, economic policies and good luck. During this period, economic variables such as GDP, inflation and production reduce in volatility.

Work by Summers (2005) suggests that the dramatic decline of output volatility which has been widespread and persistent over the last 20 years or so implies that it is "Great Moderation". However, the timing and nature of the decline has been different across countries. It was found that the decreased in the output volatility in United States occurred in the early to mid-1980s.

According to Herrera and Pesavento (2009), the increased volatility of the United States economy during the 1970s is possibly due to increased in oil price. Oil price increases has resulted in heighten inflation and the decline in output growth (as cited in Hamilton, 1983). Furthermore, oil price shocks are much easier to identify than other structural shocks. Therefore, oil price shocks have been used in this paper to identify the variable of good luck.

1.2 Problem Statement

Standard deviation of Real Gross Domestic Product (RGDP) growth has been used as a tool to generate a rough idea about the volatility of aggregate economic activity. Therefore, standard deviation of RGDP growth in Thailand is calculated in order to see the fluctuation and pattern of output growth volatility from 1980 Q1 till 2007 Q4 (refer back Figure 1.2). Asian crisis which started in Thailand in 1997 shows high fluctuation during that period.

The matter to be concern in this paper is the period prior and after the Asian Financial Crisis. Before the Asian Financial Crisis, it is observed that the majority of output volatility or the standard deviation of RGDP growth in Thailand falls at the average of 0.1 percent. However, the average of the standard deviation of RGDP growth changed and is increased by a small amount after the Asian Financial Crisis, which is more than 0.1 percent. The output growth volatility is stabilized since the beginning and it maintain low volatility after Asian Financial Crisis even though it is slightly greater between the period of 1997Q1 and 2007 Q4.

The consistency of stability and low level of output volatility since the beginning of 1980s shown in Thailand is in contrast to the findings for United States economy. Numerous researchers taking the example of United States shows there is dramatic fall in output growth volatility which is widespread and persistent only since the mid of 1980s. With this, it has enabled United States to earn the title of Great Moderation. There is no obvious pattern shown in Thailand as it already executes low and stable output growth volatility.

Moreover, work by Summers (2005) suggested the timing of the decline vary across countries. Thus, it explains that the Great Moderation exist in Thailand is much faster than that in United States.

Some may questioned what are the sources which contribute to Great Moderation? The three main sources which are deemed to be the main sources of Great Moderation in United States are good practice, good policy and good luck. Apart of knowing Great Moderation exists in Thailand, these three sources are applied as the contributor of output stability in Thailand as well in this paper. Which of these sources is likely to contribute the most among them is also part of the issue to be discussed later on.

To date, there are very few studies conducted on Southeast Asia. Thus, with the low and stable standard deviation of RGDP growth being shown in the graph, it draws our attention to further analyze the likelihood of the presence of Great Moderation and the reasons behind that leads Great Moderation shows its existence in Thailand.

1.3 Research Objective

With problem statement stated above, Thailand has motivated us to conduct an empirical analysis to find answers and solutions to such problems. Therefore, the general objective and specific objectives are derived.

1.3.1 General Objective

i. To determine the sources of Great Moderation in Thailand.

1.3.2 Specific Objectives

i. To observe whether low level of volatility of output growth in Thailand change over the period.

ii. To investigate whether good policy does contribute to Great Moderation in Thailand.
iii. To investigate whether good practice does contribute to Great Moderation in Thailand.
iv. To investigate whether good luck does contribute to Great Moderation in Thailand.

1.4 Research Question

This study intends to find out the answers for the questions below:

i. Does output growth volatility in Thailand change over the period?
ii. With the presence of Great Moderation in Thailand, what are the contributing factors of it?
iii. How many percentages of contribution of each factor towards Great Moderation?
iv. If all the factors do not contribute much in lowering and stabilizing output growth volatility in Thailand, what is the relevance behind it?

1.5 Significance of Study

Since the studies of output growth volatility during Great Moderation in developing countries especially Southeast Asia is under-researched, our research approach is to fill in the gap left by previous researches.

1.6 Chapter Layout

This paper proceeds as follows: Section 2 reviews the relevant literature regarding output volatility and the sources of output growth volatility. Section 3 discusses the data and the methodology that will be applied. Section 4 presents the result. Lastly, section 5 discusses the major findings, recommendations for future researcher and conclusion of the research paper.

CHAPTER 2: LITERATURE REVIEW

2.1 Output Growth Volatility

Output volatility is regarded as one of the most important business cycle. Together with the trend growth rate, the amount of time that economies spend in expansions or recessions can be determined from volatility. According to Olaberria and Rigolini (2009), output growth volatility had decline in nearly every area of the world and even more remarkable for non organisation for Economic Co-operation and Development (OECD) East Asian countries since the 1970s.

Trehan (2005) also notice that output growth become less volatile over the past twenty years in United States. Besides that, Badinger (2010) findings show that volatility is negatively related with economic growth of a country, even when institutional quality is controlled for. Especially for developing countries, an important policy conclusion is that the improvement of economic performance can be achieved by reducing output volatility. In the other hand, when the output volatility is more volatile, means that they are most likely affecting the economic performance negatively. Among all, the three competing explanations that contribute for the significant decline in volatility of United States real GDP growth since 1984 are good policy, good practices and good luck.

2.2 Good Policy

The belief of a passive monetary policy as an explanation for the higher output volatility in the pre-1984 period was introduced in the literature by Clarida et al. (2000). Their estimates of the forward-looking version of the Taylor rule revealed substantial difference in the values of regression coefficients in the pre-Volcker period (1960-1979) compared to the Volcker-Greenspan era (1982-1996) suggesting that the Federal Reserve was reacting more aggressively to deviations in output and inflation during the second period. Estimates of the Federal funds rate responses to inflation suggest that monetary policy not only responded more aggressively to inflation in the Volcker-Greenspan era, but also that its actions were destabilizing rather than stabilizing for the US economy from 1960 to 1979.

Specifically, in the general equilibrium models built on rational expectations assumptions, like the sticky prices New Keynesian model used by Clarida et al. (2000), the response coefficient of Federal funds rate with respect to inflation fluctuations, β less than one leads to equilibrium indeterminacy. This arises because insufficiently aggressive monetary policy creates an opportunity for self-fulfilling expectations, the so-called sunspot shocks. In the case when β less than one an increase in the expected future inflation rate by one percentage point induces a rise in central bank's (CB) nominal interest rate by less than one percentage point. Consequently, a rise in the rate of the expected inflation leads to a reduction in the anticipated real interest rate. A decline in the anticipated real interest rate raises aggregate demand, output and inflation in the subsequent period.

Therefore, the initial increase in economic agents' inflation expectations is confirmed. In this case the economy will be vulnerable not only to changes in economic fundamentals but also to sunspot shocks. On the other hand, in the case when β more than one, a rise in the CB's nominal interest rate is sufficient to increase the anticipated real interest rate, suppress aggregate demand and offset changes in inflation and output. Thus, the economy will be volatile due to fundamental shocks only. In the general equilibrium models with a limited role for rational expectations, as in the backward looking Keynesian models for example, an insufficiently aggressive monetary policy β less than one leads to an unstable or explosive equilibrium as the economic shocks are not offset but are rather enhanced by monetary policy reaction.

Clarida et al. (2000) findings show that the U.S. monetary policy did a considerably better job in insulating the U.S. economy from economic shocks in the Volcker-Greenspan era than before. Other studies confirm these results by using different approaches. For example, Lubik and Schorfheide (2004) first showed the way to estimate a DSGE model under a passive monetary rule allowing for sunspots. The econometric tools that allow for a systematic assessment of the quantitative importance of equilibrium indeterminacy and the propagation of fundamental and sunspot shocks in the context of DSGE model is provided.

According to the considered New Keynesian model, the U.S. monetary policy in the Volcker-Greenspan period is consistent with determinacy, whereas the monetary policy in the pre-Volcker period is not, which supports Clarida et al. (2000) findings that the U.S. monetary policy that has been adopted in the pre-Volcker period had resulted to aggregate instability and that it only became more stabilizing during the Volcker-Greenspan period.

In addition, Bullard and Singh (2008) employed a multiple countries open economy New Keynesian model to explore the world equilibrium determinacy conditions. Briefly, their analysis suggests that in the open economy setting, where economic shocks are transmitted across borders, the determinacy of worldwide equilibrium depends on behaviour of policymakers worldwide. Even if the monetary policy in a country is performing appropriately the country may still be exposed to sunspot volatility due to inappropriate policy in some other country or countries. The possibility of equilibrium indeterminacy is larger as the size of the economy which follows equilibrium indeterminacy inconsistent policy is larger compared to the size of an economy which follows appropriate monetary policy.

2.2.1 Other Empirical Evidence

Consistent with Clarida et al. (2000) results, Boivin and Giannoni's (2006) analysis of a VAR model over the pre- and post- 1980 period also shows a change toward more aggressive response of monetary policy to inflation in the second period. Furthermore, their counterfactual analysis of the structural macroeconomic model suggests that the change in monetary policy contribute greatly to part of the reduction in output volatility in the second period.

The same result also found by Herrera and Pesavento (2009) who suggested that systematic monetary policy response has resulted in low fluctuations in economic activity during the 1970s. The policy has played the role by preventing a change in the federals funds rate in responding to oil shocks. However, this policy has smaller contribution after the 'Great Moderation'. VAR framework of Bernanke (2004) has been modified to study the impact of oil price shocks and the role of monetary policy response before and after the "Great Moderation" (as cited in Herrera & Pesavento, 2009).

Benati and Surico (2009) suggested that the role of monetary policy is being reflected when there is small impact of policy counterfactuals on the reduced-form properties of economy and with small change in impulse response functions to a monetary policy shocks across regimes. The method that has been used to identify sources of Great Moderation is Bayesian method. This method uses New Keynesian model where it changes from passive to active monetary policy, and with the available of sunspots under indeterminacy. The result found was compatible with the result found in structural VAR method which shows that 'Good Policy' is the main explanation for Great Moderation. There was a decline in both variances and innovation variances in population. According to Benati and Surico (2009), VAR users tend to misinterpret good policy for good luck based on New-Keynasian Model which suggest the source of change are the shift from passive to active monetary policy and the existence of sunspot under indeterminacy. Based on VAR methods, good policy is significant in explaining the Great Moderation.

Meanwhile, the moderation in Guyana has been attributed to nominal exchange rate stability and fiscal stability by using variance decomposition analysis. This is due to the strong counter-cyclical shown where the public finances in Guyana improved over the past decade (Grenade, 2011).

Furthermore, Blanchard and Simon (2001) found out that it is fascinating to use countercyclical monetary policy and improvement in financial market to explain the reduction of output volatility. The improvement in financial market has helped in reducing consumption and investment volatility.

With Great Moderation being experienced by various sectors of economy differs, it was found that better monetary policy is essential in stabilizing economic activity across the sectors. It was found out that the various subcomponents of private sector investment declined prior to first quarter of 1984 while it occur much later for services and import sectors as estimated by Enders and Ma (2011).

To sum up, the good policy hypothesis is theoretically reasonable. In advanced economies, monetary policy has been improved substantially in the 1980's. These significant improvements have occurred in emerging market and developing countries as well recently. Since the 1980s, the volatility of fiscal policy has declined in most advanced economies (Clarida et al., 2000).

They find that the impact of the quality of monetary and fiscal policy is sometimes difficult to disentangle. The low volatility and long expansions in advanced economies is largely resulted from a more stable monetary and fiscal policy in advanced economies, when compared with emerging market and developing countries.

It is consistent with considerable amount of evidence by Taylor (1999), Romer and Romer (2002) and Cogley and Sargent (2002, 2005) that suggests a change in the U.S. monetary policy since the early 1980s (as cited in Coric, 2011). Good policy hypothesis is further supported by Boivin and Giannoni (2006) and Canova's (2009) findings that detected change in monetary policy are quantitatively important determinant of the decline in output volatility.

2.2.2 The Opponents' View

However, this view is opposed by few authors. Primiceri (2005), Sims and Zha (2006) Canova and Gambetti (2009) argue that estimated changes in the U.S. monetary policy had negligible effect on output volatility. Furthermore, it is not clear in which way the conduct of monetary policy has changed in the Volcker-Greenspan era.

Orphanides (2004) argues that the changes in the US monetary policy were a change to a less rather than more aggressive monetary policy. Following Orphanides (2001), he estimates the identical forward looking monetary policy reaction function as in Clarida et al. (2000), but using real time data. In particular, Orphanides (2004) estimates the monetary policy reaction function based on real time data suggest considerably different results.

These results imply that the period of economic instability associated with the pre-Volcker period coincides with the period of an excessively activist monetary policy. The recent period of low output volatility coincides, but with a less aggressive policy. The observed reduction in output volatility after the early 1980s can be an outcome of monetary policy improvement. However, the improvement in monetary policy does not necessarily mean a more aggressive policy. It could also reflect a shift from policymakers' overconfidence in their ability to stabilize output, to more modest, but attainable objectives.

Orphanides (2004) states that in cases when real time data are noisy, optimal policy is the one which responds more cautiously to output and inflation innovations than would be the case if accurate data were available to policymakers. The aggressive stabilization policy could, in fact, by its reaction to false output and inflation disturbances, be a source of economic instability. Consequently, an effective policy that appropriately accounts for the noise in the data might seek for stability and call for less involvement than may be suitable in the absence of this noise.

A less activist monetary policy is used to dampen noisy shocks through interest rate fluctuations. The magnitude of noisy shocks on interest rate is only short-lived which suggest that it is not an important source of volatility (Mayer & Scharler, 2011). Mayer and Scharler (2011) found out that interest rate rule reacts less to output volatility in 1979 based on New Keynesian model.

2.3 Good Practice

Gali and Gambetti (2009) explained that great moderation period that features the reduction in aggregate output volatility to changes in the economy's structure is the way of policy has been taking place. Structural changes in the economy include the change in output from goods to services(Burns, 1960; Moore & Zarnowitz 1986).

A better developed financial infrastructure could allow better smoothing of both consumption and investment plans. Meanwhile, other structural factors are the changes in the sectorial composition of output, improved inventory management techniques in the era of the information technology revolution, much more flexible labor and product markets, and a introducing to international trade, may have reduce and smoothen the inflation rate. (Sommer & Spatafora, 2007).

2.3.1 Inventory Management Improvement

Trehan (2005) argues that advancement in technology which changes the behavior of inventories and financial market over time shows decline in output volatility. Changes in government regulation especially Regulation Q also contributed in structural change. McConnell and Perez-Quiros (2000) and Kahn, McConnell and Perez-Quiros (2002) point out that the extensive implementation of information technology (IT) caused major changes in the method of production and distribution, and in their relation to final sales. Particularly, IT advances facilitated application of “just-in-time” approach to inventory management.

Methods of electronic scanning and bar codes made possible automatic restocking based on real time sales data. Both of these methods aim to reduce stocks of inventories necessary for firms’ “normal” functioning. Thus, their application should reduce the desired inventory-to-sales ratio, and according to the accelerator model of inventories, decrease output volatility. IT advances enabled also a better monitoring of sales reducing the time between moment when a change in final sales occurs and the firm’s management becomes aware of it. Computer controlled machines enabled greater flexibility of production, which makes it possible to cut down on the time between production decisions and sales realization. Taken together, this enabled better anticipation and prompter reaction to final sales changes which reduce the deviation of inventories from their targeted level. These cause lower inventory investment volatility and due to a positive covariance between inventory investment and final sales, it results in lower output volatility.

Davis and Kahn (2008) said that one of the decline in GDP volatility is because of the structural change. They show the improvement of inventory management in reducing volatility of durable goods output can decline in GDP volatility (as cited in Gamber, Smith, & Weiss, 2010).

Results of different theoretical models of inventory investment also challenged the inventory improvement hypothesis. Maccini and Pagan's (2003) simulations of the inventory holding model suggest that even substantial changes in parameters governing firm's inventory holding behaviour have a rather small effect on the volatility of firm's production. These results suggest that inventory management improvements cannot be quantitatively important determinant of decline in output volatility.

Ramey and Vine (2005) made an argument that the change in the covariance between final sales and inventory investment, detected by Kahn et al. (2002), can be caused by a change in the volatility of final sales. Analysing the U.S. automobile industry data they discovered that changes in final sales became less persistent after 1984. In order to understand the implication of the decline in sales persistence on production, they specified and simulate the dynamic cost minimization problem the plant manager solves in making short-run production decisions. They find that if sales shocks are very persistent, then the firm changes its production intensely in order to maintain the anticipated inventory-to-sales ratio, since the sales shocks are probably remain high (low) for a moment (as cited in Coric, 2011).

Enders and Ma (2011) also suggested that there is mild support shown that improved inventory management is significant. The various subcomponents of private sector investment experience faster volatility declines as compared to services and import sectors.

2.3.2 Institutional Quality

Institutional quality can increase a country's capacity to resolve internal political differences. Better political stability and continuity in policymaking may help economic to be stable and sustainable longer. However, weak institutions might make adjustment to major economic shocks more difficult and, in the extreme, may introduce coups and riots (Acemoglu, Daron, Johnson, Robinson and Thaicharoen, 2003). These findings also consistent with Olabberia and Rigolini (2012) who suggested that improvements in institutional quality enable government to pursue more enduring policies to adjust to major economic shocks and further reduce output growth volatility.

Acemoglu et al. (2003) explained that once institutions are controlled, macroeconomic policies will only has small effect on output volatility.. In line with Acemoglu et al. (2003), Barseghyan and Dicecio (2010) using entry barriers as institutional feature found that higher entry barriers such as taxes and quotas will lead to higher output volatility. Costlier entry reduces entry and brings to fewer competitors and a lower number of operating firms. With the barriers, the potential entrants couldn't afford the high entry costs so low-productivity firms can still survive and operate.

Based on time-varying structural VAR model with drifting coefficients and stochastic volatilities, Great Moderation has been experienced in Japan at the beginning of the mid-1970s and was followed by a dramatic decline in the macroeconomic volatility. In spite of that, it has not been persistent due to some volatile movement in the late 1980s and late 2000s. Technology shocks are found to be the driving force for the output growth volatility of Great Moderation (Ko & Murase, 2012).

Mihal (2009) stated that corruption and poor institutional quality are interference of the nation's development. According to World Bank, corruption resulted in low level of investment and deters growth. At the same time, it created macroeconomic and fiscal instability of a nation (as cited in Mihal, 2009).

However there are few researchers who argued on this statement. Cazurra (2008) argued that the impact of corruption depends on the characteristics of the economic system. In transition economy, different types of corruption might foster economic growth. According to De Jong & Bogmans (2010) when bribe is needed to reduce the detrimental effects on trade of long waiting times with poor institutions, corruption might improve the situation.

2.3.3 Financial Market

Quintana's (2009) analysis suggests that a significant part of output volatility reduction can be contributed by financial innovations that reduced transaction costs in financial markets, as for example, the introduction of electronic fund transfers as well as automated teller machines (ATM). Lower transaction costs enabled frequent portfolio re-balancing and allowed households to adjust their money balances efficiently when shocks hit the economy which is then facilitates the smoothening consumption (as cited in Coric, 2011).

Sommer and Spatafora (2007) find that financial deepening significantly reduces business cycle volatility in all dimensions in the cross-sectional analysis. However, there is strong evidence that proves that this impact weakens once a country achieves a certain degree of financial development. It is complex to detect the effect of this variable in panel regressions since financial development tends to be a relatively slow-moving variable. More developed financial markets allowing better resource allocation which needed in case of shocks has decreased the output volatility. However, the improvement varies according to countries where the financial market developments at certain countries are developing at a higher speed (Olabberia & Rigolini, 2009).

According to Zaghini and Lorenzo (2012), vigorous financial innovation of the last few decades has induced structural adjustments in firms' and consumers' behaviour, allowing households and firms to better cushioning themselves against interest-rate fluctuations and macroeconomic shocks. The underlying perception is that transformations occurred in the financial market have turned to opportunities for firms and households to smooth their investment and consumption plans, with the result that economic agents exploited more the financial instruments (financial immoderation), but the fluctuations in the main macroeconomic aggregates have moderated considerably (macroeconomic moderation).

2.3.4 Labor Market Changes

Recently, labour market changes have been proposed as another possible Great Moderation's source. The variance of output growth is the total of working hours and labour productivity growth variances and their covariance. Using this equation, Galí and Gambetti (2009) observed a large reduction in instability of hours growth, labour productivity growth, and covariance between hours and labour productivity growth around the mid-1980s. Decline in working hours and labour productivity growth covariance, that shifted from values close to zero in the early post-war period to huge negative values after mid-1980s, points to possible changes in labour market as the source of the Great Moderation.

Some of the suggested explanations are a stable rise in "just in time employment" due to increase in temporary workers, part time workers and overtime hours which significantly increased the U.S. labour market flexibility and possible reduction in labour hoarding due to an reduction in costs associated with the adjustment of labour.

The potential causes of these changes are acknowledged, however, Galí and Gambetti (2009) do not provide clear explanation for the possible relationship between the detected changes in the U.S. labour market and their proposed causes. In addition, they also do not provide empirical evidence of the effect of suggested explanations on output volatility.

2.4 Good Luck

Short-run total economic fluctuations are frequently seen as a result of a range of economic shocks which are transmitted through the propagation mechanisms. Thus, if since the early 1980s, the volatility of output has changed, the contributing factors will be either a decline in the size of the underlying shocks or an attenuation of propagation mechanisms, or both (Coric, 2011).

According to Gali and Gambetti (2009), great moderation is often addressed as "good luck" hypothesis, which explain that the greater macroeconomic stability over the past 20 years is largely attributed to smaller shocks effect on the economy, whereby having structural changes played at most a secondary role. Well, Keating and Valcarel (2011) agreed that one of the explanations on the fall of volatility also involved "good luck".

Besides, according to Gali (1999) shocks were also taken place in affecting the great moderation. Shocks can be divided in two types which are technology shocks and non-technology shocks. Technology shocks are presumed to influence the unit root in the productivity of labor (as cited in Gali and Gambetti, 2009).
Blanchard and Simon's (2001) analysis of the first-order autoregressive model (AR) for the United State economy was the first attempt to differentiate between these two sources. Their estimates of the AR (1) model consisting of a twenty quarters rolling sample from the year 1952 to 2000 implies that the autoregression coefficient declines slightly, however, it does not exhibit an obvious time pattern.

On the contrary, the pattern of the standard deviation of the regression residuals closely resembles the pattern of the standard deviations of GDP growth rate suggesting that the Great Moderation is mainly due to smaller shocks rather than weaker propagation.

The initial idea of Blanchard and Simon (2001) was further developed by Stock and Watson (2002). Stock and Watson (2002) argue that the process which generates output is much more complex than its univariate AR(1) representation. Hence, they employed a four variable vector autogression (VAR) model to examine output volatility. They estimated a VAR model over the time periods from 1960 to 1983 and from 1984 to 2001 separately and calculated counterfactual variances of quarterly GDP growth rates. The counterfactual which combined the first period economic shocks and the second period economic structure resulted in a standard deviation of the GDP growth of essentially the same magnitude as observed in the first period. Similarly, the counterfactual which combined the first period economic structure and the second period economic shocks produced a standard deviation of the GDP growth rate very close to the standard deviation observed in second period. These results suggest that the economic structures of the two periods are interchangeable. Likewise, Stock and Watson (2002) identify changes in the shocks as the source of the Great Moderation.

This approach was adopted and further extended by Ahmed, Levin and Wilson (2004), Primiceri (2005), Sims and Zha (2006) and Kim, Morley and Piger (2008) and their findings support the results of Stock and Watson (2002). For instance, Ahmed et al. (2004) highlight the importance of good luck in driving recent U.S. macroeconomic stability. Primiceri (2005) estimated a time varying structural VAR model to assess the likely changes in the U.S. monetary policy from 1953 to 2001.

Contrary to Stock and Watson (2002), his model allows gradual change in both the model parameters and in the variance covariance matrix of shocks. Both symmetric monetary policy (modelled through the parameters changes of the monetary policy function) and non-systematic monetary policy (modelled through the residual changes of the monetary policy function) have changed during the last 40 years (Primiceri, 2005). Nevertheless, the counterfactual simulations suggest these changes were less significant for changes in the U.S. economy. Exogenous non-policy shocks seem to be much more important for explaining the increased stability of unemployment and inflation over the considered period.

Trehan (2005) stated that improved performance of the economy due to small shock has contributed to fallen reduction in output volatility. Olabberia (2009) suggested that lower volatility of terms of trade shocks helps in declining the volatility in East Asia. Olabberia and Rigolini (2012) shows that the method applied for dynamic models of panel data to control for country-specific effects and joint endogeneity is generalized method of moments (GMM) estimators. Good luck is referring to a small number of large shocks since the 1980s (Enders & Ma, 2011). Good luck which shown by oil intensive sectors does not significantly reduce volatility. AR(1) and ARCH(1) model has been applied to identify volatility break in 51 different sectors as well as 5 interest rate series (Enders & Ma, 2011). Monte Carlo experiment is conducted to estimate the impact of volatility breaks and the accuracy of estimation of break dates. In order to gauge the accuracy of the estimated break dates, posterior odd ratio is calculated. Overall, these studies present considerable empirical evidence in support of the good luck hypothesis.

Although convincing, however, this empirical evidence is subject to critiques. Particularly, it is ambiguous whether the observed change in VARs residuals can be interpreted as a change in exogenous economic shocks. It is possible that the results of VAR models are a product of misspecification rather than the genuine changes in economic shocks since VAR models lack a clear theoretical background.

According to Taylor (1998), he argues that smaller economics shocks have simply not been observed over this period. Economic shocks over the decades prior to the eruption of the financial crisis in August, 2007 include the international saving and loan crisis in the 1980s, the first and second Iraq war oil shocks, Latin American, East Asian and Russian financial crashes, the September 11 terrorist attack on the U.S. and subsequent attacks in the U.K. and Spain as well as various climatic catastrophes do not appear to be smaller or frequent than shocks before 1980s. Hamilton (2005) argues that nine out of ten of the U.S. recessions between 1948 and 2001 were preceded by a spike up in oil prices.

According to Summers (2005), frequency and severity of oil shocks from 1966 onward have not, however, coincided with output volatility reduction. Blanchard and Gali's (2007) discovers that effects of oil price shocks on the economy has weakened in the U.S. during the Great Moderation indicating that U.S. encountered an improved trade-off in the face of oil price shocks of a similar magnitude (as cited in Coric, 2011).

This is in contrast to Nakov and Pescatori (2008) who found that oil shocks are likely to affect many oil-importing countries in a similar way, a reduction in oil sector volatility to the rest of the world economy is a natural candidate for explaining the rise of macroeconomic stability in the advanced world. It is found that oil shocks have played an important role in the reduced volatility especially of inflation even if the other two factors (1) better monetary policy and (2) smaller TFP shocks have played the dominant role in the stabilization of inflation and GDP growth respectively.

According to Abeysinghe (2001) for an oil importing country, the increase in oil price could have negative effects. Rafiq, Salim & Bloch (2009) had also suggested the same theory. Moreover, Cologni and Manera (2008) suggested that oil price has a significant effect on the inflation rate as the inflation rate could be transmitted to the real economy by increasing the interest rate.The leads to higher inflation rate and bring the inflation rate closer to the target rate (Kose, Emirmahmutoglu & Aksoy, 2012).

Gambetti, Pappa and Canova's (2008) results of time varying coefficients structural VAR model in which structural disturbances are identified using robust sign restrictions obtained from a structural dynamic stochastic general equilibrium (DSGE) model suggests that a reduction in output volatility is caused by the changes in the way the economy responds to supply and demand shocks as well as changes in the size of economic disturbances. The studies conducted by Ahmed et al. (2004) and Stock and Watson (2002) leave considerably different amount amounts of reduction in output volatility to be explained by changes in propagation mechanisms, although they are the same kind of VAR models with only little differences in their variables specifications. Most importantly, the proportion of the reduction in output volatility that is attributed to a change in economic disturbances appears to have an inverse relationship with the size of the model.

In particular, Giannone, Reichlin and Lenza's (2008) counterfactual analysis conclude that the more detailed the model, the smaller the shocks should be and the more limited their contribution to output volatility should be compared to the contribution of propagation mechanisms. These results suggest that the literature which explains the Great Moderation as a consequence of a decline in economic shocks is based on the models which simply did not include enough information and were misspecified.

These critiques cause serious doubt on the evidence based on VAR models. As a result, Stock and Watson (2003), Arias, Hansen and Ohanian (2007), Leduc and Sill (2007), Justiano and Primiceri (2008) and Canova (2009) consider theoretical DSGE models to avoid objections. For instance, Leduc and Sill (2007) constructs a sticky price DSGE model in which monetary policy is assumed to follow a Taylor type rule and exogenous disturbances are assumed to arise due to total the factor productivity (TFP) and oil shocks. The counterfactual analysis suggests that the change in the TFP and oil shocks accounts for the overwhelming amount of the output volatility reduction.

To take into account the possibility that other shocks are responsible for the Great Moderation, they consider the Burnshide and Eichenbaum's (1996) model. In this model output volatility, apart from the TFP shocks, government spending shocks, labour-leisure preference shocks, and intertemporal preference shocks are other factors. The counterfactual simulations suggest that changes in these shocks are not able to contribute significantly to a change in output volatility. Thus, the reduction in TFP shocks remains a major driver of the Great Moderation.

Although these studies avoid objections that their results are a product of misspecification, there are several reasons these analyses can be criticized on. Coric (2011) points out that these analyses did not consider the possibility that a reduction in output volatility may be caused by the change in economic structure. The lack of a test for possible effects of the change in economic structure does not only make these analyses incomplete, but is an indicator of a more serious problem. The initiating factors of output volatility in these DSGE models are economic shocks. The way output persistence is formulated in these models, on the other hand, can be matter of dispute. Namely, economic shocks are formulated as an AR processes.

For example, shocks follow an AR(1) process with different correlation coefficients in Leduc and Sill (2004) and Arias et al. (2007) indicates that the models' propagation mechanisms are not strong enough to generate the persistence which is observed in the output data. To facilitate replication of the persistence observed in output data, authors introduced the autocorrelated shocks. This approach is standard in the DSGE models literature, but it can be inappropriate when the objective is to test for the cause of output volatility reduction. Shocks modelled in this way do not only represent economic shocks but also the economic propagation mechanisms. Therefore, the effects of a change in the size of economic shocks on output volatility are magnified due to the fact that shocks are assumed to be autocorrelated, compared to the case when the economic propagation mechanisms are explicitly built into the model (Coric, 2011).

Justiniano and Primiceri (2008) acknowledged this problem by the interpretation of the estimates obtained from large New Keynesian model. The counterfactual analysis indicated a sharp reduction in the volatility of investment specific technology shock as the leading explanation of reduction in output volatility. However, they argue that the reduction in output volatility due to the reduction in investment specific shocks may occur actually from the reduction in financial frictions and that their model, although large, is not rich enough to test this alternative explanation. The results from DSGE models also seem to be sensitive to the type of model used for the analysis.

For instance, Canova (2009) used a three-equation New Keynesian model, found that changes in the parameters of the monetary policy rule and changes in variability of shocks were found to have support in the data. However, the two explanations must combine to account for a decline in the variability of output over time.

CHAPTER 3: DATA AND METHODOLGY

3.0 Introduction

Generally, using Structural Vector Autoregressions (SVAR) to estimate alternative economic models is an effort to apply simple time series technique in developing business cycle theory. In the widespread approach to this study, researchers usually form a hypothesis and run Vector Autoregressions on the actual data. The hypothesis developed does not required theory and several identifying assumptions are set on the Vector Autoregressions in order to withdraw empirical impulse responses to different shocks (Chari, Kehoe & McGrattan, 2007).

VAR methods are able to outline the true dynamics of the endogenous variables in response to structural shocks if properly used (Canova, 2009). According to Coric (2011), VAR analysis is capable in revealing considerably proportion of contribution to reduction in output volatility that is attributed by each variable. In line with Canova (2006) and Coric (2011), the estimated model in Primiceri (2005), and Benati and Mumtaz (2007) allow for time-varying coefficients. This feature allows it to possibly discover the changes over time in conditional as well as unconditional comovements, in a flexible way, in different variables' responses towards each type of shock, as well as the input of the different shocks to the reduction in volatility.

An example of SVAR has been applied by Kormilitsina (2008) where counterfactual experiments in the VAR model is run to recognize the outcome of oil price shocks in U.S. economy influenced by systemic tightening of monetary policy. The coefficients of a monetary policy equation in VAR model is set to be zero and the response of output to changes in oil shocks is studied accordingly. As a result, systematic monetary policy appears to contribute to a substantial decline in output (as cited in Bernanke, Gertler and Watson, 1997).

This section presents our baseline empirical model where the point of departure is a 5-dimensional VAR (p),

$$y_t = \propto + \beta_1 y_{t-1} + \dots + \beta_p y_{t-p} + u_t \qquad (1)$$

Where y_t is a vector of five variables, consisting of Thailand's real gross domestic product, oil price, institutional quality index, consumer price index and discount rate, $\propto$ is a (5 × 1) constant term, β_p (p = 1, . . . , n) are (5 × 5) VAR coefficients and u_t is a zero-mean white noise error term.

Following Lutkepohl (2012), the structural shocks, say ε_t, are obtained from the reduced form residuals by a linear transformation, say $\varepsilon_t = A^{-1}Bu_t$ or equivalently, $A\varepsilon_t = Bu_t$. In a conventional SVAR analysis, Matrix B is chosen such that the structural shocks, which are the components of ε_t are instantaneously uncorrelated. In other meanings, ε_t has a diagonal covariance matrix where the structural shocks only affect its own variable contemporaneously. In order to investigate any elements of the matrix that need to be estimated, a missing value "NA" is assigned whereas all non-missing values in the pattern matrix will be kept constant at their specified values. A zero is assigned when we assume that the variables are not affected by the structural shocks contemporaneously. Thus, Matrix B is a diagonal matrix and the structural residuals are presented as below:

$$\begin{bmatrix} \varepsilon_t^{II} \\ \varepsilon_t^{OP} \\ \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{DR} \end{bmatrix} = \begin{bmatrix} NA & 0 & 0 & 0 & 0 \\ 0 & NA & 0 & 0 & 0 \\ 0 & 0 & NA & 0 & 0 \\ 0 & 0 & 0 & NA & 0 \\ 0 & 0 & 0 & 0 & NA \end{bmatrix} \begin{bmatrix} u_t^{II} \\ u_t^{OP} \\ u_t^{RGDP} \\ u_t^{CPI} \\ u_t^{DR} \end{bmatrix} \qquad (2)$$

For many problems, the identifying restrictions on A and B matrices are simple zero exclusion restrictions. In our studies, the shocks are identified by imposing contemporaneous short run restrictions on the impact effects. More precisely, we assume that institutional quality shocks (u_t^{II}) have a contemporaneous impact on real gross domestic product and consumer price index. Oil price shocks (u_t^{OP}) affect real gross domestic product and consumer price index contemporaneously whereas consumer price index and discount rate are affected contemporaneously by real gross domestic product shocks (u_t^{RGDP}). Lastly, we assume that consumer price index shocks (u_t^{DR}) have a contemporaneous impact on discount rate. Thereby, Matrix A (baseline model) is a cholesky decomposition that represented in a lower-triangular matrix and the structural residuals are as follows:

$$\begin{bmatrix} \varepsilon_t^{II} \\ \varepsilon_t^{OP} \\ \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{DR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ 0 & 0 & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{II} \\ u_t^{OP} \\ u_t^{RGDP} \\ u_t^{CPI} \\ u_t^{DR} \end{bmatrix} \quad (3)$$

3.1 Robustness Analysis

Of course, one may question the robustness of the results as captured in Equation (3) above, thus, we perform a sensitivity analysis on another two models (Model 1 and Model 2) by imposing different contemporaneous short run restrictions on the impact effects of shocks.

Model 1 has the same restrictions imposed in Equation (3), however, we assume that real gross domestic product shocks (u_t^{RGDP}) do not have a contemporaneous impact on discount rate. Thus, Model 1 is a lower-triangular matrix and the reduced form and structural residuals are as below:

$$\begin{bmatrix} \varepsilon_t^{II} \\ \varepsilon_t^{OP} \\ \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{DR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ 0 & 0 & 0 & \alpha_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{II} \\ u_t^{OP} \\ u_t^{RGDP} \\ u_t^{CPI} \\ u_t^{DR} \end{bmatrix} \quad (4)$$

All else being equal in Equation (3), however, in Model 2, we assume that oil price shocks (u_t^{OP}) affect discount rate simultaneously. Therefore, Model 2 is a lower-triangular matrix and the reduced form and structural residuals are shown as below:

$$\begin{bmatrix} \varepsilon_t^{II} \\ \varepsilon_t^{OP} \\ \varepsilon_t^{RGDP} \\ \varepsilon_t^{CPI} \\ \varepsilon_t^{DR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ 0 & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{II} \\ u_t^{OP} \\ u_t^{RGDP} \\ u_t^{CPI} \\ u_t^{DR} \end{bmatrix} \quad (5)$$

3.2 Model Specification

One of the first and still widely used methodology by empirical works is the sub-sampling. The properties of the U.S. economy are studied separately over two distinct periods. The initiative is to use the business cycle dynamics over a pre-Moderation sample to test the changes of the Great Moderation period. There is a relatively large consensus on the break having occurred in 1984. Thus, in our studies, two sub-samples are used where the samples cover the period of pre- and post-Asian financial crisis in 1997 to examine the changes of the Great Moderation period. Subsequently, sub-sample 1 covers the period of pre-Asian financial crisis from first quarter of 1980 to fourth quarter of 1996 while sub-sample 2 covers the period of post-Asian financial crisis from the first quarter of 1997 to fourth quarter of 2007.

The data covers a substantial time interval starting from 1980Q1 to 2007Q4 and is on a quarterly basis. In total, the available data range accounts for 112 observations. However, some time series data are only available on a yearly basis. Thus, these time series data are converted into quarterly data. All data except discount rate are in logarithm, which imply that the variables are specified in levels. The notations of the variables are as follows:

LII = Logarithm of Institutional Index of Thailand

LOP = Logarithm of Oil Price of Thailand

LRGDP = Logarithm of Real Gross Domestic Product of Thailand

LCPI = Logarithm of Consumer Price Index in Thailand

DR = Discount Rate in Thailand

The table below shows the sources as well as the unit of measurement of data used in this paper:

Table 3: The Sources and the Unit of Measurements of Data Used

Variable	**Unit of measurement**	**Source of data**
Real GDP	Self Calculation , USD	World Bank
Nominal GDP	USD	World Bank
GDP Deflator	Index	World Bank
Corruption Index	Index	Bank of Thailand
Oil Price	$ per barrel	Federal Reserve Bank of St. Louis
Discount Rate	%, annual	International Financial Statistics
Consumer Price Index	Index	International Financial Statistics

From the variables listed in the table above, Real GDP and discount rate which is used in further analysis are calculated as below:

Real GDP (RGDP) is obtained by dividing Nominal GDP (NGDP) from GDP deflator and multiplied it by 100. The formula is as follows:

$$RGDP = \frac{NGDP}{GDP\ Deflator} \times 100$$

Discount rate which is in percentage form has to be multiplied by 100 to align with the index of other variables. Discount rate at the end of each quarter is used as a proxy for monetary policy in Thailand. Meanwhile, Consumer Price Index (CPI) is used as proxy for Thailand's inflation.

As the series are stationary, structural VAR in level form has been applied in this paper. The series are stationary without differencing which means that it is zero order of integration, I(0). Without the presence of unit root, the tests such as Dickey-Fuller unit root test, Augmented Dickey Fuller (ADF) test, Phillips-Peron test, Kwaitowski, Phillips, Schmidt ad Shin (KPSS) test can be omitted in this case. Furthermore, for the series with integrated of order one, I(1), the existence of cointegration has to be further tested by using Vector Error Correction Model (VECM). Thus, VAR in level form provides more reliable and robust results as compared to VECM because even without stochastic trends and cointegration, VAR in level is still able to perform (Lutkepohl, 2012). Therefore, structural VAR in level form can be done directly by skipping those tests.

Variance decomposition and impulse response function have been practiced in this paper aiming to study the relationship of good policy, good luck and good practice on output volatility in Thailand. Both variance decomposition and impulse responses assist in the interpretation of Vector Autoregressive Model. Variance decomposition splits the difference in an endogenous variable into the component shock to the VAR. Thus, information is made available on how much each variable contribute to the volatility of output in Thailand. Through this, the major source of output volatility among all the variables in the model can be identified.

In order to trace over time the effect of shock to one endogenous variable on to another variable in the VAR, impulse response function is used. The persistence of shock can be seen which provide us the information of how rapidly the system adjust back to equilibrium (converge back to zero as shown in graph). Cholesky decomposition has been used to construct the impulse responses and variance decompositions. Subsequently, structural factorization matrices must be estimated first in order to conduct structural impulse responses and variance decompositions

The decision to determine the lag length is based on the Akaike Information Criterion (AIC) statistic, which should be minimized as well as Likelihood Ratio Test (LR) statistic which should be maximized. The lag length is however, not determined based on Schwarz Information Criterion (SC) since SC always suggests a smaller lag and the consequences of smaller lag are model tends to be under fitted as well as lack of dynamism of the variables in response to structural shocks. Hence, in all the models, 5 lags will be used since AIC and LR favour the models, in other words, VAR(5) will be estimated.

CHAPTER 4: RESULTS AND INTERPRETATIONS

4.1 Introduction

In this chapter, method and tests discussed in Chapter 3 will be employed to conduct the empirical analysis on coefficients, variance decomposition of Real Gross Domestic Product of Thailand, volatility of all variables as well as impulse response of Real Gross Domestic Product and inflation towards structural shocks to institutional quality, oil price and monetary policy. As the series are stationary, structural VAR in level form has been applied in this paper.

4.2 Parameter Estimates and Statistics of Variables

This present section depicts the results for the parameters estimates for the full sample (1980Q1 to 2007Q4) as well as two sub-samples where sub-sample 1 covers the period from 1980Q1 to 1996Q4 while sub-sample 2 covers the period from 1997Q1 to 2007Q4. Matrix C is obtained by the matrix multiplication of Matrix A^{-1} with Matrix B.The rationale behind this is to capture the changes in output volatility between two sub-samples.

4.2.1 Interpretations of Coefficients in Full Sample

This section is based on the results obtained from Matrix C (Table 4.2.3). It shows that there are some arguments and inconsistency against most of the researchers. Further explanations are as below.

4.2.1.1 Institutional Quality Shocks on Real Gross Domestic Product

Olabberia and Rigolini (2012) suggested that improvements in institutional quality may foster economic stability and further reduce output volatility growth. However the results we obtained in Matrix C is inconsistent with most of the researchers. The impact of institutional quality shocks on Thailand's real gross domestic product (RGDP) turns out to be negative. Our results imply that it is not proven corruption is bad for a country's overall welfare. Different types of corruption differently affect economic development. Under rigid regulation and inefficient bureaucracy, corruption might foster economic growth. Our results suggest that corruption is positively correlated with RGDP growth and capital accumulation in countries with poor institutions.

4.2.1.2 Oil Price Shocks on Real Gross Domestic Product

According to the economic theory, an oil price increase will have adverse effects on economic growth, especially on an oil importing country (Abeysinghe, 2001). As Thailand is net oil importing country, our finding is consistent with the previous researchers. Our result shows that oil price shocks tend to be negatively correlated with the RGDP in Thailand.

The rationale behind this finding is straightforward. As oil is a basic input for production, when its price rises, it causes production costs to rise at the same time. As the result, the producer will cut down on the outputs or price the products at a higher price, which resulting in a lower consumption. The combination effect of these situations is the lower economic activities or negative economic growth. Further analysis is required to breakdown the actual impact of oil price shock on RGDP.

4.2.1.3 Institutional Quality Shocks, Oil Price Shocks and Real Gross Domestic Shocks on Inflation

It is found that institutional quality shocks did not play an important role in affecting inflation. However, oil price shocks affects inflation negatively, which is in contrast with most of the previous researchers. Our result shows a small magnitude of effect on inflation by oil price. When oil price increases by 10 percent, inflation decreases by 0.14 percent which is actually suggesting a small magnitude. We suspect that the inflated oil price is absorbed by the policy makers and producers instead of the consumers. Thailand government has been subsidizing on the imported crude oil, which helps minimizing the negative impact of increasing oil price on consumer welfare. In the short run, oil prices-consumer prices relationship is seen to be limited, however, this relationship appears to be more significant when oil price shocks are defined in local currencies (Rafiz, Salim & Bloch, 2009). In our studies oil price is priced in USD instead of Thai Baht, which might explain the minimal magnitude of the finding. However, further research is required to study the impact of oil price on business cost and government spending.

4.2.1.4 Real Gross Domestic Product Shocks and Inflation Shocks on Monetary Policy

Most of the researchers had found that a risen RGDP can spark inflation. In order to cool down the overheated economy, policy makers would increase the interest rate. At the same time, an overheated economy usually resulting in increasing inflation. Our results show that interest rate responds positively to the changes of RGDP but negatively to inflation. Hence, we would suggest that the relationship between interest rate and RGDP is consistent with the previous studies. However, contradiction is shown in the relationship between interest rate and inflation. When an economy is deemed to be overheated and unsustainable by the country, the policy makers will increase the interest rate. The rationale is easy and straightforward. When the interest rate is increased, the producer and business will face a higher lending rate, which result in lower business activities. At the same time, the consumer will spend less and save more of their monies due to the higher saving rate. However, the producers usually response slower to the changes in interest rate due to their illiquid capital. Hence, the interest rate increases according to the economic growth as the economic does not response to the changes in interest rate immediately.

The unusual relationship between interest rate and inflation can be explained by the implementation of inflation targeting framework by the Bank of Thailand (BOT). Since May 2000, the BOT has been conducting monetary policy under a flexible inflation targeting framework. Under the inflation targeting scheme, the policy maker will be prompted to adjust the interest rate if the forecasted inflation rate deviates from the target level. If the expected inflation rate is less than the target inflation, the policy maker will decrease the policy rate, hence heating up the economic activities, which in turns increase the inflation rate. The leads to higher inflation rate and bring the inflation rate closer to the target rate (Kose et al., 2012). This explains the negative relationship between interest rate and inflation rate in Thailand.

4.2.2 Interpretations of Coefficients in Sub-Sample 1 and Sub-Sample 2

This section presents the results and interpretations of coefficients in both sub-samples. The results are estimated and interpreted based on Matrix C (refer Table 4.2.6 and Table 4.2.9)

4.2.2.1 Institutional Quality Shocks on Real Gross Domestic Product

Results obtained from Matrix C in sub-sample 1(Table 4.2.6) and sub-sample 2 (Table 4.2.9) suggest that improvements in institutional quality may foster economic growth which is consistent with most of the researchers.

4.2.2.2 Oil Price Shocks on Real Gross Domestic Product

In sub-sample 1, oil price shocks affect RGDP negatively but in small magnitude of 0.01 percent when oil price increases 10 percent. However sub-sample 2 suggest that oil price shocks and RGDP have positive relationship. We suspect that the impact of oil price on RGDP might need to be traced to the changes in currency scheme. In sub-sample 1, Thai Baht is pegged to USD, hence hedging the economic activities in Thailand towards the global macroeconomic indicators. This helps to explain the smaller magnitude in sub-sample 1.

In sub-sample 2, the Thailand government unpegged Thai Baht from USD, hence making the economic in the country vulnerable to the changes in global economic. However, the positive impact of oil price on RDGP contradicts with the findings of most of the researchers. We believe that the funds set up by Thailand government in subsidizing the oil price could help to explain this contradiction.

4.2.2.3 Institutional Quality Shocks, Oil Price Shocks and Real Gross Domestic Shocks on Inflation

It is found that institutional quality shocks did not play a crucial role in the affecting inflation in both sub-samples. Regarding the relationship between oil price and inflation, oil price shocks did not play an important role in sub-sample 1 but it affects inflation positively in sub-sample 2. This finding may be due to difference in Thailand’s exchange rate policies between the two samples. Before the Asian crisis 1997, the Thai Bhat is pegged to the USD, hence the oil price is relatively stable due to the consistent currency exchange rate. However, the Thailand policymakers unpegged the Thai Baht from USD after the crisis. Hence, we believe that the impact of oil price is transmitted to the macroeconomic factors thought the floating Thai Baht.

4.2.2.4 Real Gross Domestic Product Shocks and Inflation Shocks on Monetary Policy.

We found different results on the effects of RGDP and inflation on interest rate in both sub-samples. In sub-sample 1, both RGDP and inflation exhibit no impact towards the changes of interest rate. This might be due to the irrational market behaviour at that time whereby the investors and business organizations behaved aggressively regardless of the monetary policy. At that time, economic grew too fast that it burst as the country could not sustain it.

On the other hand, sub-sample 2 shows result which different from sub-sample 1. The interest rate reacts negatively towards RGDP whereas the interest rate reacts positively towards inflation. The interest rate is being reduced when the GDP is growing, signalling that the market is now more rational towards the economic condition.

Results obtained from this section consist of mixed results and no solid conclusion can be drawn. Thus, section 4.3 and 4.4 will assist in explaining a better conclusion.

Table 4.2.1: Parameter Estimates and Statistics of Matrix A in Full Sample

Matrix A	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
a_{31}	-0.394 (-3.396)***	-0.394 (3.396)***	-0.394 (-3.396)***
a_{32}	-0.011 (-0.586)	-0.011 (-0.586)	-0.011 (-0.586)
a_{41}	-0.000 (-0.014)	-0.000 (-0.014)	-0.000 (-0.014)
a_{42}	-0.014 (-2.493)	-0.014 (-2.493)	-0.014 (-2.493)
a_{43}	0.005 (0.171)	0.005 (0.171)	0.005 (0.171)
a_{52}	0	0	-0.002 (-0.368)
a_{53}	0.038 (1.615)	0	0.038 (1.653)*
a_{54}	-0.104 (-1.284)	-0.103 (-1.255)	-0.097 (-1.163)

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: a31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.

: a32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.

: a41 refers to the impact of Institutional Quality Shocks on Inflation.

: a42 refers to the impact of Oil Price Shocks on Inflation.

: a43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.

: a52 refers to the impact of Oil Price Shocks on Monetary Policy.

: a53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.

: a54 refers to the impact of Inflation Shocks on Monetary Policy.

Table 4.2.2: Parameter Estimates and Statistics of Matrix B in Full Sample

Matrix B	Models		
Coefficient	Baseline Model	Model 1	Model 2
b_{11}	0.019 (14.56)***	0.019 (14.56)***	0.019 (14.56)***
b_{22}	0.115 (14.56)***	0.115 (14.56)***	0.115 (14.56)***
b_{33}	0.023 (14.56)***	0.023 (14.56)***	0.023 (-0.014)***
b_{44}	0.007 (14.56)***	0.007 (14.56)***	0.007 (14.56)***
b_{55}	0.006 (14.56)***	0.006 (14.56)***	0.006 (14.56)***

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: b11 refers to impact of Institutional Quality Shocks on itself.

: b22 refers to the impact of Oil Price Shocks on itself.

: b33 refers to the impact of Real Gross Domestic Product Shocks on itself.

: b44 refers to the impact of Consumer Price Index Shocks on itself.

: b55 refers to the impact of Monetary Policy Shocks on itself.

Table 4.2.3: Parameter Estimates of Matrix C in Full Sample

Matrix C ($A^{-1}*B$)	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
c_{31}	0.007	-0.394	-0.394
c_{32}	0.001	-0.011	-0.011
c_{41}	0.000	-0.000	-0.000
c_{42}	0.002	-0.014	-0.014
c_{43}	0.000	0.005	0.005
c_{52}	0	0	-0.002
c_{53}	-0.001	0	0.038
c_{54}	0.001	-0.103	-0.097

Notes : The numbers above are the results of matrix multiplication for each coefficient.

: c31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.

: c32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.

: c41 refers to the impact of Institutional Quality Shocks on Inflation.

: c42 refers to the impact of Oil Price Shocks on Inflation.

: c43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.

: c52 refers to the impact of Oil Price Shocks on Monetary Policy.

: c53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.

: c54 refers to the impact of Inflation Shocks on Monetary Policy.

Table 4.2.4: Parameter Estimates and Statistics of Matrix A in Sub-Sample 1

Matrix A	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
a_{31}	-0.124 (-1.607)	-0.124 (-1.607)	-0.124 (-1.607)
a_{32}	0.014 (0.860)	0.014 (0.860)	0.014 (0.860)
a_{41}	0.038 (0.963)	0.038 (0.963)	0.038 (0.963)
a_{42}	0.006 (0.706)	0.006 (0.706)	0.006 (0.706)
a_{43}	0.032 (0.494)	0.032 (0.494)	0.032 (0.494)
a_{52}	0	0	-0.010 (-1.751)*
a_{53}	-0.009 (-0.189)	0	-0.016 (-0.368)
a_{54}	-0.059 (-0.643)	-0.057 (-0.630)	-0.074 (-0.828)

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: a31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.

: a32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.

: a41 refers to the impact of Institutional Quality Shocks on Inflation.

: a42 refers to the impact of Oil Price Shocks on Inflation.

: a43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.

: a52 refers to the impact of Oil Price Shocks on Monetary Policy.

: a53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.

: a54 refers to the impact of Inflation Shocks on Monetary Policy.

Table 4.2.5: Parameter Estimates and Statistics of Matrix B in Sub-Sample 1

Matrix B	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
b_{11}	0.021 (11.22)***	0.021 (11.22)***	0.021 (11.22)***
b_{22}	0.104 (11.22)***	0.104 (11.22)***	0.104 (11.22)***
b_{33}	0.013 (11.22)***	0.013 (11.22)***	0.013 (11.22)***
b_{44}	0.007 (11.22)***	0.007 (11.22)***	0.007 (11.22)***
b_{55}	0.005 (11.22)***	0.005 (11.22)***	0.005 (11.22)***

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: b11 refers to impact of Institutional Quality Shocks on itself.

: b22 refers to the impact of Oil Price Shocks on itself.

: b33 refers to the impact of Real Gross Domestic Product Shocks on itself.

: b44 refers to the impact of Consumer Price Index Shocks on itself.

: b55 refers to the impact of Monetary Policy Shocks on itself.

Table 4.2.6: Parameter Estimates of Matrix C in Sub-Sample 1

Matrix C ($A^{-1}*B$)	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
c_{31}	0.003	0.003	0.003
c_{32}	-0.001	-0.001	-0.001
c_{41}	-0.001	-0.001	-0.001
c_{42}	-0.001	-0.001	-0.001
c_{43}	0.000	0.000	0.000
c_{52}	0	0	0.000
c_{53}	0.000	0	0.000
c_{54}	0.000	0.000	0.000

Notes : The numbers above are the results of matrix multiplication for each coefficient.
: c31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.
: c32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.
: c41 refers to the impact of Institutional Quality Shocks on Inflation.
: c42 refers to the impact of Oil Price Shocks on Inflation.
: c43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.
: c52 refers to the impact of Oil Price Shocks on Monetary Policy.
: c53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.
: c54 refers to the impact of Inflation Shocks on Monetary Policy.

Table 4.2.7: Parameter Estimates and Statistics of Matrix A in Sub-Sample 2

Matrix A	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
a_{31}	-1.086 (-5.166)***	-1.086 (-5.166)***	-1.086 (-5.166)***
a_{32}	-0.032 (-0.960)	-0.032 (-0.960)	-0.032 (-0.960)
a_{41}	0.024 (0.282)	0.024 (0.282)	0.024 (0.282)
a_{42}	-0.044 (-3.979)***	-0.044 (-3.979)***	-0.044 (-3.979)***
a_{43}	-0.057 (-1.172)	-0.057 (-1.172)	-0.057 (-1.172)
a_{52}	0	0	-0.002 (-0.180)
a_{53}	0.073 (2.431)	0	0.072 (2.387)
a_{54}	-0.257 (-2.605)*	-0.240 (-2.344)	-0.246 (-2.136)**

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: a31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.

: a32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.

: a41 refers to the impact of Institutional Quality Shocks on Inflation.

: a42 refers to the impact of Oil Price Shocks on Inflation.

: a43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.

: a52 refers to the impact of Oil Price Shocks on Monetary Policy.

: a53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.

: a54 refers to the impact of Inflation Shocks on Monetary Policy.

Table 4.2.8: Parameter Estimates and Statistics of Matrix B in Sub-Sample 2

Matrix B	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
b_{11}	0.013 (9.38)***	0.013 (9.38)***	0.013 (9.38)***
b_{22}	0.080 (9.38)***	0.080 (9.38)***	0.080 (9.38)***
b_{33}	0.018 (9.38)***	0.018 (9.38)***	0.018 (9.38)***
b_{44}	0.006 (9.38)***	0.006 (9.38)***	0.006 (9.38)***
b_{55}	0.005 (9.38)***	0.005 (9.38)***	0.005 (9.38)***

Notes : The numbers in brackets represent the z-statistics of each coefficient. Significance at 1%, 5% and 10% is denoted by ***, ** and * respectively.

: b11 refers to impact of Institutional Quality Shocks on itself.

: b22 refers to the impact of Oil Price Shocks on itself.

: b33 refers to the impact of Real Gross Domestic Product Shocks on itself.

: b44 refers to the impact of Consumer Price Index Shocks on itself.

: b55 refers to the impact of Monetary Policy Shocks on itself.

Table 4.2.9: Parameter Estimates of Matrix C in Sub-Sample 2

Matrix C ($A^{-1}*B$)	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
c_{31}	0.014	0.014	0.014
c_{32}	0.003	0.003	0.003
c_{41}	0.000	0.000	0.000
c_{42}	0.004	0.004	0.004
c_{43}	0.001	0.001	0.001
c_{52}	0	0	0.001
c_{53}	-0.001	0	-0.001
c_{54}	0.002	0.001	0.001

Notes : The numbers above are the results of matrix multiplication for each coefficient.

: c31 refers to impact of Institutional Quality Shocks on Real Gross Domestic Product.

: c32 refers to the impact of Oil Price Shocks on Real Gross Domestic Product.

: c41 refers to the impact of Institutional Quality Shocks on Inflation.

: c42 refers to the impact of Oil Price Shocks on Inflation.

: c43 refers to the impact of Real Gross Domestic Product Shocks on Inflation.

: c52 refers to the impact of Oil Price Shocks on Monetary Policy.

: c53 refers to the impact of Real Gross Domestic Product Shocks on Monetary Policy.

: c54 refers to the impact of Inflation Shocks on Monetary Policy.

4.3 Impulse Response

The Impulse response function of VAR is to analysis dynamic effects of the sample when the model received the impulse.

From the figure 4.3, 4.3.1, and 4.3.2, is the impulse response of institutional quality, oil price and monetary policy to the real GDP. For the full sample, when the impulse is institutional quality, more than half response in the ten periods of real GDP is positive effect. However, after period eight, the response became negative effect. While, the real GDP response negatively towards oil price for the first eight periods and then the response went positive. Meanwhile, the response of real GDP on monetary policy is almost similar with response of institutional quality. It responded positively for the first eight periods and then the response became negative after period eight.

Meanwhile, the graph in figure 4.3 appeared to be only two lines is due the overlapping from model 1 on baseline model. On the other hand, the graphs appeared to be one line in figure 4.3.1 and figure 4.3.2 due to the overlapping effect on the three models, which is baseline model, model 1 and model 2.

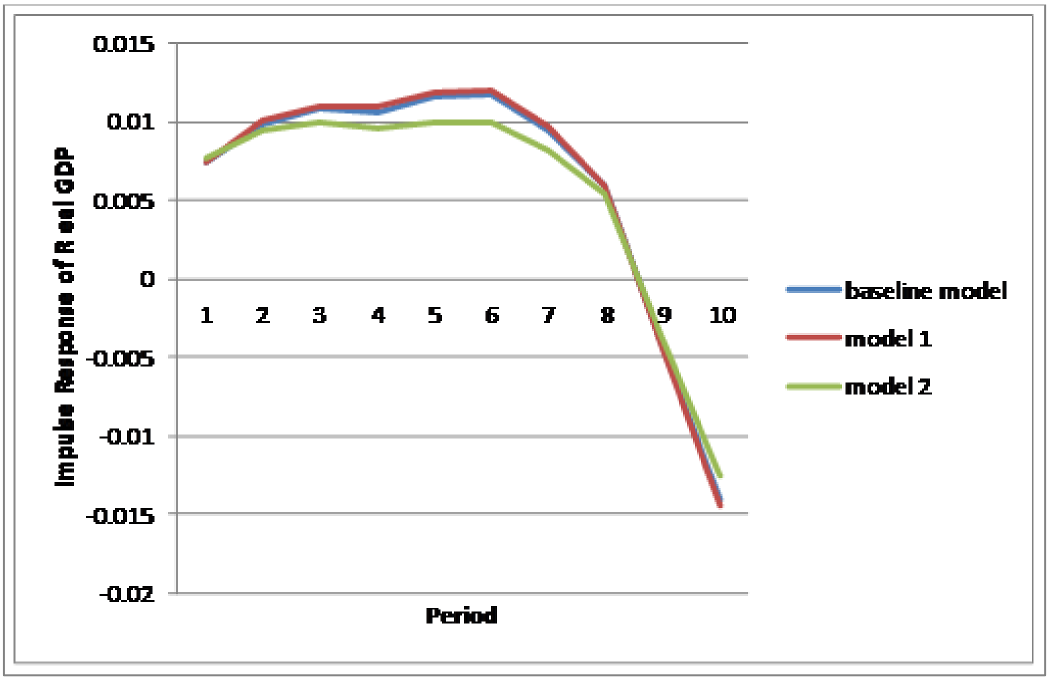


Figure 4.3: Impulse Response of Real GDP towards Structural Shock to Institutional Quality, 1980Q1-2007Q4.

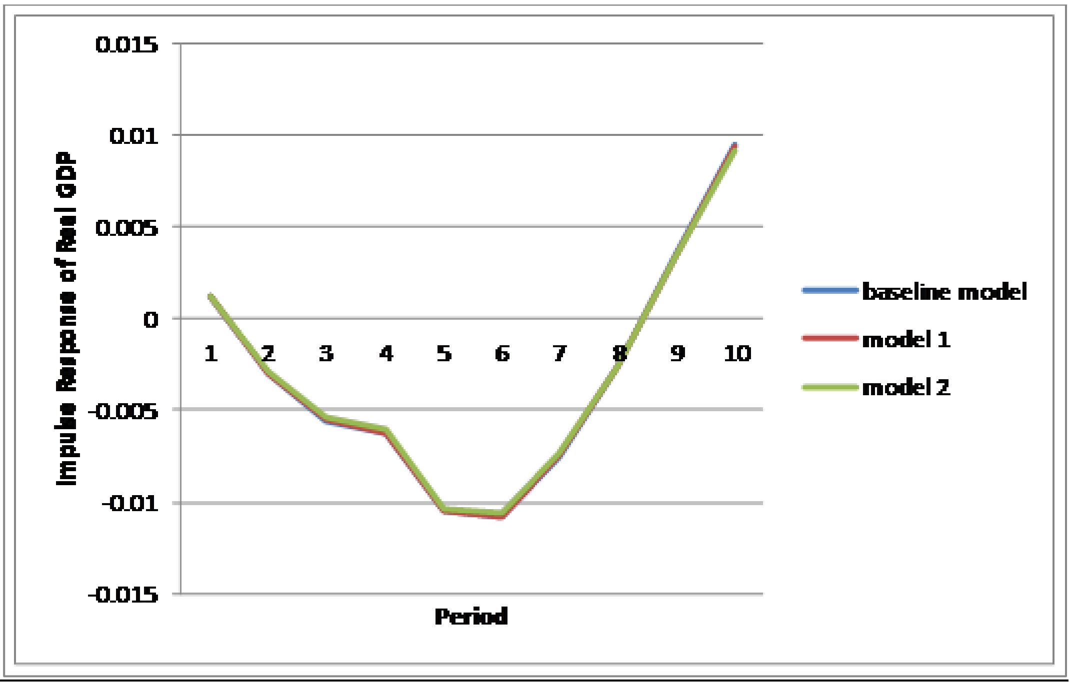


Figure 4.3.1: Impulse Response of Real GDP towards Structural Shock to Oil Price, 1980Q1-2007Q4.

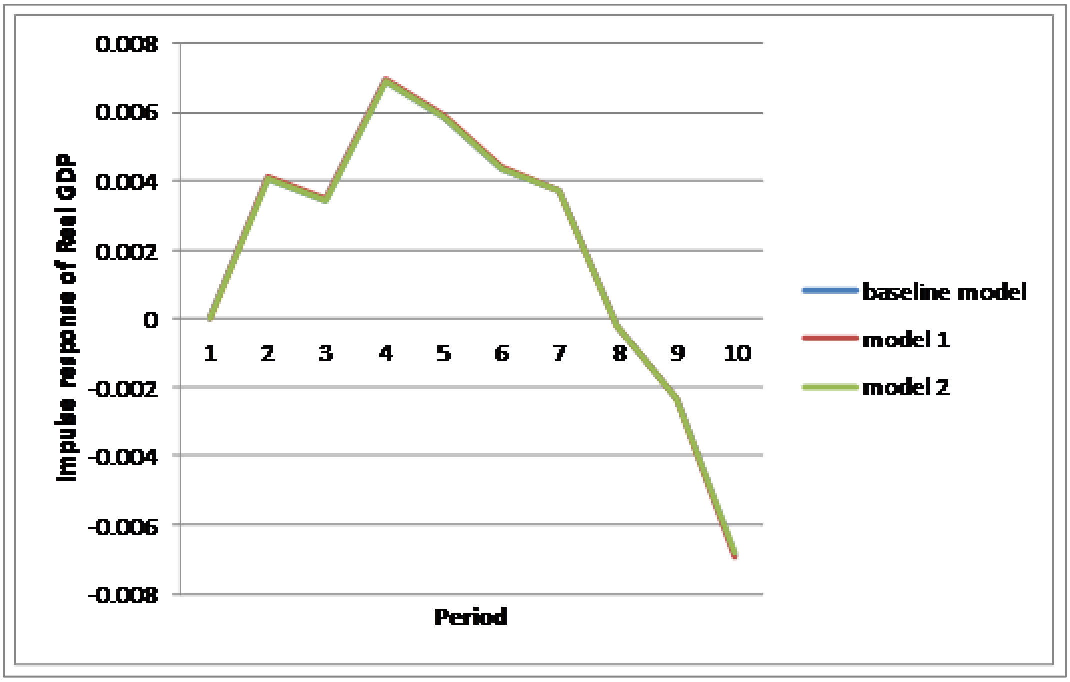


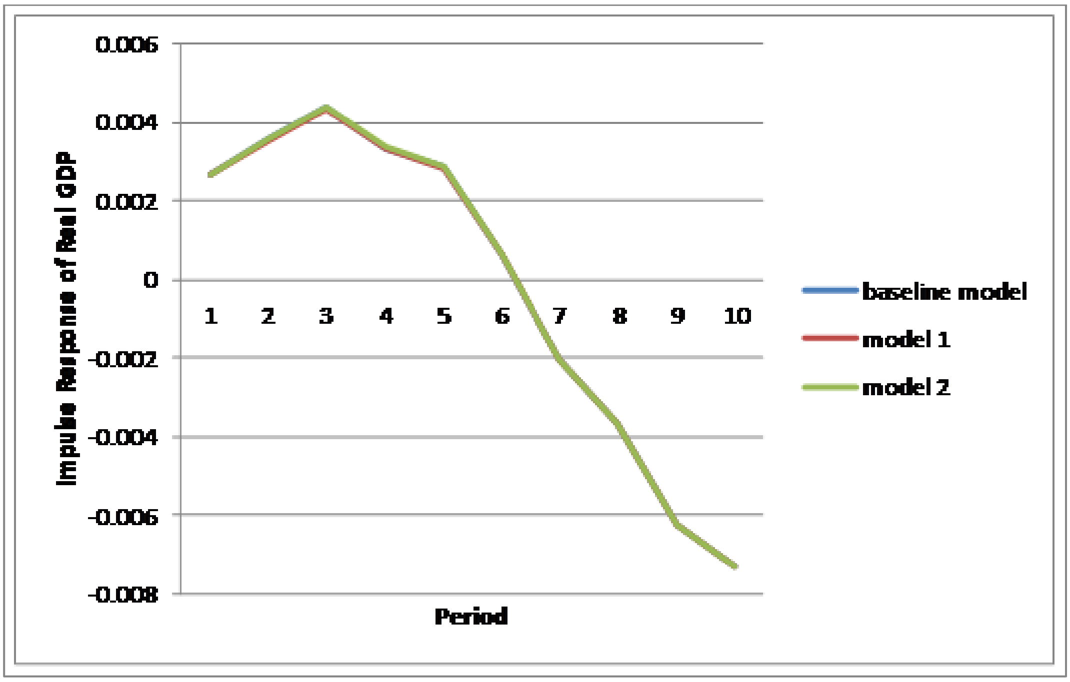
Figure 4.3.2: Impulse Response of Real GDP towards Structural Shock to Monetary Policy, 1980Q1 -2007Q4

As we can see, from the figure 4.3.3 to 4.3.8, is the impulse response of institutional quality, oil price and monetary policy to the real GDP for two different sub-samples, which sub-sample 1 is from year 1980Q1 to 1996 Q4 and sub-sample 2 is from 1997Q1 to 2007Q4. When the impulse is institutional quality, the response in the ten periods of real GDP in sub-sample 1 is positive effect for the first five period and then it goes negative and stays there while response in ten periods of real GDP in sub-sample 2 is all positive effect except for negative effect in fourth period and the highest positive effect is at period eight.

When the impulse is oil price, the response of real GDP in sub-sample 1 is all negative effect and the shape is persistent while in sub-sample 2, there is more fluctuation. In sub-sample 2, the response has positive effect in first period and goes to negative in second period and then it fluctuate around negative effect until period ten.

When the impulse is monetary policy, the response of real GDP is sub sample 1 is all positive effect except for negative effect at the sixth period. However, in sub-sample 2, all the response of real GDP is positive effect and the response is almost disappear at period ten.

The graphs appeared to be one line in figure 4.3.3, figure 4.3.4 and figure 4.3.5 due to the overlapping effect on the three models, which is baseline model, model 1 and model 2. Meanwhile, in figure 4.3.7, the graph appeared to be only two lines because the results in model 1 is overlapping baseline model. In figure 4.3.8, the graph appeared to be two lines is due to the overlapping from model 2 on baseline model.



<u>Figure 4.3.3 Impulse Response of Real GDP towards Structural Shock to Institutional Quality, 1980Q1-1996Q4</u>

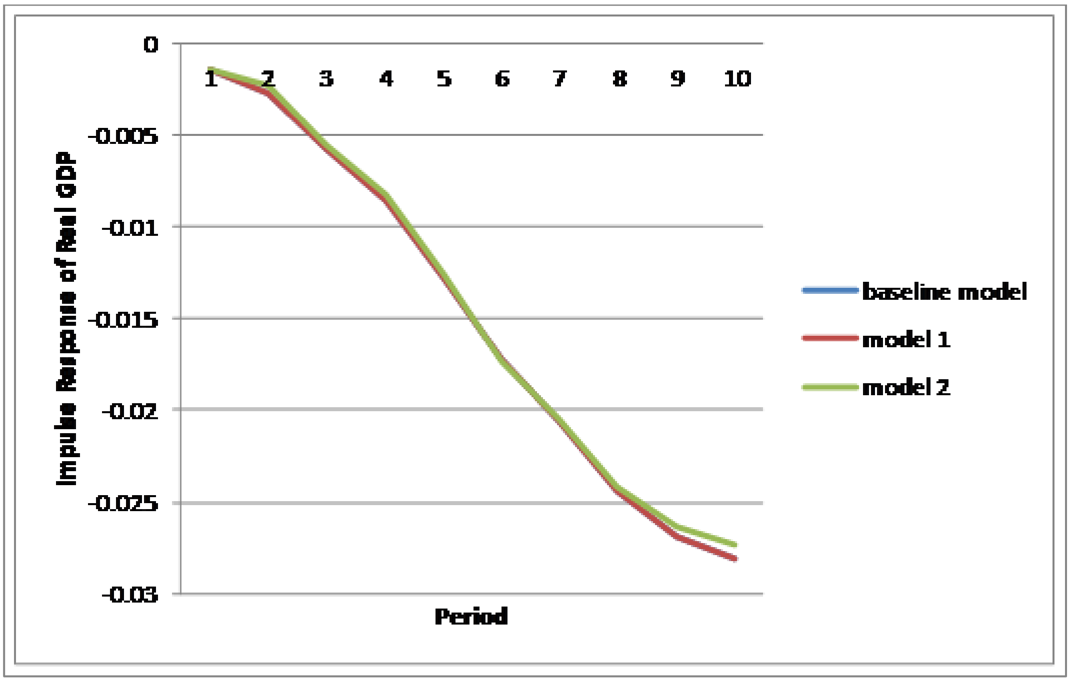


Figure 4.3.4: Impulse Response of Real GDP towards Structural Shock to Oil Price, 1980Q1-1996Q4.

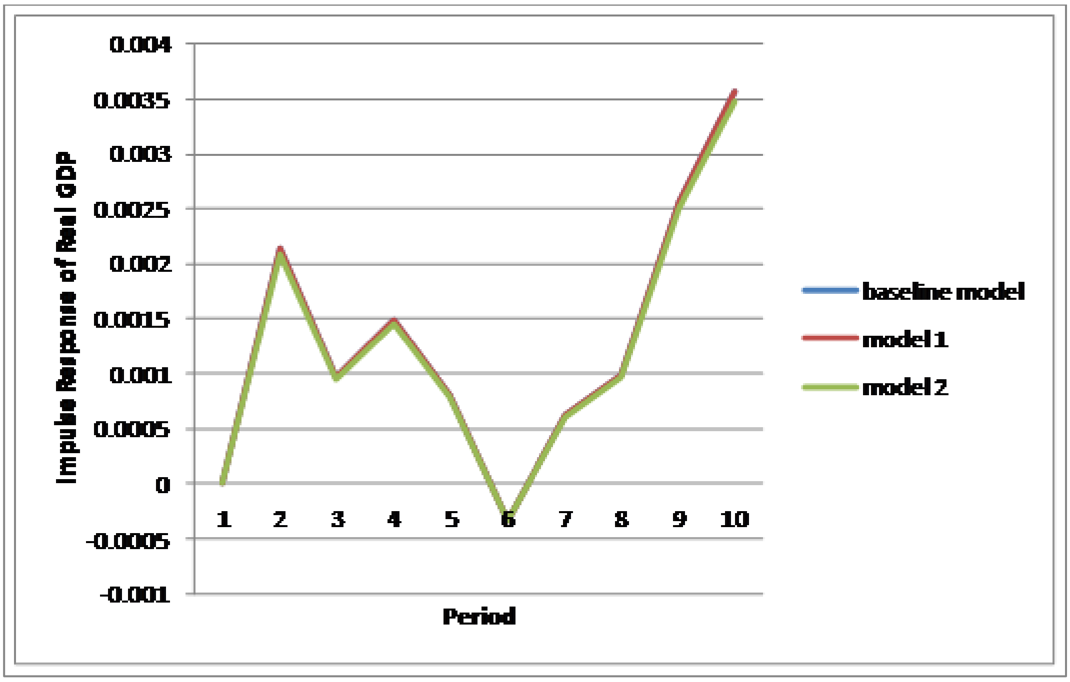


Figure 4.3.5: Impulse Response of Real GDP towards Structural Shock to Monetary Policy, 1980Q1-1996Q4.

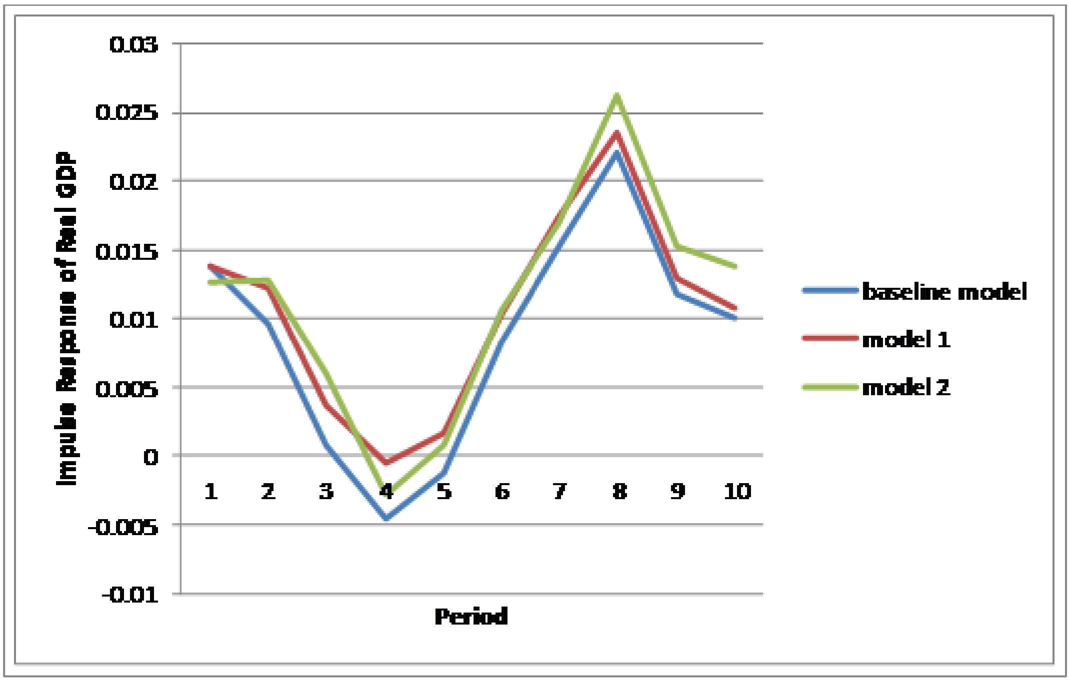


Figure 4.3.6: Impulse Response of Real GDP towards Structural Shock to Institutional Quality, 1997Q1-2007Q4.

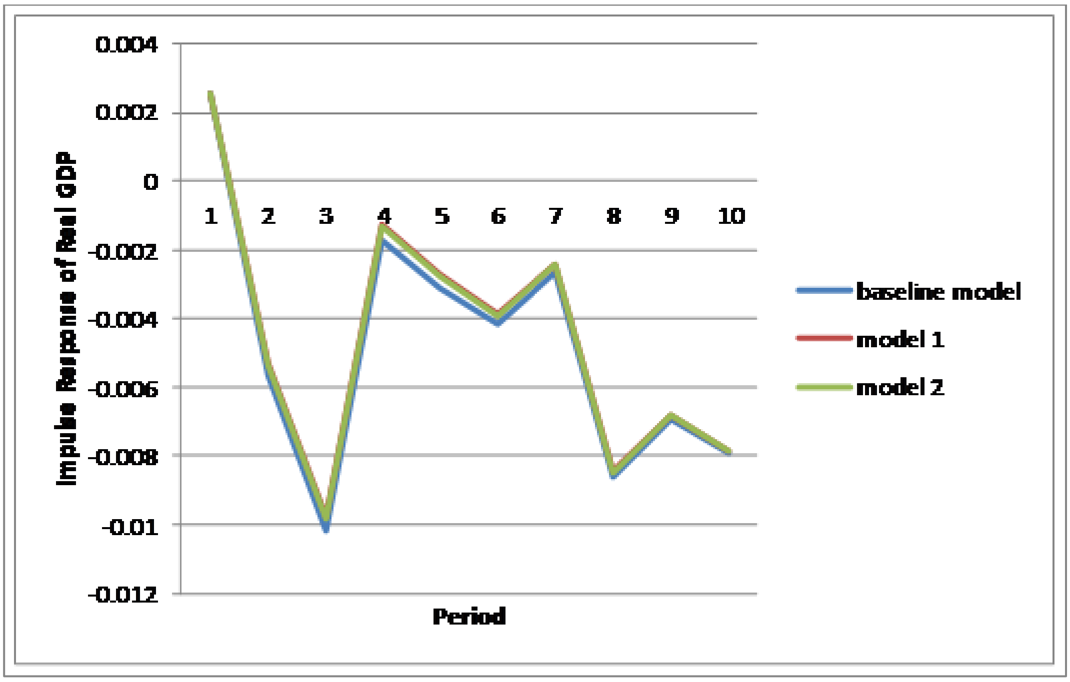


Figure 4.3.7: Impulse Response of Real GDP towards Structural Shock to Oil Price Shocks, 1997Q1-2007Q4

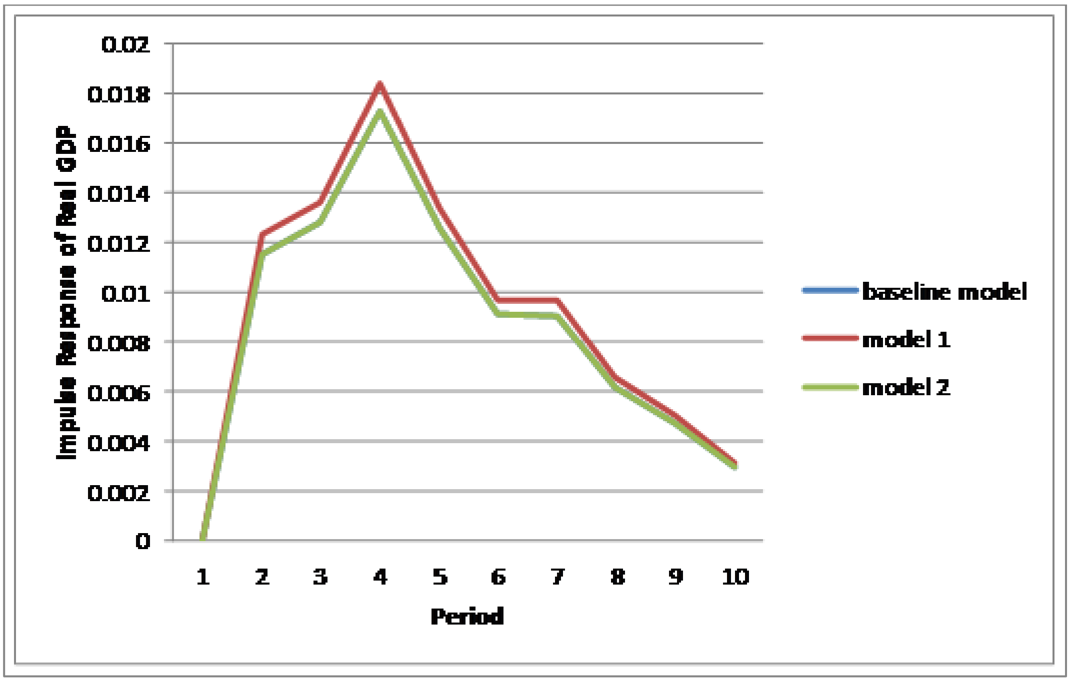


Figure 4.3.8: Impulse Response of Real GDP towards Structural Shock to Monetary Policy, 1997Q1-2007Q4.

From the figure 4.3.9, 4.3.10, and 4.3.11, is the impulse response of institutional quality, oil price and monetary policy to inflation. For the full sample, when the impulse is institutional quality, the response of inflation has obvious fluctuation. It has the lowest negative effect at the sixth period and the highest positive effect at period ten.

When the impulse is oil price, the response of inflation is all positive effect and has the highest positive effect at the fifth period. The response decreases to almost zero at period ten.

Meanwhile, when the impulse is monetary policy, the response of inflation is all negative effect and reached the lowest point at the sixth period. For figure 4.3.9, 4.3.10, and 4.3.11, the graph appeared to be two lines is due to the overlapping from model 2 on baseline model.

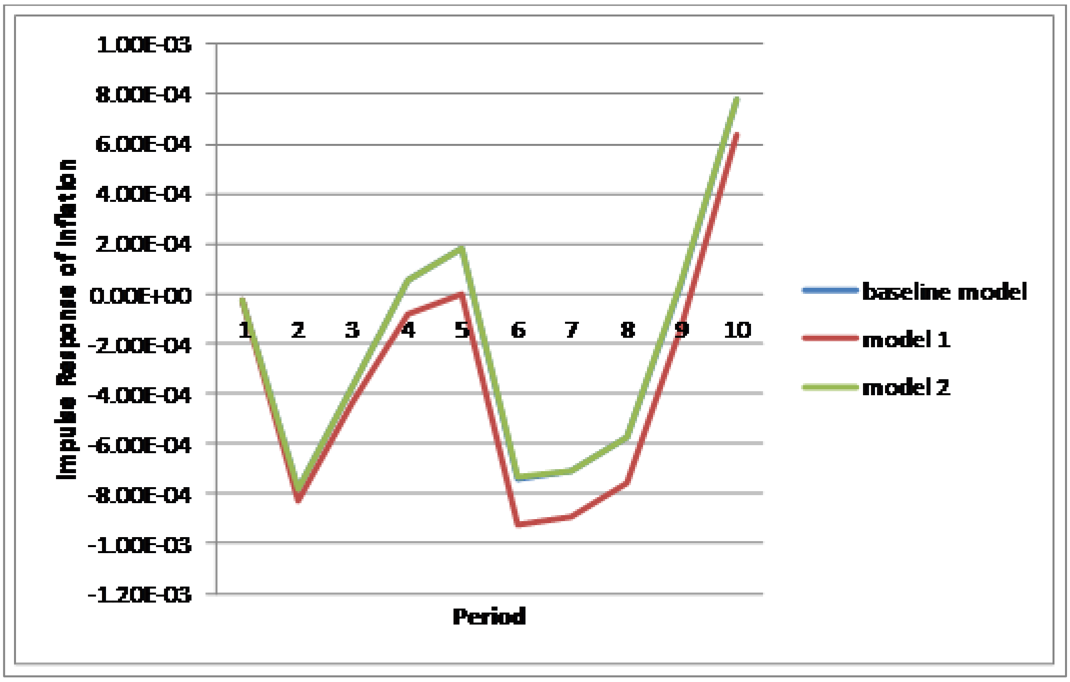


Figure 4.3.9: Impulse Response of Inflation towards Structural Shock to Institutional Quality, 1980Q1-2007Q4.

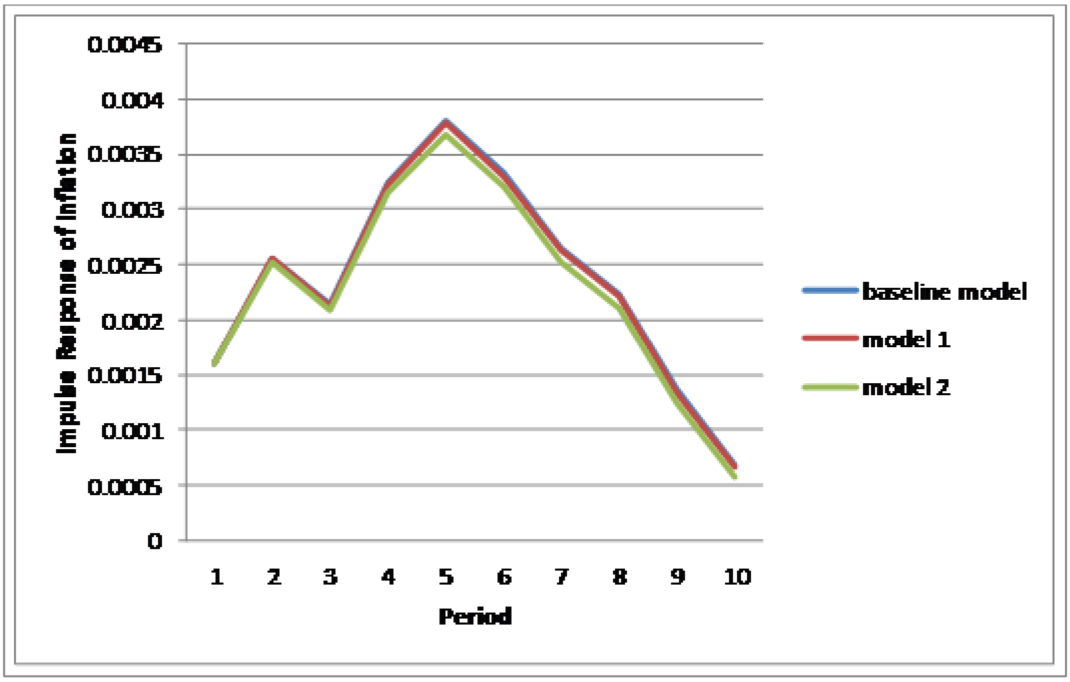


Figure 4.3.10: Impulse Response of Inflation towards Structural Shock to Oil Price, 1980Q1- 2007Q4.

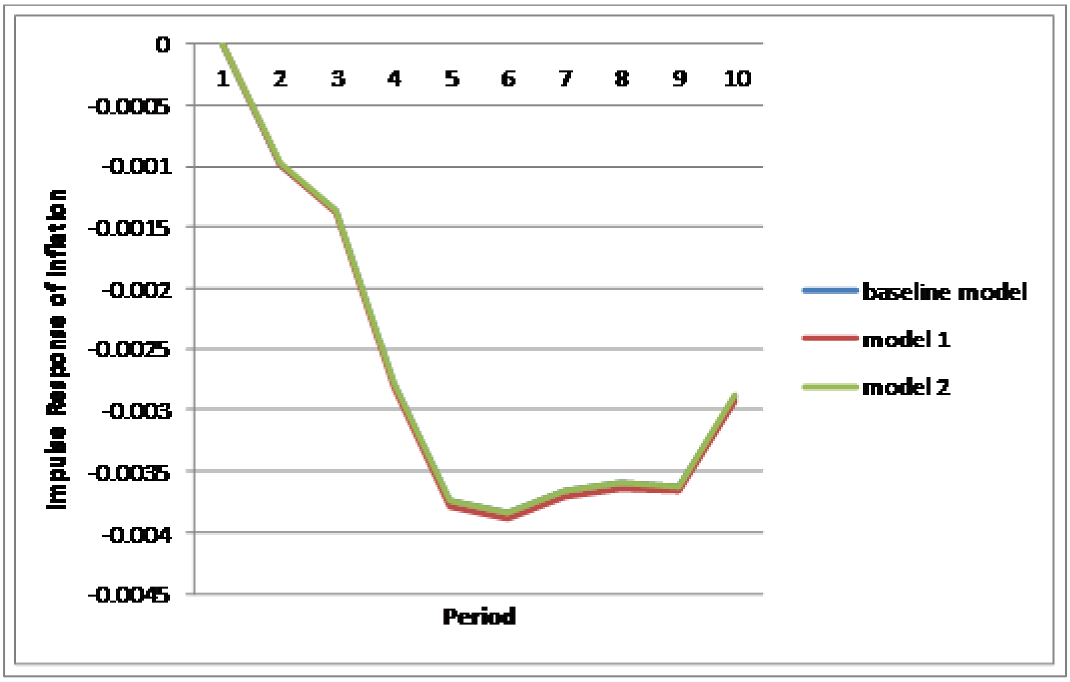


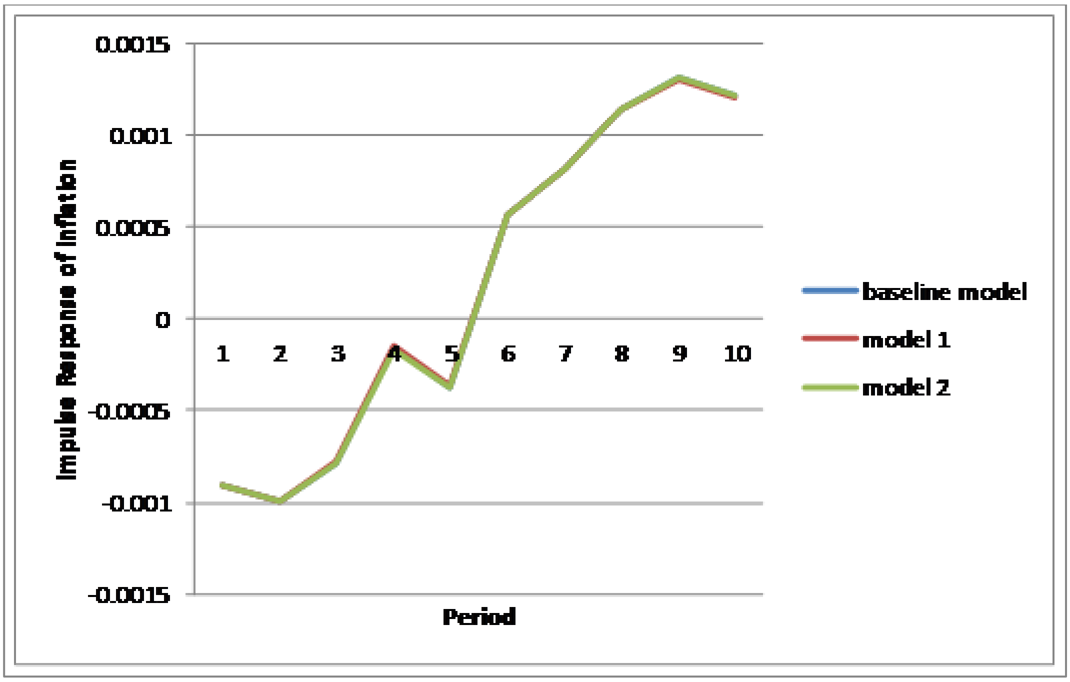
Figure 4.3.11: Impulse Response of Inflation towards Structural Shock to Monetary Policy, 1980Q1-2007Q4.

As we can see, from the figure 4.3.12 to 4.3.17, is the impulse response of institutional quality, oil price and monetary policy to the inflation for two different sub-samples, which sub-sample 1 is from year 1980Q1 to 1996 Q4 and sub-sample 2 is from 1997Q1 to 2007Q4. When the impulse is institutional quality, the response of inflation in sub-sample 1 is negative effect for the first five period and then goes to positive after the fifth period. However, the response of inflation in sub-sample 2 is all positive effect and persistent in the ten periods.

Other than that, when the impulse is oil price, the response of inflation in sub-sample 1 is all negative effect and persistent. Although in sub-sample 2, the response is persistent, but first three periods is positive effect before it falls to negative effect.

When the impulse is monetary policy, the response of inflation in sub-sample 1 has an obvious fluctuation, there is a highest positive effect would be at period ten and lowest negative effect on the fourth period. Meanwhile, the response of inflation in sub-sample 2 has less fluctuation; there is a lowest negative effect at the third period and a highest positive effect at period seven.

In figure 4.3.12, figure 4.3.14 and figure 4.3.16, the graph appeared to be only one line is due to model 2 overlapping baseline and model 1. Meanwhile, in figure 4.3.13, figure 4.3.15 and figure 4.3.17, the graph appeared to be two lines is due to the overlapping from model 2 on baseline model.



<u>Figure 4.3.12: Impulse Response of Inflation towards Structural Shock to Institutional Quality, 1980Q1-1996Q4.</u>

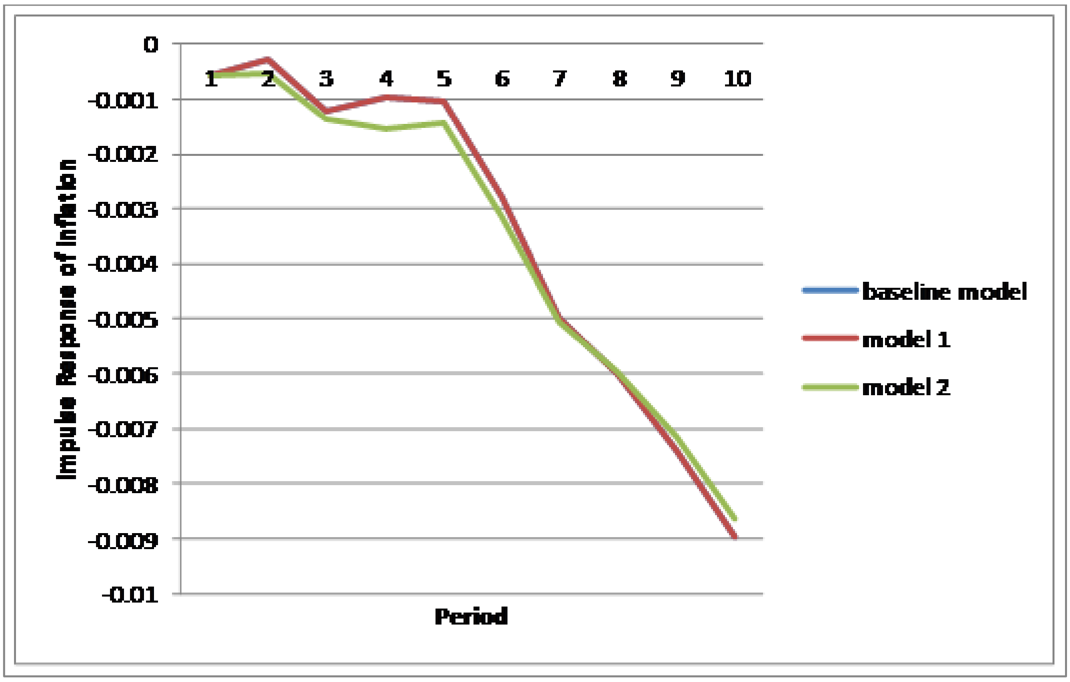


Figure 4.3.13: Impulse Response of Inflation towards Structural Shock to Oil Price, 1980Q1-1996Q4.

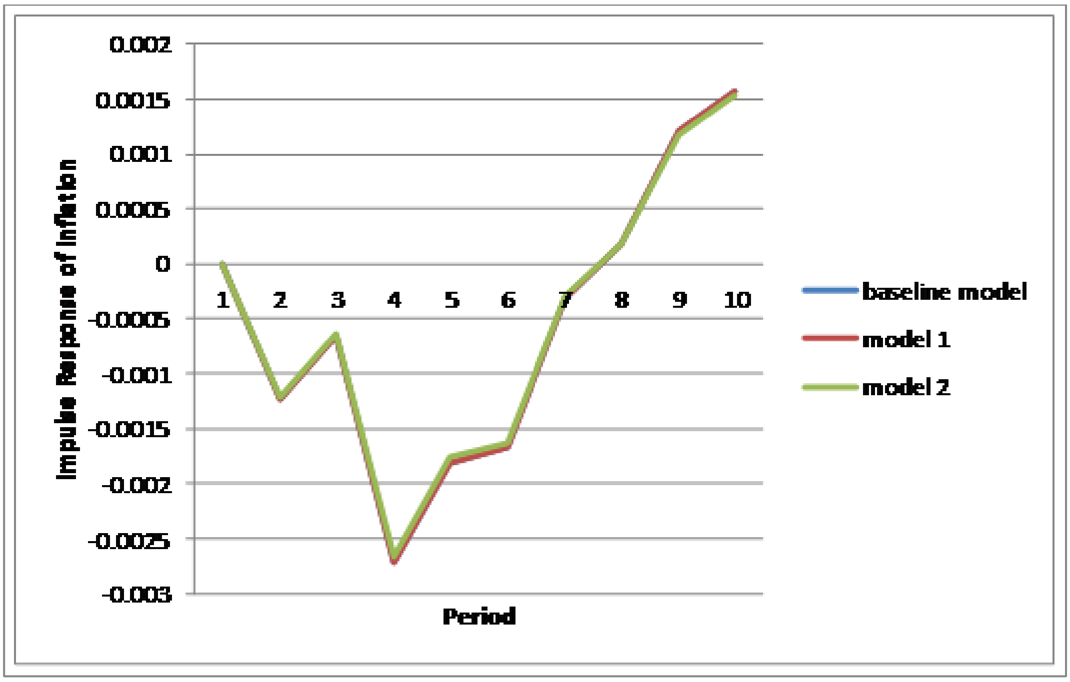


Figure 4.3.14: Impulse Response of Inflation towards Structural Shock to Monetary Policy, 1980Q1-1996Q4.

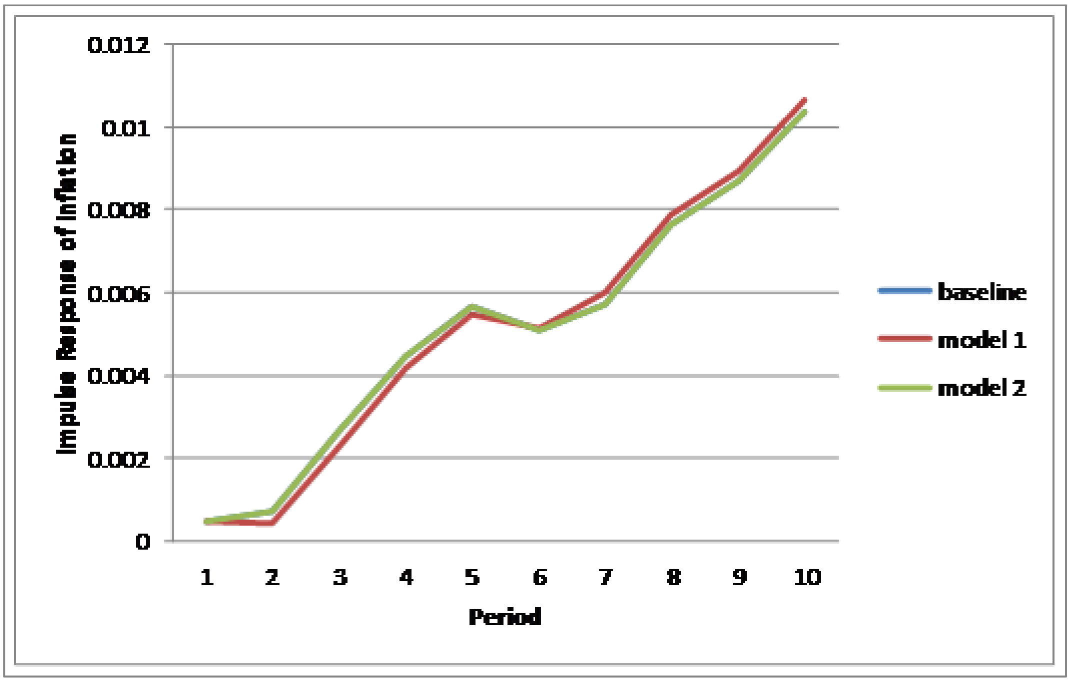


Figure 4.3.15: Impulse Response of Inflation towards Structural Shock to Institutional Quality, 1997Q1-2007Q4.

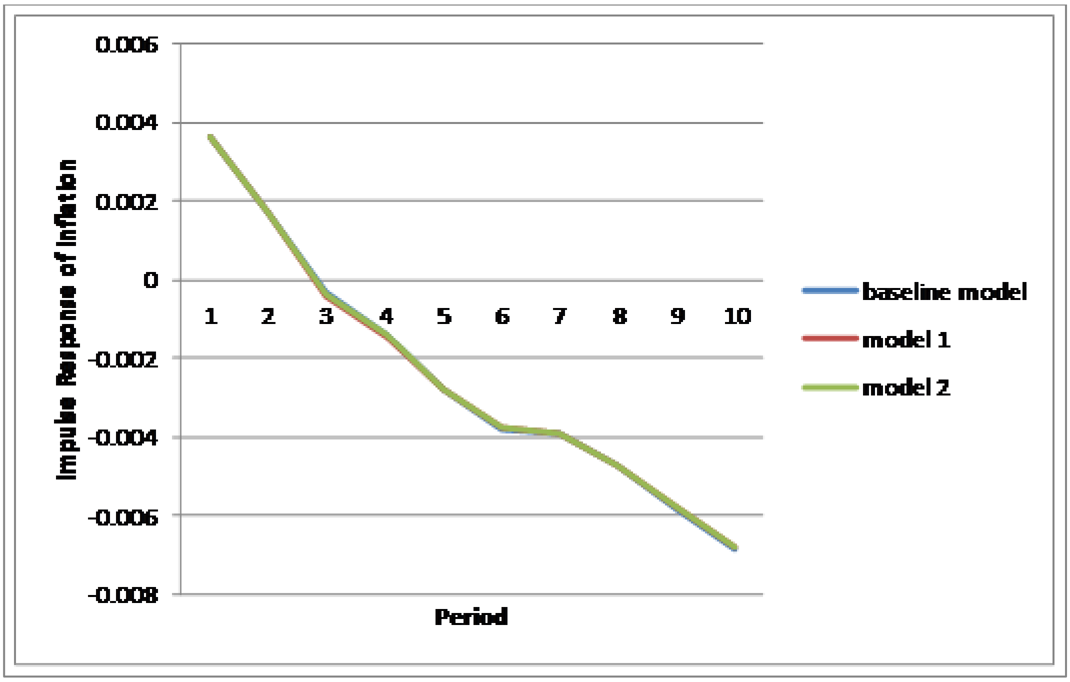


Figure 4.3.16: Impulse Response of Inflation towards Structural Shock to Oil Price, 1997Q1-2007Q4.

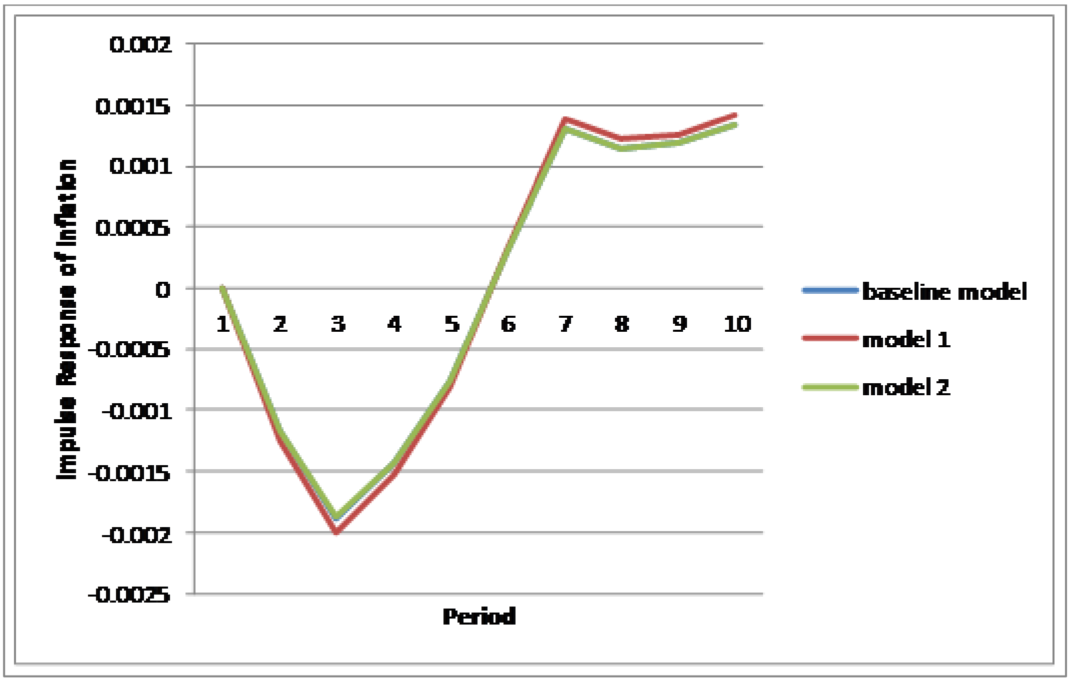


Figure 4.3.17: Impulse Response of Inflation towards Structural Shock to Monetary Policy, 1997Q1-2007Q4.

4.4 Variance Decomposition

There are two concerns to be addressed in this present section: Is the volatility of real GDP different across two different sub-samples periods? Do good practice, good luck and good policy play a vital role in explaining the reduction in volatility of Thailand's real GDP?

From the results obtained (Table 4.4, Table 4.4.1 and Table 4.4.2), a similar pattern can be seen in all models. For many of the variables, the major source of disturbance other than the variable itself is the oil price which explains about 42 percent of real GDP volatility in sub-sample 1. Institutional quality contributes nearly 2.3 percent of the volatility and monetary policy is the minimal source of disturbance which explains only about 0.4 percent of the volatility.

However, in sub-sample 2, institutional quality becomes the major source of disturbance which amounts to nearly 26 percent of real GDP volatility. Monetary policy contributes 19 percent of the volatility while only about 6 percent of the volatility of real GDP is explained by oil price. An additional finding of our analysis that is worth emphasizing is where about 45 percent of Thailand's output volatility can be explained by these three sources, the remaining of 55 percent is explained by the real GDP itself. This probably suggests that there are other prominent factors, yet to be identified that could influence the volatility of real GDP of Thailand.

Apart from that, in sub-sample 2, real GDP is seen to be slightly less volatile in a longer term as compared to the real GDP in sub-sample 1. Although the volatility of real GDP of Thailand decreases in a longer term, however, it is just a mere reduction. Even though these three sources seem to be the contributors to the volatility of real GDP, somehow, the average volatility of real GDP across both sub-samples remained almost the same where the average volatility of real GDP in sub-sample 1 is 0.054 and 0.053 in sub-sample 2. In addition to that, the volatility of each disturbance across both sub-samples remained more or less the same (refers to Table 4.4.6, 4.4.7 and 4.4.8). Hence, these results conclude that even good practice, good luck and good policy are significant in affecting output volatility in Thailand, however, they are insignificant in affecting the reduction in output volatility which is the Thailand's Great Moderation.

4.4.1 Are good policy, good luck and good practice competent in explaining Great Moderation in the viewpoint of inflation volatility?

Since Great Moderation does not happen in output volatility, the three common explanations: good policy, good luck and good practice are invalid in explaining Great Moderation.

Thus, it raises two questions: Has the volatility of inflation become less volatile in sub-sample 2? If it does, are those three sources capable in explaining Great Moderation in the perspective of inflation volatility instead?

Based on the results from Table 4.4.3, Table 4.4.4 and Table 4.4.5, in the first sub sample, oil price appears to play the most significant role in explaining the volatility of inflation since about 34 percent of the volatility is contributed by it. Monetary policy contributes nearly 3.1 percent of the volatility while institutional quality plays the least role since only about 1.3 percent of the volatility is explained by it. However, in sub-sample 2, the dominance in affecting inflation volatility has been shifted from oil price to institutional quality since institutional quality contributes about 55 percent of inflation volatility. The second largest source is oil price which explains about 24 percent of the volatility whereas only about 2.2 percent of the volatility of inflation is explained by monetary policy.

Even though, the volatilities of institutional quality, oil price and monetary policy are lesser in second sub-sample (see Table 4.4.6, 4.4.7 and 4.4.8), the reduction in volatility of inflation does not seem to be contributed by these three sources. The rationale of this is there is no significant difference in the mean of volatility of inflation across both different sub-samples since the mean of inflation volatility remained constant at 0.015 in both sub-samples. Hence, based on the findings, we can infer that although good practice, good luck and good policy play a role in affecting Thailand's output volatility, however, they are not the sources of Great Moderation even in the perspective of inflation volatility.

4.4.2 Volatilities of institutional quality, oil price and monetary policy

Table 4.4.6, 4.4.7 and 4.4.8 show the volatilities of institutional quality, oil price and monetary policy for three models; Baseline Model, Model 1 and Model 2. Based on the results obtained, it can be observed that these 3 models exhibit the similar pattern; volatility of institutional quality and volatility of oil price tend to deteriorate in sub-sample 2 as compared to sub-sample 1. For all the models, volatility of monetary policy initially remains constant for the first two periods in both sub-samples. The volatility, however, decreases in a longer term (from period 2 onwards) and remains constant in period 10. Although the volatility of each shock changes from sub-sample 1 to sub-sample 2, however, the mean of real GDP in sub-sample 1 does not deviate much from the mean of real GDP in sub-sample 2 for all models. This further implies that these three sources are not important in contributing to Great Moderation in Thailand.

Table 4.4: Variance Decomposition of RGDP for Baseline Model

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	**Volatility of RGDP**	**Institutional Quality**	**Oil price**	**Monetary Policy**	**Volatility of RGDP**	**Institutional Quality**	**Oil price**	**Monetary Policy**
1	0.013	3.893	1.114	0.000	0.023	37.266	1.287	0.000
2	0.024	3.432	1.606	0.794	0.035	22.616	3.061	10.652
3	0.035	3.197	3.437	0.453	0.043	15.486	7.705	16.227
4	0.045	2.426	5.550	0.374	0.051	11.691	5.548	22.920
5	0.054	2.020	9.620	0.290	0.054	10.551	5.311	22.064
6	0.061	1.579	15.512	0.229	0.056	11.808	5.398	26.473
7	0.067	1.388	22.087	0.196	0.060	16.856	4.930	25.512
8	0.073	1.410	29.517	0.182	0.066	24.989	5.757	21.890
9	0.080	1.812	36.418	0.257	0.070	25.568	6.217	20.308
10	0.086	2.294	42.248	0.395	0.072	25.679	6.978	19.005

Table 4.4.1: Variance Decomposition of RGDP for Sensitivity Analysis - Model 1

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	Volatility of RGDP	Institutional Quality	Oil price	Monetary Policy	Volatility of RGDP	Institutional Quality	Oil price	Monetary Policy
1	0.013	3.893	1.114	0.000	0.023	37.266	1.287	0.000
2	0.024	3.432	1.606	0.797	0.038	23.088	2.352	10.223
3	0.035	3.197	3.441	0.454	0.047	15.898	5.847	15.096
4	0.045	2.424	5.558	0.375	0.057	10.970	4.079	20.852
5	0.054	2.020	9.634	0.291	0.060	9.956	3.878	23.766
6	0.061	1.577	15.531	0.229	0.063	11.808	3.922	24.098
7	0.067	1.387	22.112	0.196	0.067	17.149	3.581	23.304
8	0.073	1.410	29.548	0.182	0.073	24.756	4.349	20.398
9	0.080	1.815	36.456	0.258	0.076	25.549	4.781	19.114
10	0.086	2.301	42.293	0.396	0.079	25.806	5.474	18.064

Table 4.4.2: Variance Decomposition of RGDP for Sensitivity Analysis - Model 2

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	**Volatility of RGDP**	**Institutional Quality**	**Oil price**	**Monetary Policy**	**Volatility of RGDP**	**Institutional Quality**	**Oil price**	**Monetary Policy**
1	0.013	3.893	1.114	0.000	0.023	37.266	1.287	0.000
2	0.024	3.439	1.217	0.758	0.035	22.717	2.825	10.667
3	0.035	3.204	3.067	0.432	0.043	15.591	7.238	16.284
4	0.045	2.433	5.083	0.358	0.051	11.751	5.171	23.002
5	0.054	2.027	9.153	0.277	0.054	10.616	4.920	26.192
6	0.061	1.583	15.222	0.218	0.056	11.902	4.990	26.620
7	0.067	1.393	22.760	0.187	0.060	17.002	4.543	25.654
8	0.073	1.416	29.120	0.174	0.066	25.193	5.390	22.008
9	0.080	1.825	36.800	0.247	0.069	25.779	5.860	20.419
10	0.086	2.321	42.406	0.382	0.072	25.889	6.631	19.107

Table 4.4.3: Variance Decomposition of Inflation for Baseline Model

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy
1	0.007	1.806	0.664	0.000	0.007	0.488	27.766	0.000
2	0.009	2.198	1.451	1.862	0.009	0.976	21.715	1.849
3	0.011	2.114	1.606	1.717	0.010	8.108	16.477	4.956
4	0.012	1.797	2.014	6.852	0.011	22.246	14.391	5.512
5	0.013	1.577	2.325	7.672	0.014	31.657	13.706	3.975
6	0.014	1.482	5.841	7.834	0.015	36.082	16.999	3.215
7	0.016	1.434	14.513	6.216	0.017	40.033	18.908	3.165
8	0.018	1.516	22.297	4.815	0.019	46.544	20.656	2.814
9	0.021	1.474	28.215	3.786	0.022	50.739	22.625	2.434
10	0.025	1.326	33.868	3.182	0.026	54.857	24.296	2.117

Table 4.4.4: Variance Decomposition of Inflation for Sensitivity Analysis - Model 1

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy
1	0.007	1.806	0.664	0.000	0.007	0.488	27.766	0.000
2	0.009	2.184	0.453	1.864	0.009	0.559	21.228	2.059
3	0.011	2.101	1.611	1.718	0.010	5.546	16.086	5.500
4	0.012	1.782	2.028	6.856	0.011	18.069	14.401	6.227
5	0.013	1.560	2.341	7.669	0.014	28.172	13.936	4.545
6	0.014	1.471	5.857	7.822	0.015	33.543	17.127	3.657
7	0.016	1.426	14.510	6.207	0.017	38.678	18.673	3.549
8	0.018	1.509	22.285	4.812	0.020	46.021	20.169	3.129
9	0.021	1.468	28.220	3.788	0.023	50.753	21.942	2.692
10	0.025	1.320	33.897	3.188	0.026	55.283	23.468	2.335

Table 4.4.5: Variance Decomposition of Inflation for Sensitivity Analysis - Model 2

	Sub-Sample 1 (1980Q1 – 1996Q4)				Sub-Sample 2 (1997Q1 – 2007Q4)			
		Sources of Disturbance				Sources of Disturbances		
Period	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy	Volatility of Inflation	Institutional Quality	Oil price	Monetary Policy
1	0.007	1.806	0.664	0.000	0.007	0.488	27.766	0.000
2	0.009	2.206	0.705	1.779	0.009	0.969	21.570	1.846
3	0.011	2.118	2.102	1.636	0.010	8.053	16.373	4.940
4	0.012	1.791	3.468	6.497	0.011	22.122	14.372	5.492
5	0.013	1.571	4.096	7.265	0.014	31.514	13.737	3.961
6	0.014	1.465	8.302	7.370	0.015	35.972	16.997	3.207
7	0.016	1.418	16.588	5.851	0.017	39.993	18.840	3.161
8	0.018	1.504	23.713	4.552	0.019	46.555	20.548	2.812
9	0.021	1.478	28.576	3.614	0.022	50.796	22.492	2.434
10	0.025	1.341	33.459	3.063	0.026	54.950	24.146	2.118

Table 4.4.6: Volatilities of Institutional Quality, Oil Price and Monetary Policy for Baseline Model

	Sub-Sample 1 (1980Q1 – 1996Q4)			Sub-Sample 2 (1997Q1 – 2007Q4)		
Period	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**
1	0.021	0.104	0.005	0.013	0.080	0.005
2	0.035	0.149	0.006	0.021	0.103	0.006
3	0.048	0.167	0.008	0.028	0.110	0.006
4	0.060	0.203	0.010	0.037	0.115	0.007
5	0.068	0.218	0.011	0.044	0.132	0.009
6	0.076	0.228	0.014	0.053	0.144	0.011
7	0.081	0.236	0.015	0.061	0.152	0.012
8	0.086	0.248	0.017	0.070	0.167	0.012
9	0.090	0.259	0.017	0.076	0.184	0.014
10	0.094	0.266	0.018	0.081	0.195	0.017

Table 4.4.7: Volatilities of Institutional Quality, Oil Price and Monetary Policy for Sensitivity Analysis - Model 1

	Sub-Sample 1 (1980Q1 – 1996Q4)			Sub-Sample 2 (1997Q1 – 2007Q4)		
Period	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**
1	0.021	0.104	0.005	0.013	0.080	0.005
2	0.035	0.149	0.006	0.021	0.102	0.006
3	0.048	0.167	0.008	0.028	0.108	0.006
4	0.060	0.203	0.010	0.037	0.113	0.007
5	0.068	0.218	0.011	0.044	0.132	0.010
6	0.075	0.228	0.014	0.053	0.146	0.012
7	0.080	0.236	0.015	0.062	0.153	0.013
8	0.086	0.248	0.017	0.070	0.170	0.013
9	0.090	0.259	0.017	0.076	0.188	0.015
10	0.094	0.265	0.018	0.081	0.200	0.018

Table 4.4.8: Volatilities of Institutional Quality, Oil Price and Monetary Policy for Sensitivity Analysis - Model 2

	Sub-Sample 1 (1980Q1 – 1996Q4)			Sub-Sample 2 (1997Q1 – 2007Q4)		
Period	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**	**Volatility of Institutional Quality**	**Volatility of Oil Price**	**Volatility of Monetary Policy**
1	0.021	0.104	0.005	0.013	0.080	0.005
2	0.035	0.149	0.006	0.021	0.103	0.006
3	0.048	0.167	0.009	0.028	0.109	0.006
4	0.060	0.201	0.010	0.037	0.115	0.007
5	0.068	0.214	0.012	0.044	0.132	0.009
6	0.075	0.224	0.013	0.053	0.144	0.011
7	0.080	0.232	0.015	0.061	0.151	0.012
8	0.086	0.243	0.016	0.070	0.166	0.012
9	0.090	0.255	0.017	0.076	0.183	0.014
10	0.094	0.262	0.017	0.081	0.195	0.017

CHAPTER 5: CONCLUSION

5.1 Contribution

In this paper, we have occupied the gap left by previous researchers since the studies on Southeast Asia's economy are limited. In this studies, we focused our attention on Thailand's economy and our empirical results at least have proven that although the three common explanations used by previous researchers: good policy, good luck and good practice play a role in affecting Thailand's output volatility, however, they do not appear to be significant in contributing to Thailand's Great Moderation.

5.2 Main Findings

Many studies suggested that the good policy, good luck and good practice appeared to be the three common explanations for the existence of Great Moderation. On the contrary, the empirical evidence shown in this paper does not favor any single explanation to Great Moderation. Thus, there appears to be a doubt of these three common explanations played a vital role. Based on the results obtained from variance decomposition, even though good policy, good luck and good practice seem to contribute to the volatility of output, however, the average output volatility remained more or less the same across both sub-samples and this suggests that good policy, good luck and good practice do not contribute to the reduction in Thailand's economic fluctuation.

Since Great Moderation does not happen in output volatility. It raises our concern on whether those three sources capable in explaining Great Moderation in the perspective of inflation volatility instead? Again, our empirical results show that good policy, good luck and good practice are not the sources of Great Moderation even in the perspective of inflation volatility since the mean of volatility of inflation does not show a significant difference across both different sub-samples.

An additional finding of our analysis that is worth emphasizing is where about 45 percent of Thailand's output volatility can be explained by these three sources, the remaining of 55 percent is explained by the real GDP itself. This probably suggests that there are other prominent factors, yet to be identified that could influence the volatility of output of Thailand.

5.3 Limitations

Although the research has reached its objectives but there are some unavoidable limitations which we would like to spell out. Firstly, as we have mentioned, we encounter difficulty in access to information. As a result, some of the data used were converted from annually into quarterly data.

Secondly, since Structural Vector Autoregressions modeling often requires the imposition of informal restrictions, this method tends to be less capable in differentiating between competing theories as the restrictions set might or might not be in accordance to the existing theories.

Thirdly, additional limitation of our analysis is worth emphasizing. According to Keating (1990), contemporaneous "zero" restrictions may be unsuitable in an atmosphere with forward-looking agents who constantly have rational expectations. In order to tackle this problem, one is required to use the recent methods developed by Villaverde and Ramirez (2007), which employ higher-order approximations to agents decision rules and more complex Monte Carlo methods. However, this option is time-consuming.

Lastly, we might omit certain significant variables in our model since only three variables which are institutional quality, oil price, and consumer price index are used as the proxies for the three common explanations. In addition to that, these three variables did not exhibit any significant contributions to Great Moderation even though Great Moderation exists in Thailand.

5.4 Suggestions

The inconsistency of our results from previous researchers emphasize the sensitivity of the results to the selection of the country, the examination of sample period, the methodology used, the selection of the proxy variables as well as the frequency of the data. This obvious discrepancy signals further investigation of the relationship between output volatility and its determinants. Moreover, since our studies only focus on Thailand, further studies on other Southeast Asia or Asian countries may prove enlightening. For instance, the newly industrializing countries such as Four Asian Tigers may account for completely different circumstances due to their rapid growth rates. Lastly, since none of the estimated variables explain Thailand's output volatility, what could be the possible sources that affect the volatility? Could it be the exchange rate regimes, inventory management or fiscal policy?

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Appendix A

Parameter Estimates of Matrix A in Full Sample

Inverse Matrix A	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
a_{31}	-0.394	-0.394	-0.394
a_{32}	0.011	0.011	0.011
a_{41}	-0.002	-0.002	-0.002
a_{42}	0.014	0.014	0.014
a_{43}	-0.005	-0.005	-0.005
a_{52}	0	0	0.003
a_{53}	-0.039	0	-0.038
a_{54}	0.104	0.103	0.097

Appendix B

Parameter Estimates of Inverse Matrix A in Sub-Sample 1

Inverse Matrix A	Models		
Coefficient	**Baseline Model**	**Model 1**	**Model 2**
a_{31}	0.124	0.124	0.124
a_{32}	-0.014	-0.014	-0.014
a_{41}	-0.042	-0.042	-0.042
a_{42}	-0.006	-0.006	-0.006
a_{43}	-0.032	-0.032	-0.032
a_{52}	0	0	0.009
a_{53}	0.007	0	0.014
a_{54}	0.059	0.057	0.074

Appendix C

Parameter Estimates of Inverse Matrix A in Sub-Sample 2

Inverse Matrix A	Models		
Coefficient	Baseline Model	Model 1	Model 2
a_{31}	1.086	1.086	1.086
a_{32}	0.032	0.032	0.032
a_{41}	0.038	0.038	0.038
a_{42}	0.046	0.046	0.046
a_{43}	0.057	0.057	0.057
a_{52}	0	0	0.011
a_{53}	-0.058	0	-0.058
a_{54}	0.257	0.240	0.246

Appendix D

VAR Lag Order Selection Criteria of Full Sample for Baseline Model

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 14:55
Sample: 1980Q1 2007Q4
Included observations: 107

Lag	LogL	LR	FPE	AIC	SC	HQ
0	265.8734	NA	5.25e-09	-4.876138	-4.751240	-4.825506
1	1301.783	1955.642	3.27e-17	-23.77164	-23.02225	-23.46785
2	1362.597	109.1245	1.68e-17*	-24.44106	-23.06718*	-23.88411*
3	1385.376	38.74642	1.76e-17	-24.39956	-22.40118	-23.58944
4	1395.431	16.16293	2.36e-17	-24.12021	-21.49734	-23.05693
5	1439.867	67.27620*	1.68e-17	-24.48349*	-21.23613	-23.16705

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix E

VAR Lag Order Selection Criteria of Full Sample for Model 1

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:08
Sample: 1980Q1 2007Q4
Included observations: 107

Lag	LogL	LR	FPE	AIC	SC	HQ
0	265.8734	NA	5.25e-09	-4.876138	-4.751240	-4.825506
1	1301.783	1955.642	3.27e-17	-23.77164	-23.02225	-23.46785
2	1362.597	109.1245	1.68e-17*	-24.44106	-23.06718*	-23.88411*
3	1385.376	38.74642	1.76e-17	-24.39956	-22.40118	-23.58944
4	1395.431	16.16293	2.36e-17	-24.12021	-21.49734	-23.05693
5	1439.867	67.27620*	1.68e-17	-24.48349*	-21.23613	-23.16705

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix F

VAR Lag Order Selection Criteria of Full Sample for Model 2

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:11
Sample: 1980Q1 2007Q4
Included observations: 107

Lag	LogL	LR	FPE	AIC	SC	HQ
0	265.8734	NA	5.25e-09	-4.876138	-4.751240	-4.825506
1	1301.783	1955.642	3.27e-17	-23.77164	-23.02225	-23.46785
2	1362.597	109.1245	1.68e-17*	-24.44106	-23.06718*	-23.88411*
3	1385.376	38.74642	1.76e-17	-24.39956	-22.40118	-23.58944
4	1395.431	16.16293	2.36e-17	-24.12021	-21.49734	-23.05693
5	1439.867	67.27620*	1.68e-17	-24.48349*	-21.23613	-23.16705

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix G

VAR Lag Order Selection Criteria of Sub-Sample 1 for Baseline Model

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:17
Sample: 1980Q1 1996Q4
Included observations: 63

Lag	LogL	LR	FPE	AIC	SC	HQ
0	350.7936	NA	1.18e-11	-10.97757	-10.80748	-10.91068
1	840.3242	885.8172	4.64e-18*	-25.72458	-24.70404*	-25.32319*
2	865.5231	41.59822	4.68e-18	-25.73089	-23.85990	-24.99502
3	885.0518	29.13801	5.79e-18	-25.55720	-22.83576	-24.48684
4	897.1057	16.07197	9.42e-18	-25.14621	-21.57432	-23.74137
5	946.9650	58.56487*	4.87e-18	-25.93540*	-21.51306	-24.19607

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix H

VAR Lag Order Selection Criteria of Sub-Sample 1 for Model 1

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:24
Sample: 1980Q1 1996Q4
Included observations: 63

Lag	LogL	LR	FPE	AIC	SC	HQ
0	350.7936	NA	1.18e-11	-10.97757	-10.80748	-10.91068
1	840.3242	885.8172	4.64e-18*	-25.72458	-24.70404*	-25.32319*
2	865.5231	41.59822	4.68e-18	-25.73089	-23.85990	-24.99502
3	885.0518	29.13801	5.79e-18	-25.55720	-22.83576	-24.48684
4	897.1057	16.07197	9.42e-18	-25.14621	-21.57432	-23.74137
5	946.9650	58.56487*	4.87e-18	-25.93540*	-21.51306	-24.19607

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix I

VAR Lag Order Selection Criteria of Sub-Sample 1 for Model 2

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:27
Sample: 1980Q1 1996Q4
Included observations: 63

Lag	LogL	LR	FPE	AIC	SC	HQ
0	350.7936	NA	1.18e-11	-10.97757	-10.80748	-10.91068
1	840.3242	885.8172	4.64e-18*	-25.72458	-24.70404*	-25.32319*
2	865.5231	41.59822	4.68e-18	-25.73089	-23.85990	-24.99502
3	885.0518	29.13801	5.79e-18	-25.55720	-22.83576	-24.48684
4	897.1057	16.07197	9.42e-18	-25.14621	-21.57432	-23.74137
5	946.9650	58.56487*	4.87e-18	-25.93540*	-21.51306	-24.19607

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix J

VAR Lag Order Selection Criteria of Sub-Sample 2 for Baseline Model

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:28
Sample: 1997Q1 2007Q4
Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
0	260.1531	NA	6.32e-12	-11.59787	-11.39512	-11.52268
1	589.2408	568.4242	6.33e-18	-25.42004	-24.20354*	-24.96890
2	616.4034	40.74380	6.01e-18	-25.51833	-23.28810	-24.69126
3	646.0277	37.70374	5.49e-18	-25.72853	-22.48455	-24.52551
4	671.6390	26.77538	6.84e-18	-25.75632	-21.49859	-24.17735
5	737.7010	54.05078*	1.68e-18*	-27.62277*	-22.35131	-25.66786*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix K

VAR Lag Order Selection Criteria of Sub-Sample 2 for Model 1

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:30
Sample: 1997Q1 2007Q4
Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
0	260.1531	NA	6.32e-12	-11.59787	-11.39512	-11.52268
1	589.2408	568.4242	6.33e-18	-25.42004	-24.20354*	-24.96890
2	616.4034	40.74380	6.01e-18	-25.51833	-23.28810	-24.69126
3	646.0277	37.70374	5.49e-18	-25.72853	-22.48455	-24.52551
4	671.6390	26.77538	6.84e-18	-25.75632	-21.49859	-24.17735
5	737.7010	54.05078*	1.68e-18*	-27.62277*	-22.35131	-25.66786*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix L

VAR Lag Order Selection Criteria of Sub-Sample 2 for Model 2

VAR Lag Order Selection Criteria
Endogenous variables: LII LOP LRGDP LCPI DR1
Exogenous variables: C
Date: 04/03/13 Time: 15:31
Sample: 1997Q1 2007Q4
Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
0	260.1531	NA	6.32e-12	-11.59787	-11.39512	-11.52268
1	589.2408	568.4242	6.33e-18	-25.42004	-24.20354*	-24.96890
2	616.4034	40.74380	6.01e-18	-25.51833	-23.28810	-24.69126
3	646.0277	37.70374	5.49e-18	-25.72853	-22.48455	-24.52551
4	671.6390	26.77538	6.84e-18	-25.75632	-21.49859	-24.17735
5	737.7010	54.05078*	1.68e-18*	-27.62277*	-22.35131	-25.66786*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion