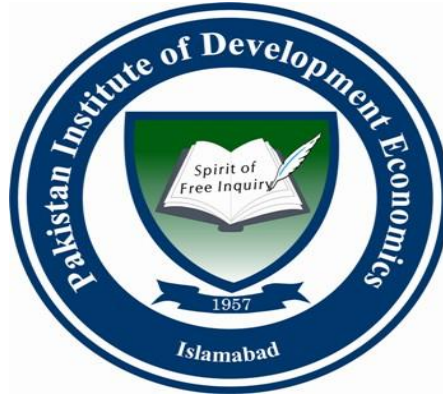


**AN ANALYSIS OF THE IMPACT OF CHINA'S MONETARY
POLICY SHOCKS ON SOUTH ASIAN ECONOMIES**



By

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**A Dissertation Submitted to the Pakistan Institute of Development
Economics, Islamabad, in partial fulfillment of the requirements of the
Degree of Master of Philosophy in Economics**

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CERTIFICATE

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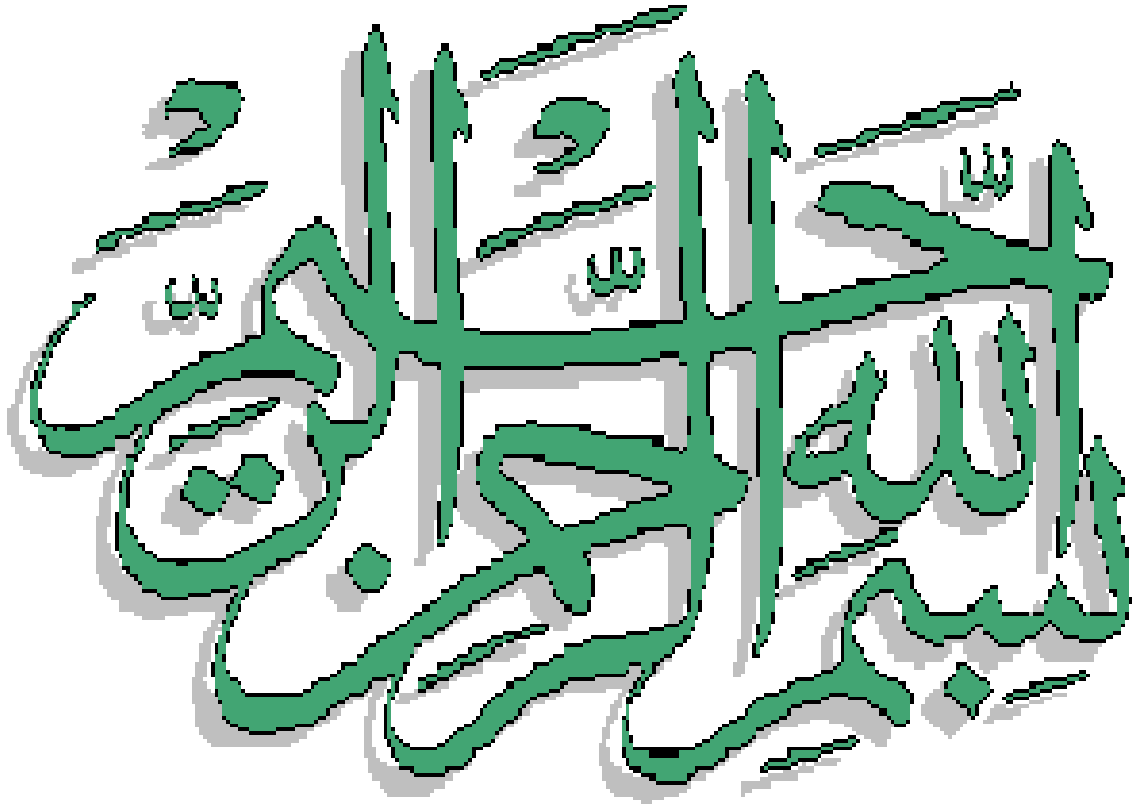
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*By (the Token of) Time (through the ages),
Verily Human is in loss,
Except such as have Faith,
and do righteous deeds, and (join together) in the
Mutual teaching of Truth, and of Patience and
Constancy.*

(Surah AL-Asar)

Dedicated
To
My Parents

Acknowledgments

All praises for Almighty Allah, Lord of the Worlds, Who has created the immensity of this world and gifted human being with knowledge and wisdom. Without Allah's divine help, I would not have been able to achieve anything in my life. All respects to Holy Prophet Hazrat Mohammad (S.A.W), the most perfect among all human beings ever born on the surface of the earth, who is forever a source of guidance and knowledge for humanity as a whole.

*I owe heartily sincerest gratitude to my most respectful and ever-affectionate supervisor, **Dr. Hassan .M.Mohsin.**, whose commitment to work, optimism, intelligence and continuous support and encouragement at every step during the course of this whole thesis enabled me to achieve my goals. I attribute the level of my M.Phil to his encouragement, keen interest, guidance, effort and without him this thesis would not have been completed or written. Once again, my gratefulness and respect for him will always be remembered and appreciated.*

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Neelam Zulfiqar

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Declaration

I hereby declare that this thesis, neither as a whole nor as a part thereof, has been copied out from any source. It is further declared that I have carried out this research by myself and have completed this thesis on the basis of my personal efforts under the guidance and help of my supervisor. If any part of this thesis is proven to be copied out or earlier submitted, I shall stand by the consequences. No portion of work presented in this thesis has been submitted in support of any application for any other degree or qualification in any other university or institute of learning.

Neelam Zulfiqar

Abstract

Keeping in view the growing influence of China on its trading partners, this study intended to examine the influence of monetary policy shocks of China on selected South Asian economies using time series monthly data over the period 1998m1-2010m6. For this purpose we have used two external and four domestic endogenous variables. Short term interest rate, exchange rate per US dollar, industrial production index and consumer price index are the domestic endogenous variables. Our external endogenous variables are M2 as China's money supply and average crude price of oil.

For structural VAR analysis, we have estimated the VAR system in level. The structural VAR model has been estimated by imposing non recursive contemporaneous restrictions on structural form, our model have three over identifying restrictions for a given structural factorization specified in equation. In next step, we have estimated impulse response dynamics within structural VAR analysis; first, we examine how domestic monetary policy shock respond to price level and output by following contractionary monetary policy and then response of domestic output and price level for Chinese monetary policy. Moreover, we have used variance decomposition test to determine the variations in output and price level due to expansionary monetary policy shocks of China.

We found that, as a result of monetary policy expansion in China price level and output increased in some countries in our sample, especially in Pakistan and Sri Lanka. Our results are consistent with theory that monetary expansion of large open economy has a significant influence on macroeconomic variables of its trading partners. But the importance of Chinese monetary policy shocks may still be small. Our result emphasized that China has growing influence for its trading partners in South Asia.

Chapter 1

INTRODUCTION

1.1. Background

Over the past decades, international trade plays an important role to interconnect the countries. With the deepening of economic interaction, it seems obvious that economic decision of one state has a great influence on decision of other economies. Macroeconomic theories also predict that large open economies have a significant impact on small open economies. These effects mentioned in general equilibrium and Mundell Fleming model that imprison intertemporal effect. However, as China has a growing influence on world economy, it become essential to understand how its economic decision and policies affecting rest of the world.

China has growing influence on other economies through number of Channels. Firstly, China's imports of goods, intermediate as well as final products have direct positive impact on rest of the world. China's exports of goods to other economies have a negative direct effect on net export of those economies, but indirectly positive impact on GDP because of availability of relatively low cost products increases production and consumption possibilities of its trading partners. Second, China's demand for intermediate products can affect the international prices of these inputs and thus influence the term of trade for trading partners. Thirdly, Asian supply chain represents the implications of China to rest of the Asia, where final product exported from China but inputs used for production, imports from rest of the Asian economies. We mainly focus on cross border

effect of Chinese monetary policy. Due to the strict capital control, Chinese monetary policy is transmitted to foreign economies through trade channel. In recent decades, China's spillover effect has increased and affected Asian economies via trade channel because of growing influence of China on Asia. Chinese primarily import consumer goods and intermediate products which served as input for final products and export highly manufactured and primary products from South Asian economies. Previous literature have been studied the impact of monetary policy shock of large economies on small economies by using recursive and non recursive VAR (Kim, 2001; Kim and Roubini, 2000; Macowik, 2006).

Kozluk and Mehrotra (2009) have concluded that monetary policy shock of China has a significant impact on economies of South East Asia. . The aim of this study is to analyze the impact of Chinese monetary policy shocks on its important trading partners in South Asia. To best of our knowledge, there is no previous study in South Asia that is based on influence of large economy on small economy. Our study is first that will investigate the impact of Chinese monetary policy shocks on macroeconomic variables of South Asia.

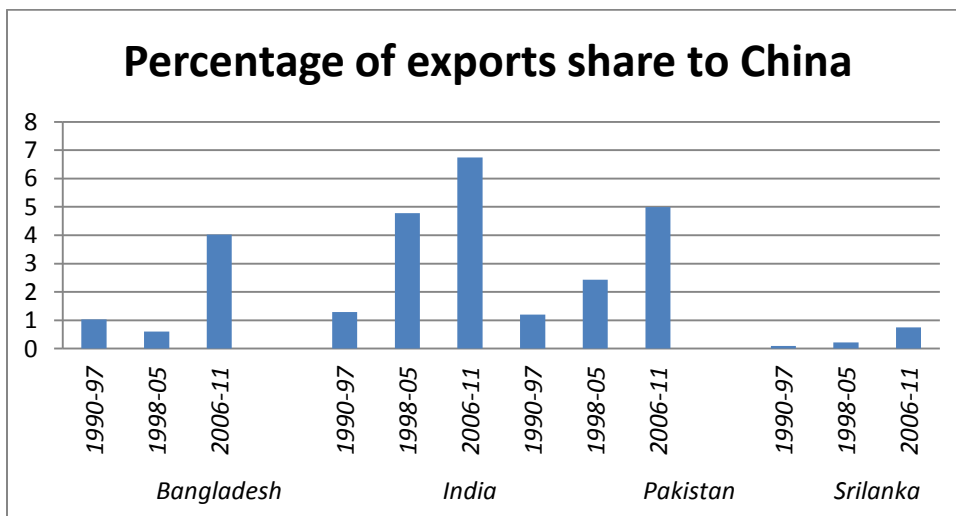
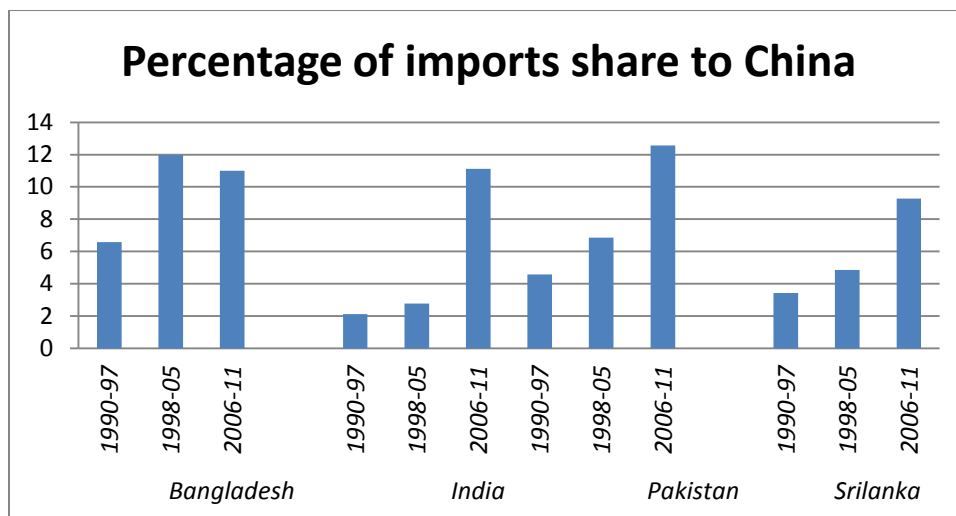
1.2 China's Influence on South Asian Economies:

Over the last three decades, shares of china in GDP and world trade have increased significantly because of its opening up and reforming strategy. Due to rapid economic growth China's share in world GDP have increased from 2 percent on the basis of purchasing power parity in 1980 to 12 percent in 2008 and contribution in world trade just accounted 1 percent, while in 2008 nearly 8 percent share in world trade have been found (Kozluk, 2008). In recent decades, China has a growing influence on South Asian economies. More specifically, trade expanded from 40 billion dollars in 2006 to 85 billion dollars in 2011 and bilateral investment has also increased from 500

million dollars in 2005 to 2.8 billion dollars in 2010. As a large variety of exports flow from China in to South Asian region, increase opportunities for growth and development. From 2003 to 2012, China more than doubled its exports to Bangladesh and Sri Lanka. About one fourth of Bangladesh exports have come from China. Moreover, China invests millions of dollars in infrastructure projects, including facilities of ports in Pakistan, Sri Lanka and Bangladesh (Curtis, 2011).

China exports more to South Asian economies than imports. This growing and large imbalance arises from the fact that South Asian economies import highly manufactured products like equipment uses in telecom and power generation from China, While Pakistan's biggest import to china is cotton yarn and India's main export to China is iron ore. Hamid and Hayat (2012) have concluded that economic integration of Pakistan with China has grown rapidly in last decades. In 2010, China was Pakistan's fourth biggest market for exports and second largest market for imports. Adil et al., (2010) have concluded that Pakistan's export market does not play a major role in Chinese market in 2009. But after European Union and united state, China was third largest partner of Pakistan with seven billion dollars in trade. Pakistan is China's second major trade partner and largest investment target in South Asia. China imports primary products from South Asian economies such as iron ores, cotton, ash and slag. In this study, we get China's share in export and import in total imports and exports of selected South Asian economies i.e. Pakistan, Sri Lanka, Bangladesh and India. As shown in figure 1.2.1, share of China in exports of South Asia was in the range of 2 to 6 percent during 1998-2011.while china's share in South Asian import ranges from 7 to 12 percent. We conclude that China has growing influence on South Asian economies which is similar in literature. In coming years, China is actively seeking to pave a way for much greater economic integration with South Asian economies.

Figure 1.2.1: Shares of imports and exports to China in total imports and exports for economies of South Asia.



Source: (UN COMTRADE, 2011).

As shown in above figures share of China in exports of South Asia was in the range of 2 to 6 percent during 1998-2011.while, china's share in South Asian import ranges from 7 to 12 percent. The growing trade propose that growth in China has provided larger market for South Asian economies.

1.3 Objective of Study:

The main goal of our study is to examine the influence of monetary policy shocks of China on macroeconomics variables such as output and price level of South Asian economies by using non recursive structural VAR model. Before examine Chinese monetary shocks, it is essential to identified whether domestic monetary policy shock provide sensible dynamics. Firstly, we will examine the domestic contractionary monetary policy shock on output and price level of domestic economies by using impulse response function within the estimated SVAR model. As mentioned earlier there has been no previous study that examines the influence of monetary policy shock of China on price level and output of South Asian economies through trade channel.

1.4 Plans of Study

The plan of the study is as follows. After introduction, second chapter briefly illustrates the monetary policy of China and South Asian economies. Chapter 3 gives a comprehensive review of literature which will be divided into two parts, first part is based on impact of monetary policy shocks of large open economies on small open economies and their growing influence on small open economies and second part has discussed the review of literature in context of China. Chapter 4 discusses the theoretical aspects, data and variables descriptions. The fifth chapter is about the econometric methodology used in the study. Results and discussion are given in chapter 6 and chapter 7 is comprised of conclusion and policy implications.

Chapter 2

Descriptive Analysis of

Monetary Policy of China and South Asian economies

2.1 Monetary Policy of China

World economies have integrated more rapidly over the last three decades. After the period of Asian Crisis, with an average annual growth of about 9 percent, China has achieved considerable economic growth. For the time being, the inflation rate, as measured by consumer price index and GDP deflator, has remained moderate. With the termination of direct control from indirect control system in 1998, role of monetary policy of China in macroeconomic stabilization became significant (Green, 2005). Monetary policy of China has experienced different phases of development in term of monetary tools, goals and intermediate targets. Hence, its exchange rate regimes also faced different development stages such as floating, managed floating and fixed exchange rate regime with a narrow band (Huang and Wang, 2004). Along with different exchange rate regimes, old and new trading system were introduced and abolished respectively. But still the most important instruments of monetary policy in china to control money supply and credit growth. In recent years, money markets and capital market were gradually developed in China. However, the transmission mechanism of monetary policy remained complex. Since 1998, people bank of China have been adopted different instrument monetary policy such as reserve requirement, open market operations and discount rate to maintained stabilization in the

Figure 2.1: Transmission of Monetary Policy in China

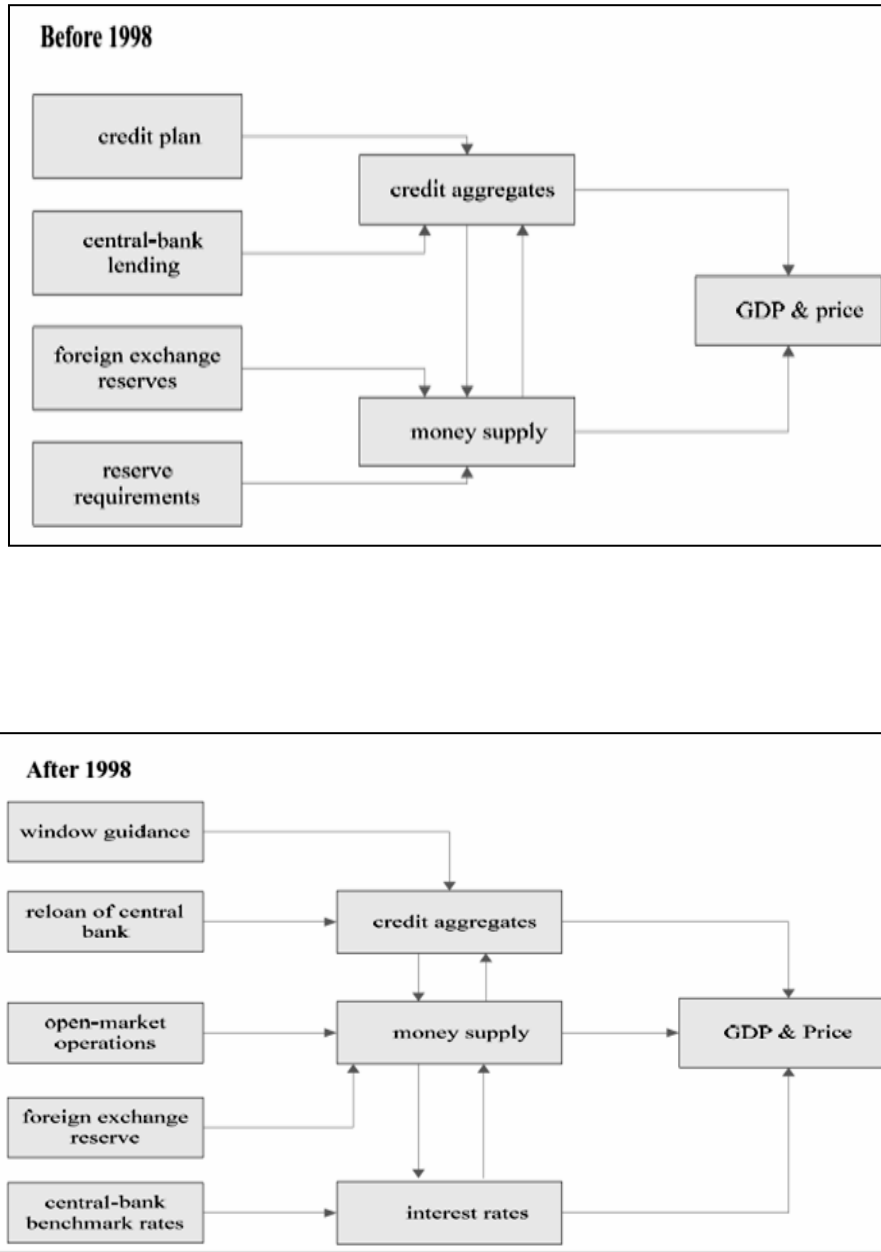


Figure 2.1: This figure represents monetary transmission mechanism of China which is divided into two periods before 1998 and after 1998 till today. China’s monetary policy and its instrument faces great challenges from direct to indirect control system. The left column shows monetary policy instruments applied by the PBC, the middle column describe intermediate target and right column shows final target and have objective to stabilize price and promote economic growth (Yan, 2008).

economy. Though, the mechanism through which monetary policy transmit to real economy has remained complex because of instability between these instrument and macroeconomic variables. Moreover, Prasad (1997) have studied that as China has integrated rapidly through out world, the effectiveness and independence of monetary policy of China have been challenged because of rigidity in exchange rate. In recent years, there has been an increasing attention on the impact and mechanism through which monetary policy transmitted to real economy.

2.2 Monetary Policy of Sri Lanka

The Central Bank of Sri Lanka is the monetary authority which is responsible for implementing monetary policy and controlling the money supply. As mentioned earlier, the main objective of monetary policy is to achieve high and sustainable level of output growth, while keeping inflation at enviable level. Therefore, similar to many national authorities especially in developing economies, the main goals of Central Bank of Sri Lanka are stabilization of domestic and external value of rupee, promotion of output growth.

In the last four decades, monetary policy in Sri Lanka has undergone significant changes. Since 1997, central Bank of Sri Lanka has gradually moved away from direct policy control to market oriented policy tools. To maintain economic stability, central authority has changed its priority from exchange rate stability to price stability. Specifically, central bank of Sri Lanka mainly focuses on stabilization objective rather than objective of development. While credit control were gradually eliminated and administratively determined bank rate was gradually neglected. Central Bank of Sri Lanka has progressively used open market operation to conduct monetary policy. While, in 2002, Central bank of Sri Lanka revised its goals of monetary policy, based on international trend that are now oriented toward sustainable economic development, price stability and to achieve stability in financial system. By following these goals and objectives,

central authority of Sri Lanka has move toward inflation targeting approach instead of exchange rate and monetary targeting regime with interest rate as the main instrument of monetary policy. In 2001, floating of exchange rate has added to the operational independence of monetary policy (Amarasekara, 2008). A monetary programmed is prepared “considering the projections based on sustainable economic development, forecast balance of payment and expected fiscal operations of the government and also considering the economic outlook of the economy .Therefore, as the operating target for monetary policy reserve money target is established” (Jayamaha et al., 2002). Since 2010, monetary policy of national authority of Sri Lanka is based on monetary targeting framework with interest rate as the main instrument of monetary policy (Report of central bank of Sri Lanka, 2010). However, Central bank of Sri Lanka is also concerned about fluctuations of exchange rate; economic growth as well as bi directional causality between fiscal and monetary policies cannot be ruled out.

2.3 Monetary policy of India

Monetary policy of India has experienced different phases of transformation over time. In 1960s, inflation was the main problem and inflation instability was mainly caused by agricultural failures. In 1980s, they made agreement on the basis of primary causes of inflation. They have concluded that oil price shock and instability in agricultural prices did affect inflation, but the primary cause of sustained inflation was expansionary monetary policy because of fiscal deficit. In 2005, Reserve bank of India has suggested the monetary targeting regime to control inflation and to achieve higher output growth. They argued that, this approach was reliable and understood for public at large. Rangarajan (1997) has proposed that in the early 1990s, monetary targeting approach as an intermediate target in monetary policy came under question. This was

because of financial liberalization and trade that has gained importance and played significant role in economy. During 1990s, monetary policy of India has experienced many external shocks mainly from capital flow variability, fluctuations in exchange rate and global business cycles. Under this situation, it was very difficult to control monetary aggregate regime. Consequently, Central bank of India has changed the transmission mechanism of monetary policy with exchange rate and interest rate gaining importance gradually. Since 1998, multiple indicator approach was formally adopted by reserve bank of India. Under this approach, interest rate in different markets along with fiscal positions, capital flows, trade, credit, inflation rate and transactions in foreign exchange available on a high frequency basis are move together with output data for making policy perspectives.

2.4 Monetary Policy of Bangladesh

After independence, central bank of Bangladesh was established in 1972. Like many developing economies, main objectives of central bank of Bangladesh were to achieve price, exchange rate and financial system stability. To attain these objectives, under fixed exchange rate central bank of Bangladesh has conducted monetary policy on the basis of direct and quantitative monetary control to some extent. In 1990s, there have been major changes occurred in legal, institutional and policy framework. Moreover, there have been significant changes in interest rate liberalization and progressively development in money market of Bangladesh. In 1994, by following floating exchange rate regime, monetary policy of Bangladesh was based on market base instruments along with direct instruments. In recent years, central bank of Bangladesh has conducted monetary policy in exchange rate regime. Therefore, to maintain stability, exchange rate and interest rate was largely driven by market with the intervention of monetary authority of

Bangladesh. In 2010, while keeping inflation at desirable level, the main objective of monetary authority was achieve sustainable economic growth. Bangladesh bank has encouraged the inclusion of banking and financial sector to increase the lending of underserved sectors.

2.5 Monetary policy of Pakistan

Monetary policy regime of Pakistan can be divided into three parts. First part (1947-1972) was the formation of banking sector and money market development. During this regime, the main goal was credit distribution to private and public sector and also distribution of money. Second part (1973-1990) was known as an expansionary period, because of large expansion in monetary asset and credit. Third part (1991-2010) is known as reform period. These reforms started in 1989 and many financial sector reforms take place during this period. During 1990, financial sector and monetary policy regime of Pakistan have undergone significant changes including liberalization. Prior to 1990, direct instrument was used by central bank to conduct monetary policy of Pakistan. After 1990, monetary authority has moved toward liberalization and began to use indirect monetary policy instruments. Since then, monetary policy of Pakistan face many challenges to move toward money market based instruments.

In Pakistan, monetary transmission mechanism has remained complex and unexplored. There is need to examine the real effectiveness of monetary policy and to examine the mechanism through which monetary policy transmit to real economy. Effectiveness of monetary policy in Pakistan is quite limited (Mohsin, 2011). Agha et al., (2005) have studied the relative significance of channels of monetary transmission mechanism in Pakistan. Regarding financial and economic structure of Pakistan, State Bank of Pakistan has suggested monetary targeting regime to achieve the objective of moderate inflation. For transmitting monetary policy to the

real economy, credit control regime has played significant role (Ahmed et al., 2005). According to Moinud din (2007) the monetary aggregate approach is not suitable for Pakistan, because money demand is unstable here and monetary aggregate regime is based on stable relationship between monetary aggregates and inflation. This case is experienced in recent years when actual monetary expansion exceeded the targets with wide margin. Therefore, inflation targeting regime is best option for Pakistan. Many developing countries have adopting inflation targeting regime after the successful achievement of Turkey, Peru and Chile. Zaidi (2005) also suggested this regime for Pakistan.

Table 2.1: Monetary regime in China and South Asian Economies

Country	Monetary policy regime
China	Monetary aggregate targeting
Pakistan	Inflation targeting regime.
Bangladesh	Inflation targeting regime.
India	Multiple indicator approach.
Sri Lanka	Monetary targeting regime

Source: Monetary Policy Frameworks, IMF, <http://www.imf.org/external/np/mfd/er/index.asp>.

Chapter 3

Review of Literature

3.1. Introduction

Several studies have been conducted to examine the impact of monetary policy of large economies on small economies. On empirical grounds, there are very few studies that have analyzed the transmission of monetary policy on international level. In this chapter we have given a brief review of the relevant literature that has been focused on the empirical analysis of Chinese monetary policy on Asian economies.

This chapter comprised of three sections. After introduction, Section 3.2 brings the literature on the issue of impact of monetary policy of large economies on small economies and has been further divided into two sub-sections; the first section contains discussion that analyze the transmission of monetary policy on international level, while the second describes the studies which have analyzed the literature in context of china. Finally Section 3.3 is based on conclusion.

3.2. Review of the Empirical Work on Transmission of Monetary Policy

Main focus of this section is to check the impact of monetary policy shocks of large economies on small economies. For this purpose we have divided this section into two subsections; first one generally discussed the international transmission of monetary policy shocks and second one

strictly focused on growing influence of Chinese economy on small open economies especially Asian economies.

3.2.1. Review of the studies that have focused on impact of large open economies on small open economies

Schmidt (2006) examined that how monetary policy affect the domestic economy as well as to the economies of rest of the world. He showed that in flexible exchange rate regime which started from 1974, impact of monetary policy of US on output of foreign economies is positive as well as weighted average of non US G-7 countries. Kim (2001) has investigated the international transmission of expansionary monetary policy shock of US under flexible exchange rate period to G-6 economies. By using VAR methodology he has concluded two important points, first, there is long term improvement in trade balance instead of short term but in term of ratio change in trade is very small as compared to change in output. Secondly, impact of US monetary policy is positive and significant on non US G-7 economies. Because US economy is large and developed, when its interest rate decrease because of expansionary monetary policy, then world interest rate also decreases and as a result consumption and investment will increase.

Kim and Roubini (2000) have studied the influence of US monetary policy on G-7 countries. The author estimate Structural VAR by using four domestic and two exogenous variables i.e. oil and federal fund rate. The methodology used in this analysis follow Sim and Zha (2006) with identification scheme based on non recursive identification scheme arising from economic theory. Overall, they find noteworthy impact of monetary policy of US on output of G-7 economies especially in Canada and impact on Germany was relatively small. The effect of monetary policy shocks of US economy on Canada under flexible exchange rate regime was investigated by (Cushman and Zha, 1997). They used structural VAR methodology with monthly

observations for 1974–1993. They have used block exogenous approach for identification and find a remarkable influence of US monetary policy shocks on output of Canada.

Canova (2005) has analyzed the transmission mechanism through which monetary policy transmitted to real economy by estimating Structural VAR. Canova found the positive effect of US monetary policy. His results indicated that the financial channel and capital control play significant role in monetary transmission mechanism. Miniane and Rogers (2007) have argued that economies with limited capital accounts are generally more affected by international transmission mechanism. Coenen and Wieland (2003) have investigated that monetary policy shocks of Japan significantly effect on Europe and US. They assumed in their study that Taylor nominal interest rule followed by all the three banks in US, Japan and Europe. Their results were in favor of a considerable beggar-thy-neighbor effect. More specifically, Rodriguez and Rowe (2007) have studied that how monetary policy of US was transmitted to its trading partners under fixed exchange rate regime. They have found the remarkable impact of US monetary policy shock on output of Hong Kong.

Ozdamir (2010) has investigated the two ways through which external shock affects the domestic economies. First effect is based on impact of large open economies on small open economies and second effect is further divided into two parts, direct and indirect effect. Direct effect is related to the international transmission of large open economies on small pen economies and the effect which passes through another large open economy before reaching to the small open economy. So by using simulation technique he concluded that indirect effect is more significant as compared to direct effect but the significance level of indirect effect depend upon the policy adoption of the economy from which shock is originated.

Callen and McKibbin (2001) have examined that how monetary policy shock of Japan influenced the Asia pacific region by using G-cubed model. They have concluded that Japanese monetary policy would affect domestic economy in short run but in long run no remarkable effect on rest of the region. In recent policies debate some economists have argued that expansionary monetary policy of Japan has increased domestic as well as output of East Asian economies, while other group of economists advised that it is beggar thy neighbor policy. Mackowiak (2006) has investigated that how Japan's monetary policy transmitted to other economies in East Asia by estimating SVAR. He has concluded that the impact of Japanese monetary policy on trade balance, exchange rate and real output in East Asia has been relatively moderate.

Younus (2009) has examined the effect of Indian and domestic monetary policy shock on macroeconomic variables of Bangladesh economy. To formulate domestic monetary policy, he examines the changes in relevant foreign variables such as exchange rate, money supply and output. By using NVAR model, he has concluded that foreign money supply shock has a remarkable impact on Bangladesh's output, price level and real exchange rate. Furthermore, foreign money supply does not have significant impact on output and price level of Bangladesh economy. He has further concluded that Bangladesh's money supply shock have significant impact on domestic output and price level.

3.2.2. Review of the Studies in Context of China

The main purpose of this section is to focus on impact of monetary policy of China on Asia, because of growing influence of China in term of trade. There are very few studies which have empirically discussed the impact of china on rest of the world. Likewise, Arora (2010) has

measured the impact of china's growth in rest of the world in short and long run period. Short run estimate use VAR and error correction model and conclude that spillover effect have increased in recent years. The most suitable channel of this transmission is trade channel. While, Long run period based on growth regression model which is also based on panel data and it also shows a significant effect. . Furthermore, Fung (2002) has used VAR model to examined the influence of Chinese monetary expansionary on seven East Asian economies. By estimating VAR model and dynamics of impulse response function, he has concluded a significant result for most of the economies especially before the period of 1997 financial crises. He has further concluded that in small open economies exchange rate has played a significant role to conduct monetary policy. In some economies exchange rate play a larger role while in some relatively smaller role. These types of complicated results have created difficulties for applying existing technique to emerging Asian countries.

Kozluk et al., (2009) have purposed the influence of monetary policy of china on neighbor economies and these economies are also trade partners of China including south and East Asian countries. SVAR model is used for these six economies (Taiwan, Malaysia, Singapore, Philippines, Korea and Hong Kong) and concluded that monetary expansion of China has significantly increase the price level (permanently) and has temporary impact on GDP of many economies. Finally, it is concluded that China has a great influence on neighboring countries and has a positive impact on these countries due to its monetary policy expansion.

In recent decades china engages with multilateral trade liberalization. China trade has a great impact on neighbor countries. So, it's beneficial for China and its trading partner to set an atmosphere which is based on trade liberalization. Arora et al., (2005) empirically estimated the pattern of trading partners does influence on the economy. By using data from 1960-1999 for

101 countries, he concluded that it become beneficial for countries to trade with developing economies and also found that there is positive relationship between growth of a country with relative income and share of growth of its trading partners. These results are robust for global trend, regional shocks and by reserve causality. These results also showed stronger result for open economies in some specifications especially in recent decades.

Zhang et al., (2004) has empirically examined the trade intensities of China in decades of liberalization by showing international trade statistics from 1993-1999 and concluded that in world trade market. China is growing rapidly and that mechanism work properly. In 1993, geographical and political disturbance are the two important factors that have affected the trade intensities. But in 1999, some economic factors have influenced the trade intensities of China. Second, by comparing the findings of export and import trade intensities, exports are more affected by trade intensities than imports. Furthermore, Eichengreen et al., (2006) have studied that export of other Asian economies was significantly affected by growth in China. They have wanted to check endogeneity of China's exports. For this purpose, instrumental variable in gravity model with country fixed pair effect was used and they have found that crowding out effect of China mainly effects less developed Asian countries and on markets of consumer goods. In other words it doesn't affect the market of capital goods or developed Asian economies. There has been strong tendency in China's economy to offset third market effect by sucking import from Asian countries. But this directly affects the markets of capital good, where China's income elasticity of import demand is higher. So, he has concluded that increase in China's output as well as import and export positively affect the exports of more developed Asian neighbors and less effect the exports of under developed Asian neighbors.

China has a growing positive influence on Asian economies and in recent years China affianced with multi trade liberalization. Abraham (2005) has used gravity model and took the data of 23 countries of Asia pacific from 1992 to 2000 and has concluded that China as a member of regional trade agreement has a great impact on export potentials of entire region including ASEAN as well as south and East Asian economies. While in case of APEC, ASEAN and Asia pacific RTA have a limited impact on intra regional trade flows, these are mainly influenced by common culture such as language, trade barriers and growth. Pak-China FTA was signed in 2006 and was implemented in 2007. Both countries have offered tariff concession to each other under FTA. Adil et al., (2010) have focused to estimate the Pak-China FTA (free trade agreement). For this purpose data has been selected from year 2005-2009 and divided into two sub period i.e. pre FTA (2005-07) and post FTA period (2007-09). Chinese import has increased even in no concession category while exports of Pakistan have increased in two categories from five. During period of post FTA, China usually imported intermediate products from Pakistan. To analyze export specialization of Pakistan, he used the approach of comparative advantage and concluded that the export market of Pakistan does not play a significant role in Chinese market. After Comparative analyses, he has further concluded that China gives more tariffs to ASEAN as compared to Pakistan. Though, Pakistan could not increase their market share of exported products and as a result trade deficit increase continuously because of slow export growth to China. In some ways PAK-China FTA is beneficial for Pakistani manufacture. Because they expose their product to international market through this channel and if they sustain the pressure of competition then they attract other products.

Johansson (2009) also investigated that monetary policy shocks of US have remarkable impact on the China's economy. Johansson (2010) have studied that transmission of Chinese monetary

shocks to equity market in Southeast Asia by using non recursive SVAR. The influence of expansionary monetary policy of China is positive and significant for many equity markets of Southeast Asia. The results provide evidence that China has a growing influence in Southeast Asia and its financial markets. The transmission effect may still be small, but can be expected to rise if independence of China's central bank and economic integration between China and Southeast Asia continue.

Shambaugh (2005) has concluded that integrating china into the regional order has been a goal for Asia, Japan and US. In recent years Asia has faced a fundamental change and rise of china in regional order is also one of the reason while some old and new factors also play an important role. But unfortunately, there is no single model that describes the Asian system. So, policy makers apply different analytical and policy tools to explain the Asian region.

Gosse and Guillaumin (2012) have checked the impact of external Shocks (oil, US monetary and financial shocks) on Asian economies if these can account external imbalance by using data of nine Asian economies through SVAR analysis. The oil and the US monetary shocks have played a significant role in describing current account balances of Asia. Though, these shocks have failed to describe the surpluses of Hong Kong and China. Dungey and Vehbi (2011) have investigated the domestic and international shocks, these shocks mostly responded to the degree of openness of Asian economies. They have studied the differences and similarities of shocks to these economies and realized that these economies respond quickly to the shocks of US economy as compared to shocks originated from Chinese economy.

Vespignani et al., (2013) have investigated that the China, US shock on Japan over the period of 1999:1-2012:12 by using structural VEC model, the impact of Chinese monetary expansion on

Japan through China's growth in commodity prices and as a result demand for import increased. China's monetary expansion has significantly affects inflation, export and industrial production of Japan and decrease in trade. Euro monetary expansion does not significantly affect Japanese economy.

Joaquin et al., (2013) have examined that the spillover affect of Chinese monetary expansion on US economy over the period of 1996-2012. China's growing influence on US economy through rise in demand for import especially in case of commodities. China's growth influence world price of oil and as result inflation in US also increases. China monetary expansion has significantly decreased the trade weighted value of US dollar, due to the operation of pegged currency. China has wide capital control and managed exchange rate.

3.3 Conclusion:

In this chapter, we review the empirical and theoretical literature based on impact of large open economies on small open economies. The main focus of our literature was on Chinese economy especially on effect of monetary policy shock of China on macroeconomic variables of other economies. From the last three decades China's trade with rest of world increasing rapidly. We have concluded from previous studies that China has a great influence on neighboring countries and has a positive impact on Asian countries due to its monetary policy expansion. In case of South Asia, there are only one or two studies which measure the impact of monetary policy shock of large open economy on small economy. We can conclude that, there is need to estimate the influence of monetary policy shock of large economy (in our case China) on macroeconomic variables of selected South Asian economies by using an appropriate technique.

Chapter 4

Theoretical Aspects and Variables Descriptions

4.1 Introduction

This chapter is divided into two sections. Section 4.1 presents the theoretical framework and in section 4.2 the data description for empirical analysis is also presented.

4.2 Theoretical Aspects

We follow Svensson and Van Wijnbergen (1989) who presented a general equilibrium model. In this model, expansionary monetary policy of the foreign economy may raise the output of the domestic economy. In their framework, foreign monetary policy must influence foreign output under the assumptions of; first, the economy is in a consumption regime and second assumption there is some complementarity between domestic and foreign goods. In our case, the foreign economy is China and the domestic economies are selected South Asian economies i.e. Pakistan, Sri Lanka, Bangladesh and India. A consumption regime is reasonable because of different economic and financial crises and their aftermath in South Asia, which led to a decrease in GDP in several economies whose trading partner is China. The second assumption is also reasonable because of integration and the growing influence of China in South Asian economies.

After fulfillment of these two conditions, foreign monetary policy will generate two types of effect, the first one is the beggar thy neighbor effect and the second one is the intertemporal effect. The beggar thy

neighbor effect follows shift from foreign to domestic goods, foreign goods became cheap because of foreign currency depreciation, so demand for foreign good increase which led to fall in domestic output. Later is intertemporal substitution effect, which shows inflation in foreign economy may raise because of monetary policy expansion in that economy, consequently real interest rate fall. This led to intertemporal substitution effect in support of currently produced domestic output, the demand for home good may rise. This intertemporal effect may support further by wealth effect. Because of expansionary monetary policy of China, Chinese consumer feel rich and demand more output, so china demand more inputs to produce output. The demand for import increase may increase output in Asian economies, and possibly put forth upward pressure on prices. As we know, china has little exchange rate flexibility and capital market is not completely developed, as before 1998 capital flow of China was subject to strict control but after that capital market was gradually developed. We expect the second effect i.e. intertemporal effect to dominate.

4.3 Data and Variables Description:

4.3.1 Introduction:

We present here different variables used in the estimation process and their definitions and sources from where they have been collected. Study hereby used the time series monthly dataset from 1998M₀₁- 2010M₀₆. The reason behind choosing the starting value from 1998 because monetary policy of china has changed from direct to indirect control (Cao: 2001, Xie: 2002) and ending value indicates that the limitations of data and non availability of data for some variables. The next section will elaborate the description and sources of different variables used in estimation process in detail.

4.3.2 Description of Variables

In literature, no consensus has been found that how many variables used in SVAR model to give a reasonable explanation. In SVAR model, eleven variables were included by Dungey and Pagan (2000). While Brichetto and Voss (1999) and Kim and Roubini (2000) have studied that six variables are sufficient. By following Kozluk (2009) six variables are used in this study. These include two external and four domestic variables. Domestic variables include Consumer Price Index, Industrial Production Index, nominal exchange rate, Short term interest rate, and two external endogenous variables are Chinese money supply and oil price.

IR= Short term interest rate

Interest rate on contracts of loans or debt instruments such as Treasury bill rates, commercial paper or deposits having maturities of less than one year. Short term interest rate is used to capture the monetary policy reaction in many economies. This is used as monetary policy function of dependent economies, because the main policy instrument used in these economies to achieve monetary policy goal is interest rate. We have used overnight call money rate for all the three countries except Bangladesh. For Bangladesh, we have used Treasury bill rate and data taken from Bangladesh Bank. Data of overnight call money rate which are used as a proxy of short term interest rate taken from IFS.

IP= Real Output

For output, data of real GDP is mostly used in different studies, but we used data on monthly basis and real GDP is not available in monthly frequency. So, we need proxy here and Industrial production index is a good proxy of real GDP (Kim: 1999, Kim and Roubini: 2000, Johansson: 2010). Industrial production Index is monthly series of dataset measures output in term of

mining, manufacturing, electricity and gas utilities. We include this variable to measure the impact of domestic and Chinese monetary policy shocks on real sector of selected South Asian economies. For Pakistan, data of manufacturing production will be used because of non availability of industrial production index data. Except Sri Lanka, data of this variable for all other economies has been collected from international financial statistics and for Sri Lanka data of industrial production index has been collected from monthly bulletin of central bank of Sri Lanka.

CPI= Price Level

By following Kozluk (2009), we measure price level in term of consumer price index. We include this variable to measure the influence of domestic and Chinese monetary policy shocks on price level of selected South Asian economies. As the monetary policy objective of most economies is to achieve the stability in price level. Date of Consumer price index has been collected from International financial statistics on the base of 2005 for all economies.

M= Money supply

Money supply play prominent role in the conduct of China's monetary policy. Xie (2004) has viewed that for economic growth and to control inflation are the prime objective of monetary policy of China, open market operation and money supply are used as main instruments to control money base. By following Kozluk (2009) and Johansson (2012) we used M2 as monetary policy instrument of China. Kozluk (2009) has argued that money supply is the suitable variable to identified China's monetary policy shock instead of interest rate; it does not play an important role in transmission of monetary policy as that in economies of developed nations. M2 indicates

the Chinese monetary policy shock which may influence the macroeconomic variables of South Asian economies. Data of M2 has been collected from monthly bulletin of people bank of China.

EX= Exchange rate

In this study nominal exchange rate is used for all economies, which is normally measured as unit of domestic currency per one unit of US dollar. Nominal exchange rate is introduced to check the effect of identified monetary policy shocks on the domestic currency. It presents as information market variable. According to Kim and Roubini (2000), exchange rate reacts as forward looking asset, so contemporaneous affects all variables under this study. Data of nominal exchange rate for all South Asian economies has been collected from international financial statistics.

Oil= Average crude price of oil

Under this study, oil price used as the average crude price of oil measures in term of US dollars. Oil price is act as external endogenous variable and it do not react to rest of the variables in the system. As changes in world oil price is indeed an important factor for small open economies. Data of average crude price of oil in term of \$US per barrel has been selected from international financial statistics.

Chapter: 5

Econometric Methodology

5.1 Introduction

This chapter describes the specification of econometric model which is to be estimated. Our main purpose to check the influence of monetary policy shocks of China on South Asian economies. We deal with this issue by using a structural vector autoregressive (SVAR) model. Structural VAR model is used to determine the dynamic response of estimated variables to various shocks. SVAR is an appropriate methodology to deal with economic theory and multiple time series analysis together. This methodology is introduced by Sims model (1980, 1982, and 1986) and the general model of SVAR further discussed by Giannini (1992), Amisano and Giannini (1997).

After that, employ dynamic impulse response analysis within estimated structural VAR system. We have performed a forecast-error variance decomposition to test to check how much share of variation in prices and output can be interpreted by a monetary policy shock of China.

5.2 Unit Root Test:

In order to check the order of integration in all variables included in this study, we have to apply the augmented dickey fuller test (ADF). The null hypothesis is that series 'Y_t' is non-stationary by computing a t-statistics for $\beta=0$ in the following equation

$$\Delta Y_t = \alpha_0 + \beta Y_{t-1} + \alpha_{1t} + \sum_{i=1}^n \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (5.2.1)$$

With $H_0: \beta=0$; or variable Y_t is Non- stationary or has unit root

$H_1: \beta < 0$; or variable Y_t is stationary

If ADF calculated t value is greater than critical value of test statistics, we do not accept the null hypothesis which concluded that series is stationary, and integrated at level I (0), if we cannot reject the null hypothesis of a unit root, and then the series is non-stationary at levels. It should be then determined whether our univariate series is stationary at first difference or not.

For this purpose, take first difference and repeat the above process to makes it stationary. In this case the univariate series is integrated at order one (I (1)), mostly univariate series become stationary at first difference; then no further difference of the data is required.

5.3 Specification of Structural Vector Autoregressive (SVAR)

The most prominent feature of Structural VAR that differentiate it from other classes of VAR model, its empirical fit is better and allows indentifying structural innovations on economic theory basis. In order to check the impact of monetary policy of China on system of variables, we have estimated SVAR model. Moreover, Chuku *et al.*, (2011) have concluded that the effects of unanticipated change or shock in one or more variables on other variables in equations can also be examined by SVAR. The initial step of structural VAR analysis is to estimate the reduced form. A reduced form VAR model, without constant terms, is as follow

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + u_t \quad (5.3.1)$$

P represents the no of lag included or order of VAR model. Under this study, n endogenous variables, $y_t = (y_{1t}, y_{2t}, \dots, y_{kt})'$ is $(n \times 1)$ vector of endogenous variables ($y_t = (ip_t, cpi_t, ir_t, ex_t, oil_t, m_t)$), A_i are $(n \times n)$ matrices of fixed coefficient. We assume that $u_t = (u_{1t}, u_{2t}, \dots, u_{nt})'$ follows n

dimensional white noise error. We impose identifying contemporaneous restrictions on the basis of theoretical framework and assumption on availability of information following Sims (1999), Sims and Zha (1998), Gordon and Leeper (1994), Lee and Ni (2002) and Kim (2001). Generally, we can write structural representation as

$$Ay_t = A_1^* y_{t-1} + \dots + A_p^* y_{t-p} + B\varepsilon_t \quad (5.3.2)$$

The matrix A allows for modeling of instantaneous relations, A^*i 's are matrix of fixed coefficients and B is a matrix of structural form parameters. Where ε_t denotes structural innovations are linked to the model residual by linear equation and orthogonal as well. Structural model is connected with reduced form disturbance by multiplying equation (2) by A^{-1} .

$$A^{-1}Ay_t = A^{-1}A_1^* y_{t-1} + \dots + A^{-1}A_p^* y_{t-p} + A^{-1}B\varepsilon_t$$

$$y_t = A_{j1} y_{t-1} + \dots + A_{jp} y_{t-p} + u_t \quad (5.3.3)$$

So $A_j = A^{-1}A_j^*$ ($j= 1 \dots p$). From this, we can make the relationship between error of the structural form and reduced form:

$$u_t = A^{-1}B\varepsilon_t = Au_t = B\varepsilon_t \quad (5.3.4)$$

In equation (5.3.5), we combine the restriction of A and B by following AB model by Amisano and Giannini (1997). Lutkepohl and krazig (2004) propose that Structural VAR model can be used to analyze the dynamic impulse response of estimated variables to various shocks by imposing restriction on matrices A and B , to employ identifying structural form parameters it is essential to impose enough restriction on either matrices A and B or both of them.

For the purpose of identification, we need $(n^2 + n)/2$ restrictions on A and B, we need $2n - n(n+1)/2$ further restriction for exact identification. Under this study, we have used six variables and need 15 restrictions to estimate structural VAR model.

5.3A Identification:

In literature, no consensus has been found that how many variables used in SVAR model to give a reasonable explanation of economic theory. In SVAR model, eleven variables were included by Dungey and Pagan (2000). Though Brichetto and Voss (1999) and Kim and Roubini (2000) have studied that six variables are sufficient. By following Kozluk (2009) six variables are used in this study.

Thus, we have to state a VAR model that includes no of variables characterized by the following vector y_t .

$$(y_t = ip_t, cpi_t, ir_t, ex_t, oil_t, m_t)'$$

Where ip_t denote real output, industrial production is proxies by real output, cpi_t is price level as consumer price index, ir_t is short term interest rate, m_t represents Chinese money supply, ex_t is exchange rate per US dollar and oil_t is average crude price of oil in term of US dollar.

Our scheme of identification is analogous to Kim and Roubini (2000), but Chinese monetary policy has some specific features which allow some departure from their identification scheme.

We purpose the relationships that relate the innovations to the variables, u_t , with the structural shocks, ε_t , through the equilibrium framework of our macroeconomic model. First row of equation (5.3.5) presents the identification scheme of Chinese monetary policy shocks. We assume that the monetary authority of China use money supply as instrument variable, and

reacting to the international price of oil but do not react to contemporaneously to other variables in the model.

$$u_t^m + a_{15}u_t^{oil} = b_{11}\varepsilon_t^m \quad (a)$$

while in Sims and Zha (2006), real output can only be effected by exchange rate and monetary policy shocks with a lag, due to noteworthy sluggishness in economic activity .

$$u_t^{ip} + a_{25}u_t^{oil} = b_{22}\varepsilon_t^{ip} \quad (b)$$

The third row represents foreign exchange market, where exchange rate can respond contemporaneously to any shock in the system.

$$a_{31}u_t^m + a_{32}u_t^{ip} + u_t^{ex} + a_{34}u_t^{cpi} + a_{35}u_t^{oil} + a_{36}u_t^{ir} = b_{33}u_t^{ex} \quad (c)$$

In our system of equations, while in reduced form representations of monetary policy it is supposed that price slowly respond to monetary policy shocks and exchange rate. This is shown in fourth row of equation (5.3.5). Prices are slowly adjusted is consistent by following canonical pricing scheme by (Calvo, 1983). Because prices do not respond contemporaneously to shock of interest rate, the real interest rate increases and cause monetary policy contraction.

$$a_{42}u_t^{ip} + u_t^{cpi} + a_{45}u_t^{oil} = b_{44}u_t^{cpi} \quad (d)$$

The fifth row of equation system describes the shock of oil price. The average crude price of oil does not respond contemporaneously to any other shock because it is exogenous. For this reason, we do allow for lag effect.

$$u_t^{oil} = b_{55}u_t^{oil} \quad (e)$$

The reaction function of the domestic monetary authority describe in last row of equation (5.3.5).

In many developing economies, the main objective of monetary authority is stability in price level. Generally, we assumed that interest rate determined on the basis of price level. But interest can also respond to average crude price of oil.

$$a_{63}u_t^{ex} + a_{64}u_t^{cpi} + a_{65}u_t^{oil} + u_t^{ir} = b_{66}u_t^m \quad (f)$$

Now, we can sum up the above set of relations between structural shocks and innovations as follows:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & a15 & 0 \\ 0 & 1 & 0 & 0 & a25 & 0 \\ a31 & a32 & 1 & a34 & a35 & a36 \\ 0 & a42 & 0 & 1 & a45 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & a63 & a64 & a65 & 1 \end{bmatrix} \begin{bmatrix} u_t^m \\ u_t^{ip} \\ u_t^{ex} \\ u_t^{cpi} \\ u_t^{oil} \\ u_t^{ir} \end{bmatrix} = \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \varepsilon_t^m \\ \varepsilon_t^{ip} \\ \varepsilon_t^{ex} \\ \varepsilon_t^{cpi} \\ \varepsilon_t^{oil} \\ \varepsilon_t^{ir} \end{bmatrix} \quad (5.3.5)$$

Overall, the structural innovations consist of various sections. The first equation describes China's monetary policy reaction function; second and fourth equation represents the good market equilibrium. An equation third is an equation of arbitrage for the foreign exchange market. The fifth row represents the oil price shock. The last row of Equation (5.3.5) represents monetary authority response of domestic central bank.

5.4 Impulse response function:

In a VAR, we are often interested in obtaining the impulse response functions. Stock and Watson (2001) have investigated that impulse responses pointed out the response of current and future values of each of the variables to a one unit rises in the current value of one of the VAR errors, supposing that this error returns to zero in following time periods and that remaining errors are

equal to zero. When the errors are not correlated across equation then it is more sensible changing one error while making other errors constant. Impulse responses are used for structural and recursive VARs.

For structural impulse response, vector moving average representation is:

$$y_t = \Phi_1 u_{t-1} + \Phi_2 u_{t-2} + \Phi_3 u_{t-3} + \dots \quad (5.4.1)$$

Where Φ s can be computed non recursively as

$$\Phi_s = \sum_{j=1}^s \Phi_{s-j} A_j, s = 1, 2, \dots \quad (5.4.2)$$

Coefficient of this illustration may be explained as representing the responses to impulses striking the system. The elements of Φ s denotes the impulse responses of y_t with respect to the u_t innovations.

5.5 Forecast Error Variance Decomposition

Forecast error variance decompositions is used to find out the proportion of the variability of the errors in forecasting y variables at time $t + s$ on the basis of information availability at time t that is due to variability in the structural shocks ε_1 and ε_2 between times t and $t + s$. Given our structural model

$$\Phi(L)x_t = u_t \quad (5.5.1)$$

$$x_t = \Phi_1 u_{t-1} + \Phi_2 u_{t-2} + \Phi_3 u_{t-3} + \dots \quad (5.5.2)$$

And the error in forecasting y_t in the future is, for each horizon s :

$$x_{t+s} - E x_{t+s} = \Phi_1 u_{t+s-1} + \Phi_2 u_{t+s-2} + \dots + \Phi_{s-1} u_{t+1} \quad (5.5.3)$$

From which we get the variance of the forecasting error:

$$\text{Var}(x_{t+s} - E x_{t+s}) = \varphi_1 \sum u \varphi_1' + \varphi_2 \sum u \varphi_2' + \dots + \varphi_{s-1} \sum u \varphi_{s-1}' \quad (5.5.4)$$

From equation (5.5.4), we can calculate the share of the total variance of the forecast error for each variable inferable to the variance of each structural shock.

5.6 Conclusion

In nut shell, this study has Structural VAR model to empirically analyze the impact of Chinese monetary policy shock on macroeconomic variables of South Asian economies. After that, we empirically analyze the dynamic impulse response within estimated structural system. We employ a forecast-error variance decomposition that analyzes how much share of variations in prices and output can be explained by Chinese monetary policy shocks.

Chapter 6

Results and Discussion

6.1 Introduction

In next section, firstly we have determined the order of integration by using unit root test. In section 6.3, short run contemporaneous restrictions of structural coefficient will be estimated and then we imply impulse response function of domestic and foreign monetary policy shocks on domestic variables in section 6.4. In last section, we will apply forecast variance error decomposition test.

6.2 Statistics of Augmented Dickey Fuller Test

Augmented Dickey Fuller test is used to check whether variables are stationary or not. The variables under consideration of this study are integrated at order one and stationary at first difference (results are shown in Appendix A). The textbook approach and many relevant studies would persuade us to get rid of the non stationarity, either by differencing of variables or by modeling the co integrating relationship. Nevertheless, by following Sims et al. (1990), we have estimated the VAR system in levels. They have suggested that the main objective of a VAR model is to make the interrelationships between the variables. Differencing of variables may create misspecification of model and drop important information regarding the co-movements in the data (Enders, 2004). The majority of empirical literature takes this approach. The reasons are as follows.

First, in small samples, it is not easy to determine whether co-integrating relationship among variables is present or not. Second, imposing the restrictions of co-integration improperly could

probably lead to incorrect inference. On the whole, our main goal is the short term effect of shocks on other variable and we are not so much concerned with structure of co-integration, without explicitly modeling it, we will assume it implicitly between the variables in level.

6.3 Empirical Findings of SVAR Methodology

We estimate the influence of China's monetary Policy shocks on selected South Asian economies by using Structural Vector Auto Regression. For SVAR analysis, VAR has been estimated for two external and four domestic endogenous variables. The domestic endogenous variables includes industrial production (IP), Consumer price index (CPI), exchange rate (EX), short term interest rate (IR) and two external endogenous variables are money supply (M_2) and average crude price of oil (Oil). The series of industrial production (IP), consumer price index (CPI) and China's money supply (M_2) are seasonally adjusted using X-12 method. Finally, we take natural logarithms of all variables except interest rate. The structural VAR model has been estimated by imposing non recursive contemporaneous restriction on structural form, our model have three over identifying restriction for a given structural factorization specified in equation.

To check the response of output and price level of selected South Asian economies on Chinese money supply, we will apply impulse response analysis on the basis of short run contemporaneous restrictions of Structural VAR model. Though, the lag length is identified by the information criteria is found to be insufficient to capture the dynamics of the model as it is inadequate to remove the autocorrelations appeared in the residual series (Ibrahim 2006) . Hence Hall (1989) and Johansen (1992) concluded that, it was possible to choose lag on the basis of where residual are not correlated. Up to residual testing, structural VAR model is estimated by using three lag for Pakistan, six lag for India and seven lag for Sri Lanka and Bangladesh.

In Table 6.3.1 reports contemporaneous structural coefficients and their standard error based on Structural vector Auto regression analysis for South Asian economies. These structural coefficients provide baseline intuition of basic relationship among variables in system of equation. A formal likelihood ratio test conducted to check the validity of restriction. Our first contemporaneous coefficient based on impact of Chinese money supply on oil price i.e. a_{15} which implies monetary authority takes an expansionary monetary when unexpected change in oil price occur. We observe that monetary authority of China use money supply as monetary policy instrument and contemporaneously react to the international price of oil without considering the value of other variables. It implies that monetary authority takes an expansionary monetary policy when facing oil price increase. a_{25} shows the unexpected change in average crude price of oil decrease output of all south Asian economies because these economies are net oil importing economies. The results are in confirmation to the earlier findings that unexpected oil price movement adversely affects industrial production developing economies (Malik 2008, Kumar 2009, Du et al 2010). However, the effect of unanticipated rise in oil price is relatively small on Pakistan, Bangladesh and Sri- Lanka. The reason could be that Bangladesh and Sri Lanka are small economies and change in crude price of oil has adverse but insignificant impact on output of these economies. In case of Pakistan, heavy industries are partially dependent on electricity generated by import oil. In Pakistan percentage share of oil in total amount of energy is 29 percent, while natural gas account for 40 percent (Malik, 2008). As compared to other economies, India has relatively significant effect because of dependence of major industries of India on crude price of oil. China's money supply has not statistically significant impact on exchange rate which is shown by coefficient a_{31} , because of rigidity of exchange rate in China from many years.

The estimated values of a_{32} and a_{34} are negative for all South Asian economies, because exchange rate depreciates due to unanticipated rise in industrial production and consumer price index. In small open economies, conventional theories followed by short run dynamics. When exchange rate depreciate, price of foreign goods increase relative to domestic goods and cost of production also rises, Due to increased prices of import and costs of production, spending from foreign to domestic commodities rises thus causing raise in aggregate demand and prices. On the other hand, a depreciation of currency lowers prices of export. This causes the net exports to decrease and consequently real income fall in economy. Hence the overall result of exchange rate fluctuation on output and price is determined by combined effect of demand and supply channels (Agha et al., 2005). But in case of Sri Lanka exchange rate appreciate when it observes unexpected rise in consumer price index and industrial production. The estimated value of a_{35} implies that unexpected change in oil price causes exchange rate to depreciates in all South Asian economies, because in small open economies, when oil price shocks occur it leads to inflation which cause budget deficit and put downward pressure on exchange rate and makes import more expensive. But this effect is not statistically significant in all economies especially Sri Lanka and Bangladesh, because these economies are small and based on primary industrial products which mainly used labor intensive technology. So, crude price of oil do not significantly affect the exchange rate (vinayagathan, 2013). a_{42} negative sign implies that unexpected change in output causes price level to increase. a_{45} implies that unexpected change in world oil price causes price level to increase, this means both world price of oil and price level moves in same direction for all economies in our sample. Because oil uses as major input in economy, when input cost raises then price of final product may also rises. Our results are consistent with theory. From many relevant studies we conclude that since oil based products

have important role in CPI, so rise in oil price has a direct impact on inflation (Galesi and Lombardi, 2009). This rising trend in crude price of oil may adversely affect many economies of world including Pakistan, in term of increasing budget deficit, balance of payments problem and by increasing inflationary pressure (Malik, 2008). The estimated value of a_{63} coefficient is negative which implies monetary authority raise interest rate when it examines unexpected exchange rate depreciation. Kim and Roubini (2000) findings support this result. While in case of India interest rate shock follow exchange rate appreciation, but level of significance is very weak in this case.

Coefficient a_{64} implies unexpected rise in price level follow positive interest rate in our study. According to theory, Contractionary monetary policy shock is expected to decrease the price level, but when response of price level is opposite to economic theory, this is called price puzzle. We found little evidence of price puzzle in all economies; this is because of inflationary pressure in developing economies. The estimated value of a_{65} coefficient shows positive sign which implies unexpected change in oil price causes interest rate to decline in all selected South Asian economies except Sri Lanka. Because Sri Lanka and Bangladesh based upon small economies that's why oil price shock does not significantly affect the interest rate. From the response of short-term interest rate, we can conclude that short-term interest rate declines immediately by following oil price shocks. This result is in line with contractionary monetary policy after an oil price shock (Javid and Munir, 2011; Kim and Roubini, 2000). The rest of coefficients represent structural form parameters presents its own structural shocks.

Table 6.3.1: Contemporaneous Structural Coefficients and their standard errors

	Pakistan		India		Sri Lanka		Bangladesh	
	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error
a ₁₅	1.455382	9.204712	2.630988	27.66276	3.358307	116.5774	0.338559	0.177469
a ₂₅	0.089332	0.596506	10.12822	105.3450	0.681169	23.63828	0.036713	0.041032
a ₃₁	0.008741	0.009089	0.083976	0.044460	0.004969	0.021987	0.011574	0.020166
a ₃₂	-1094591.	7040000000	-684.7046	995.6288	-1452562.	6500000	11.53190	7.626363
a ₃₄	-1.040334	6.724156	-2.459718	25.57026	-4.016954	133.1015	-0.100880	0.174216
a ₃₅	10797.42	69519927	40.68825	123.5756	261544.8	1170000	0.953169	2.026179
a ₃₆	-0.020851	0.009335	-0.017160	0.010469	-0.024677	0.007873	-0.002649	0.008094
a ₄₂	-0.074968	0.052968	-0.035230	0.014510	0.060587	0.046844	-0.076287	0.027555
a ₄₅	-0.083603	0.529254	-0.584369	6.193167	-0.553623	18.50487	-0.033984	0.016530
a ₆₃	-0.015978	0.005877	0.006011	0.007898	-0.018088	0.012389	-0.009318	0.006798
a ₆₄	2326.895	14962846	-6.222739	11.11196	-29376.36	1310000	-0.063429	0.223907
a ₆₅	0.065281	0.409627	0.247609	2.589544	0.111210	3.856711	-0.057636	0.050306
b ₁₁	0.009254	0.000540	0.009169	0.000540	-0.007948	0.000470	0.008647	0.000513
b ₂₂	-0.052506	0.003062	-0.012709	0.000749	0.047288	0.002796	0.029437	0.001747
b ₃₃	-0.129478	0.812471	0.453441	4.714449	0.489316	16.96915	0.013660	0.004829
b ₄₄	-0.005786	0.000337	-0.006780	0.000400	-0.012433	0.000735	0.007074	0.000420
b ₅₅	-0.081760	0.004768	0.072991	0.004301	0.084417	0.004992	0.089651	0.005320
b ₆₆	17021.30	109000000	9.066944	13.11782	20122.72	90028570	-0.170338	0.046100

Table 6.3.2: Test for three over identifying restrictions

Economy	Likelihood ratio test
Pakistan	7.11(0.07)*
India	3.42(0.33)
Sri Lanka	5.28(0.15)
Bangladesh	2.03(0.56)

Note: *, ** and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively

The Structural VAR model is estimated by using likelihood ratio test. Our model is over identified with three over identifying restrictions. Formal likelihood ratio tests apply to check the validity of restrictions, our null hypothesis in likelihood ratio test is restrictions are valid. Under this study, likelihood ratio test accept the over identified models for all economies at the 5 percent level, as given in Table 6.3.2. For Pakistan, restrictions of over identification are weakly rejected (at 10 percent level). Thus, we can conclude that our restrictions are valid for all selected South Asian economies.

6.4 Impulse Response Analysis

We have investigated the dynamics of model by observing impulse response analysis by using estimated SVAR model. The main goal of our analysis based on impact of monetary expansion in china on macroeconomic variables of South Asia. In order to attain this objective, we must sure that whether our model gives reasonable dynamics. First to examine whether contractionary monetary policy shock of economies of South Asia make sense, we check the impact of positive interest rate shock on industrial production and consumer price index of all economies.

6.4.1 Impact of domestic monetary policy shocks on domestic output and Price level

In order to study the effect of domestic monetary policy shock on domestic output and price level of South Asian economies, we assumed that all economies in South Asia follow contractionary policy in which we would expect that price level and output decline because of positive interest rate innovation.

Figure 6.4.1A display estimated an impulse response that represents the impact of domestic monetary policy shock to industrial production. As shown in figure 6.4.1A response of positive monetary policy shock to Industrial production initially rises up to 20 month then persist to fall in case of Pakistan, while Indian economy shows the same behavior, by following contractionary monetary policy, output increase over some horizon but continuously fall after initial rise. In case of Sri Lanka, output does not show a persistent nature up to 6 month but then continuously fall till 30 month by following positive interest rate innovation. As compared to developed economies, industrial production of South Asian economies does not show much variation by following positive innovation in interest rate (Javid and Munir 2010). By following positive interest rate innovations, industrial production of Bangladesh falls over the horizon but not persistently. Industrial innovation is not significantly effect by interest rate innovation. Bhuiyan

(2011) conclude that monetary policy shock is not main source of fluctuation in industrial production in Bangladesh. Because Bangladesh is small open economy and do not much rely on industrial production.

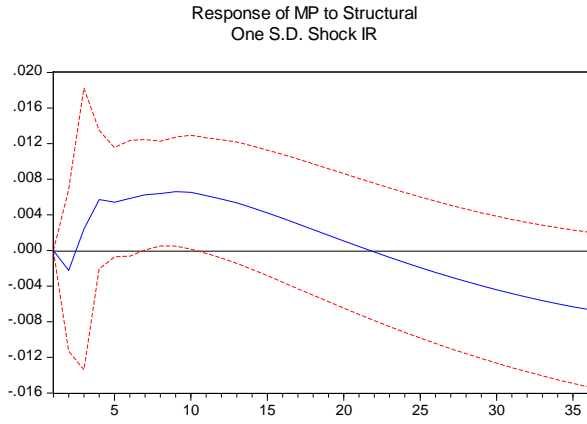
Figure 6.4.1B display the estimated impulse response by examining the influence of domestic monetary policy shock on price level of South Asian economies, we have found evidence of price puzzle in Pakistan. By following contractionary monetary policy, price level persistently rises. The rise in the price level is continuous over the full 36 months horizon and this rise is statistically significant over the full time period. Javid and Munir (2011) observed that both inflation and interest rate in Pakistan are increasing during recent decade. If the interest rate and inflation move in the same direction with positive correlation, then we face price puzzle. Price puzzle is most common in developing economies. In Pakistan, many factors have been contributing in raising inflation from several years. Primarily, government is borrowing from central bank for deficit finances, due to this energy and food prices rising continuously. As energy and food prices works through supply chain and inflation is also largely driven by supply shock. This may be the reason that monetary authority faces difficulty to meet their target level of inflation.

In case of Sri Lanka price level continuously rise up to 36 horizons and inclusion of crude price of oil in the system of equation does not provide solution. Fung (2002) has concluded that price puzzle does not resolve by including commodity price index or US variables in system of equation of VAR for many East Asian economies. IMF report (2004) examine that in Sri Lanka, impact of inflation is volatile and contractionary monetary policy shock is small from supply side shocks, particularly in agriculture which play a major role in consumer price index. Therefore, the relationship between price level and positive interest rate shock is not strong in

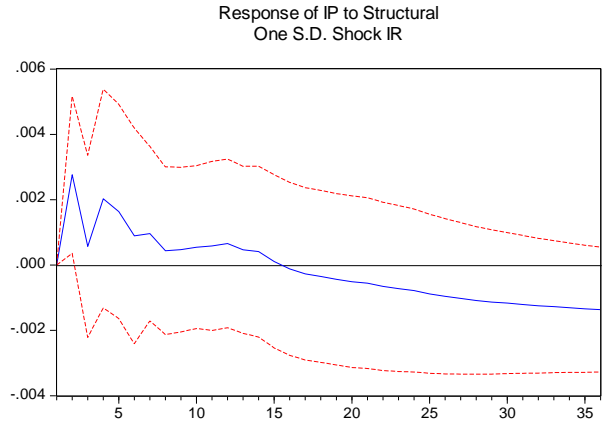
case of Sri Lanka. While in contrast Indian economy shows a persistent fall in price level, clearly no evidence of price puzzle shown over full horizon. Overall impact of positive interest rate innovation on Indian economy is consistent with theory that monetary contraction cause fall in price level. Although in case of Bangladesh price level initially rises and makes hump from 5 to 10 months, then continuously fall toward zero and become negative as price puzzle disappeared. These consequences proposed that we have in fact managed to identify monetary policy shocks of all economies within our model.

Figure 6.4.1A: Response of output to domestic monetary policy shock

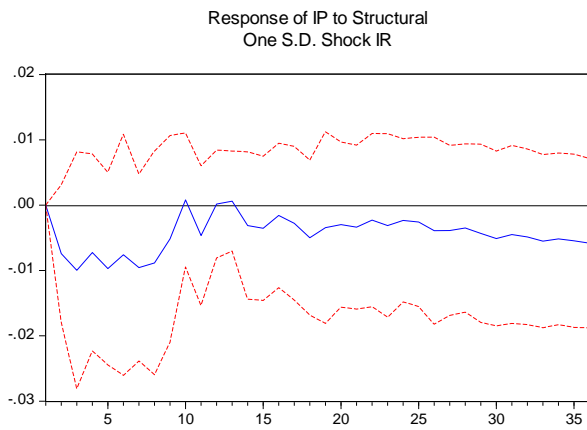
Pakistan



India



Sri Lanka



Bangladesh

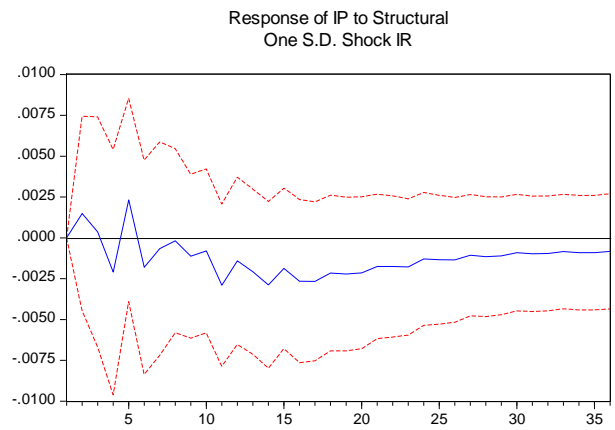
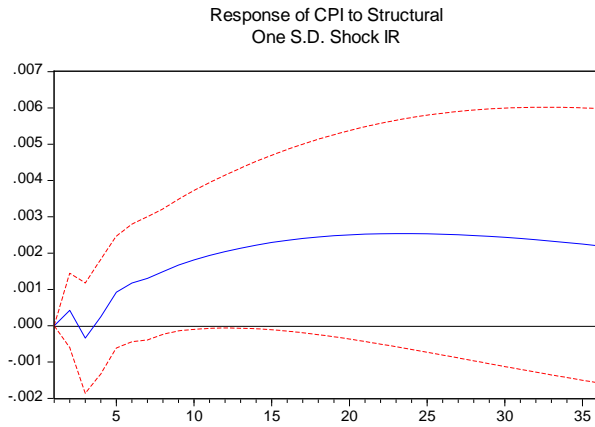
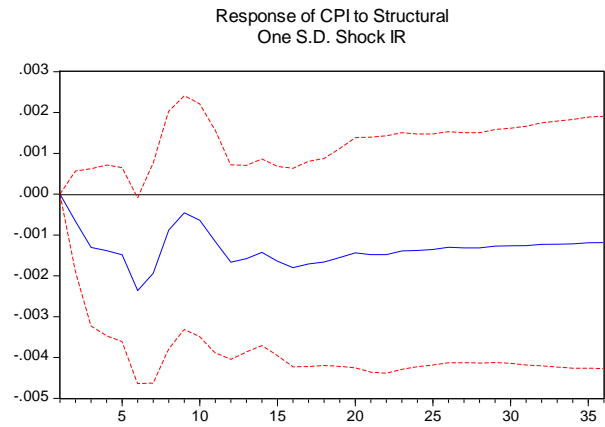


Figure 6.4.1B: Response of Price Level to domestic monetary policy shock

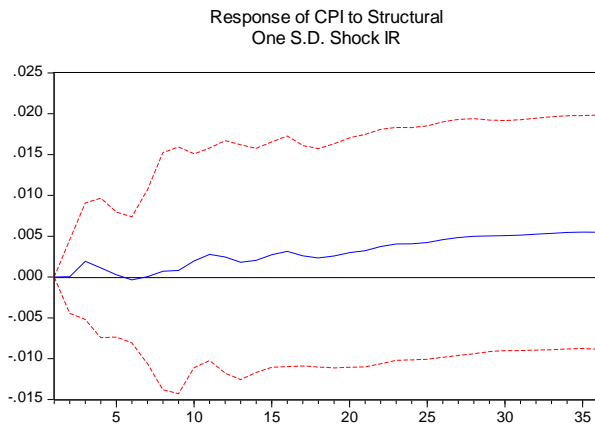
Pakistan



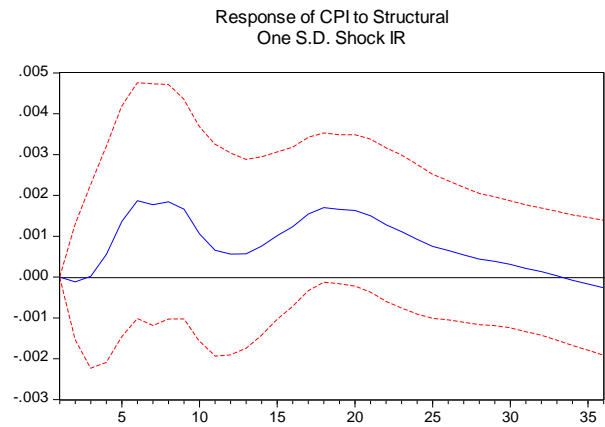
India



Sri Lanka



Bangladesh



6.4.2 Impact of monetary policy China on domestic output and Price level

In this section, we have to investigated the impact of expansionary monetary policy of China on macroeconomic variable i.e. output and price level on South Asian economies under this study. Figure 6.4.2A shows the estimated Impulse response functions of monetary expansion in China on output of South Asia under this study. Our results are quite consistent with theory that monetary policy expansion of large economy leads to an expansion in output of their trading partners through trade Channel. A number of microeconomic theories including Mundell Fleming model and intertemporal substitution effect presents that large open economies have a great influence on small economies through various channels. Under this study, output of all economies increased because of expansionary monetary policy shock of China.

The impact of China's money supply shocks on domestic output of Indian economy is slightly less significant up to 12 month at initial periods but then continuously rising upward over full horizon as compared to other economies. In case of Pakistan, expansionary monetary policy shocks of China shows significant effect on its industrial production but stabilize in long run.

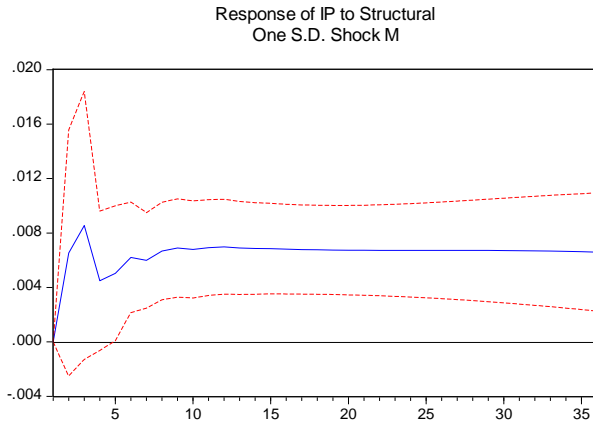
In case of Sri Lanka, industrial production fluctuates till over the full horizon and does not show persistency in nature of variable. In case of Bangladesh, industrial production initially fluctuate up to period 10 but then increases over the remaining horizon fluctuations gradually dies out. From this behavior, we can conclude that impact of China's monetary policy shock on South Asian economies is only temporary not persistent in nature.

Response of domestic price level of South Asian economies to Chinese money supply is shown in figure 6.4.2B which implies that price level of all economies increased persistently due to expansionary monetary policy shock of China. But in case of Sri Lanka and Bangladesh results are quite different from other economies, in this case response of price level to China's money

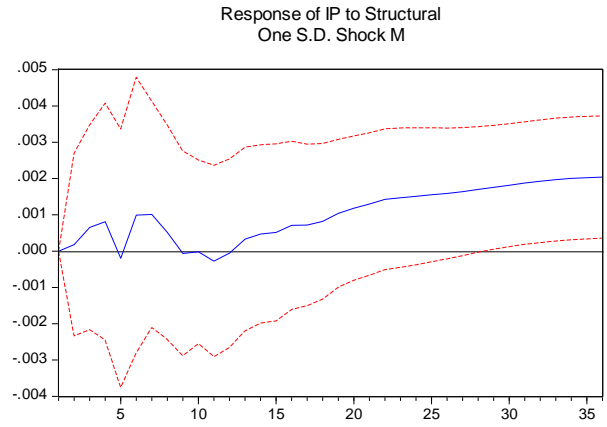
supply initially decline up to 10 months then it rise continuously over the remaining horizon. In rest of economies monetary expansion of china leads to persistent rise in price over all horizons, this means Chinese money supply has a significant impact on price level of selected South Asian economies.

Figure 6.4.1A: Response of output to Chinese monetary policy shock

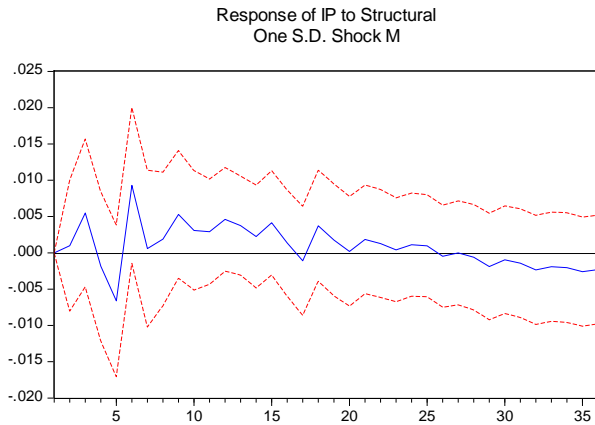
Pakistan



India



Sri Lanka



Bangladesh

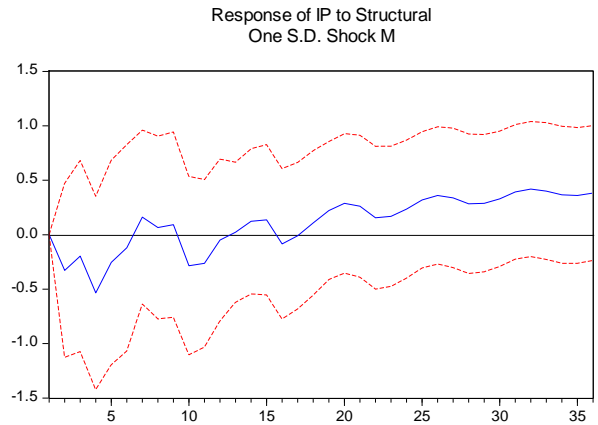
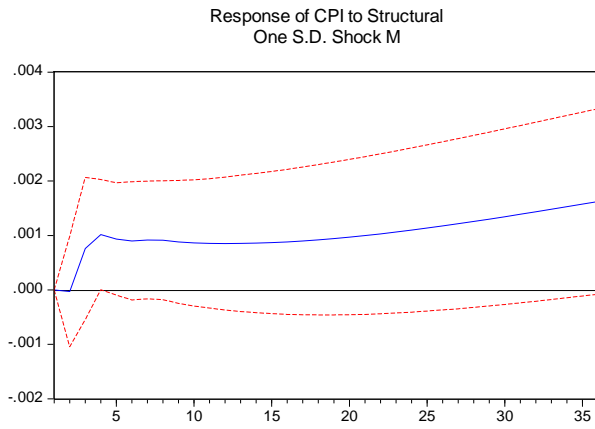
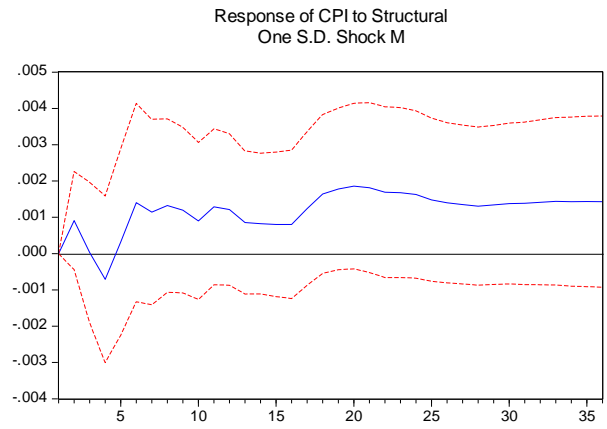


Figure 6.4.1B: Response of Price Level to Chinese monetary policy shock

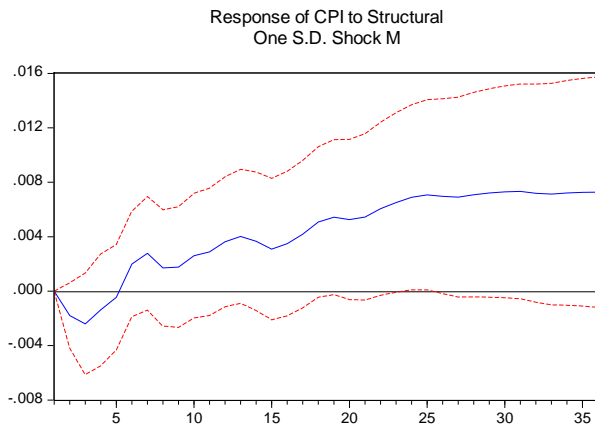
Pakistan



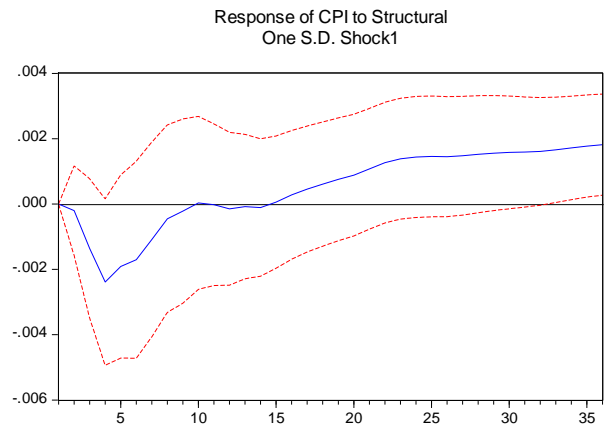
India



Sri Lanka



Bangladesh



6.5 Variance decomposition Analysis

Impact of expansionary monetary policy shocks of china is statistically significant in some economies, but there importance may still be small. To determine the importance of China's monetary policy shock of China to Price level and output of south Asian economies, we have used variance decomposition test. Here, we have examined that how large China's money supply contributed to the variation in prices and output. Results of variance decomposition analysis are shown in Table 6.5.1 and 6.5.2; we have investigated the importance of the shock up to 36 month ahead.

Table. 6.5.1. Importance of Chinese monetary policy shocks to domestic output

Period	Pakistan	India	Sri Lanka	Bangladesh
1	0	0	0	0
5	4.36	0.27	1.47	1.61
10	7.52	0.56	3.26	1.49
15	11.0	0.54	3.67	1.45
20	13.6	0.98	3.47	1.56
25	15.4	2.11	3.27	1.91
30	16.6	3.56	3.07	2.55
36	17.3	5.72	3.09	3.59

The tables suggest that monetary policy of china does not cause major fluctuations in any of the south Asian economy. The responses of output are very similar across all South Asian economies except India. The smallest share of output for such a shock is explained by Sri Lanka (3 percent overall horizons up to 36 months) and relatively largest share for output of Pakistan (17 percent up to 36 months). In Bangladesh, the proportional rate of Chinese money supply shocks in explaining variance error decomposition in output is less than 4 percent. While in case of India, it

is approximately 6 percent. These results clearly explain that China’s monetary policy shocks are not the main source of variation in output of South Asian economies.

Table.6.5.2: Importance of Chinese monetary policy shocks to domestic Price Level

Period	Pakistan	India	Sri Lanka	Bangladesh
1	0	0	0	0
5	1.82	0.6	1.64	3.72
10	2.87	2.65	2.39	3.91
15	3.31	3.17	4.08	3.59
20	3.71	4.35	6.24	3.73
25	4.25	5.52	8.96	5.15
30	4.97	5.86	11.16	6.95
36	6.14	6.25	12.09	9.58

Considering the impact of prices, we have examined that the contribution of monetary policy shock of China notably higher in Bangladesh and Sri Lanka (9-12 percent). While in case of Pakistan and India variation in price level due to China’s monetary policy shock is less than 7 percent.

From the results of Tables 6.5.1 and 6.5.2, the importance of China’s monetary policy shocks is normally larger for prices than for output. But in case of Pakistan this shock is high for output relative to price level, but effect on output is of temporary nature and insignificant in some horizon. As mentioned earlier that by using impulse response function, we have found that price level persistently increased because of expansionary monetary policy. But overall the importance of expansionary monetary policy shock of China’s economy on output and price level of South Asian economies may still be small.

6.6 Conclusion:

As this study attempted to examine and evaluate the effect of monetary policy shocks of China on South Asian economies. To fulfill this purpose, structural VAR on the basis of non recursive contemporaneous restriction was estimated, where we impose identification restriction on the basis of economic theory. By applying, likelihood ratio test, we have concluded that our restriction are valid for all economies. Next, we estimated impulse response dynamics within structural VAR analysis; first, we examined the response of output and price level to domestic monetary policy shock, to check whether our impulse responses make sensible dynamics. By following Contractionary monetary policy, we found evidence of price puzzle in Pakistan, Bangladesh and Sri Lanka. But in case of India, we did not found price puzzle. By following positive innovation of interest, output initially rises then continuously fall showing the results are consistent with theory. Next, we examined that response of price level and output to expansionary monetary policy shock of China is positive. Our results are consistent with theory that monetary expansion of large open economy influenced on macroeconomic variables of its trading partners.

In last, we have used variance decomposition analysis. From this test, we conclude that Pakistan and India show less variation in price level as compared to Bangladesh and Sri Lanka. But in case of output, Pakistan shows large variation as compared to other economies.

Chapter: 7

Conclusion and Policy Implications

7.1 Conclusion

The dissertation intended the impact of foreign (China) monetary shocks as well as domestic monetary policy shocks on fundamental macroeconomic variables such as price level and output of selected south Asia economies (Pakistan, Sri Lanka, Bangladesh, and India). For this purpose, we have used four domestic endogenous variables are consumer price index used as price level, call money rate as short term interest rate, Industrial production used as a proxy of real GDP, exchange rate per US dollars and two external endogenous variables are average crude price of oil and M2 as Chinese money supply. The series of industrial production (IP), consumer price index (CPI) and China's money supply (M2) are seasonally adjusted using X-12 method. We take log of all variables except interest rate. For Structural VAR analysis, we have estimated the VAR system in level. The structural VAR model has been estimated by imposing non recursive contemporaneous restriction on structural form, our model have three over identifying restriction for a given structural factorization specified in equation. Validity of restrictions was checked by likelihood ratio test, our restrictions are valid for all economies.

By using identification scheme that is based on theoretical consideration, we were able to find a sensible reaction of variables to domestic monetary policy shock. We have investigated the model dynamics by observing impulse response function within the estimated structural vector Auto regression analysis. First we examined whether our domestic monetary policy shock of South Asian economies make sense, we have checked the impact of positive interest rate

innovation on industrial production and consumer price index of all economies. In order to check the effect of domestic monetary policy shocks on domestic price level and output, we have identify contractionary monetary policy in all South Asian economies. In case of Pakistan, India and Sri Lanka, output rise initially then fall continuously over the whole horizon by following contractionary monetary policy shock. The results are not significant for Bangladesh, because Bangladesh is small economy and does not much rely on Industrial production. Evidence of price puzzle was found in some economies by investigating the response of price level on positive interest rate innovation. This is because of inflationary pressure in developing economies. But in case of India, we did not find price puzzle.

Next, response of output and price level to expansionary monetary policy shock of China was examined. We found that output and price level rises as a result of Chinese money supply shock. But rise in output is of temporary nature in some economies but rises in price level is quite persistent, make sure that price level is the main channel from which South Asian economies managed foreign economy shock. Our results are consistent with theory that monetary expansion in China has a growing influence on macroeconomic variables of its trading partners.

Finally, to determine the importance of Chinese monetary policy shocks on output and price level of South Asian economies, we have used variance decomposition analysis. We found that output and price level of South Asian economies show less variation due to Chinese monetary policy shocks during the period 1998m1- 2010m6. In case of price level, Pakistan and India show less variation in price level as compared to Bangladesh and Sri Lanka. But in case of output, Pakistan presents more variation due to China's expansionary monetary policy shock as compared to variation in output of rest of the economies. Our results are consistent with intertemporal open macroeconomic model, which shows inflation in foreign economy may raise

because of monetary policy expansion in that economy, consequently real interest rate fall. This led to intertemporal substitution effect in support of currently produced domestic commodities, as a result the demand for home good may rise. This Intertemporal effect may support further by wealth effect. Because of expansionary monetary policy of China, Chinese consumer feel rich and demand more output, China demand more inputs to produce output. The demand for import increases output and price of South Asian economies. But overall the importance of expansionary monetary policy shock of China's economy on output and price level of South Asian economies may still be small.

As this study attempted to examine and evaluate the effect of monetary policy shocks of China on South Asian economies. The main implication of our study is that if the prime objective of monetary authority is to control short run output variations and prices then they must pay interest toward development in China's monetary policy. This is particularly for those economies where variation in price level and output due to Chinese monetary policy shocks is more than 10 percent.

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Appendix A

1. Augmented Dicky Fuller Test:

To check stationarity of variables concerned, we have employed the Augmented Dickey Fuller (ADF). The results of the ADF test are reported in tables A.1-4 below

Table A.1.1 Pakistan:

Variables	Intercept/ Trend	Level (t- statistics)	First Difference (t-statistics)	Decision
Mp	intercept	-0.92	-12.5*	I (1)
CPI	intercept	-0.60	-4.62*	I (1)
IR	intercept	-2.34	-15.2*	I (1)
EX	intercept	-0.42	-12.6*	I (1)
M2	Intercept	-2.01	-5.47*	I(1)
Oil	intercept	-1.25	-10.7*	I (1)

(*), (**) and (***) shows significance at 1%, 5% and 10% respectively

Table A.1.2 India:

Variables	Intercept/ Trend	Level (t- statistics)	First Difference (t-statistics)	Decision
IP	intercept	-0.63	-18.3*	I (1)
CPI	intercept	-3.68	-8.41*	I (1)
IR	intercept	-2.41	-14.4*	I (1)
EX	intercept	-2.95	-9.45*	I (1)
M2	Intercept	-2.01	-5.47*	I(1)
Oil	intercept	-1.25	-10.7*	I (1)

(*), (**) and (***) shows significance at 1%, 5% and 10% respectively

Table A.1.3 Sri Lanka:

Variables	Intercept/ Trend	Level (t- statistics)	First Difference (t-statistics)	Decision
IP	intercept	0.24	-13.8*	I (1)
CPI	intercept	-0.39	-10.5*	I (1)
IR	intercept	-1.76	-13.2*	I (1)
EX	intercept	-3.02	-12.8*	I (1)
M2	Intercept	-2.01	-5.47*	I(1)
Oil	intercept	-1.25	-10.7*	I (1)

(*), (**) and (***) shows significance at 1%, 5% and 10% respectively

Table A.1.4 Bangladesh:

Variables	Intercept/ Trend	Level (t- statistics)	First Difference (t-statistics)	Decision
IP	intercept	0.12	-11.8*	I (1)
CPI	intercept	-1.51	-7.87*	I (1)
IR	intercept	-1.48	-11.4*	I (1)
EX	intercept	-1.66	-11.6	I (1)
M2	Intercept	-2.01	-5.47*	I(1)
Oil	intercept	-1.25	-10.7*	I (1)

(*), (**) and (***) shows significance at 1%, 5% and 10% respectively

A.2 Autocorrelation Test:

To test for autocorrelation (serial correlation) in residuals, we used VAR residual serial correlation LM test. Results are reported in table A.2.1-4 below

Table A.2.1: Pakistan

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	37.08083	0.4189
2	39.62884	0.3113
3	46.11961	0.1204

Probs from chi-square with 36 df.

Table A.2.2: India

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	29.00917	0.7894
2	39.09166	0.3327
3	45.39402	0.1356
4	45.31256	0.1374
5	61.05779	0.0057
6	33.06688	0.6088

Probs from chi-square with 36 df.

Table A.2.3: Sri Lanka

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	46.36409	0.1155
2	40.79555	0.2677
3	51.20994	0.0480
4	34.86629	0.5224
5	34.50569	0.5397
6	51.85003	0.0423
7	37.64162	0.3940

Probs from chi-square with 36 df.

Table A.2.3: Bangladesh

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	24.97948	0.9163
2	41.85316	0.2317
3	35.27567	0.5028
4	36.13156	0.4625
5	45.25220	0.1387
6	67.19335	0.0012
7	23.29396	0.9496

Probs from chi-square with 36 df.

Our null hypothesis based on no serial correlation at lag order h. Since neither of the probability values for Pakistan with 3 lags, Srilanka and Bangladesh with 7 lags, India with 6 lag is significant at 5% level. But we found little evidence of autocorrelation in some economies.

A.3 Heteroskedasticity Test:

To test for Heteroskedasticity, we used white heteroskedasticity with no cross term. Results are reported in table A.2.1-4 below

Table A.3.1: Pakistan

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:		
Chi-sq	df	Prob.
864.2412	777	0.0527

Table A.3.2: India

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:		
Chi-sq	df	Prob.
1615.832	1512	0.0615

Table A.3.3: Sri Lanka

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:		
Chi-sq	df	Prob.
1871.995	1785	0.0744

Table A.3.4: Bangladesh

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:

Chi-sq	df	Prob.
1779.697	1785	0.5310

The test for Heteroskedasticity with no cross term is based on white (1980). The results from the test indicate that there exist no Heteroskedasticity in the residuals for all economies in our sample at 5 % level of level of significance. Thus, no evidence of Heteroskedasticity is found.