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EXCHANGE RATE PASS-THROUGH
AND ITS IMPLICATIONS FOR INFLATION IN VIETNAM

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Abstract

This paper aims to measure the level and timing of the ERPT, (2) to evaluate the impact of changes in the exchange rate on inflation, and (3) to recommend appropriate policies from these outcomes". In this paper, I used various empirical tests including Augmented Dickey-Fuller Tests, Hodrick and Prescott tests, and impulse response tests. Through the tests, I found that the exchange rate pass-through (ERPT) of Vietnam in the first year is 0.61, staying at the medium level as compared with other economies at the similar background. The largest effect on import price is reasonably delayed from 5 to 7 months after an exchange rate shock due to delayed adjustment of foreign trade contracts of the companies. However, the impact of exchange rate shock to consumer price is even kept inertial around 10 months after the shock in exchange rate. After 15 months, the impact of an exchange rate shock on import price and consumer price is completely removed. Due to moderate level of ERPT, a more flexible of exchange rate regime i.e. larger band of fluctuation, is recommended. The SBV is therefore able to adopt stronger monetary policies to cope with volatilities in the financial market.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller	NEER	Nominal Effective Exchange Rate
AFTA	ASEAN Free Trade Area	D(LNEER)	NEER in Difference of Logarithm
AIC	Akaike Information Criterion	NMPAB	National Monetary Policy Advisory Board
APEC	Asia Pacific Economic Cooperation	NIE	New Industrial Economy
ASEAN	Association of South East Asian Nations	M2	Broad Money
BTA	Bilateral Trade Agreement	LM2	M2 in Logarithm
CMEA	Council of Mutual Economic Assistance	D(LM2)	M2 In Difference of Logarithm
CIEM	Central Institute for Economic Management	PCP	Producer Currency Pricing
CPI	Consumer Price Index	PTM	Pricing-To-Market
D(LCPI)	CPI in Difference of Logarithm	GAP	Output Gap
EPZ	Export Processing Zone	GDP	Gross Domestic Product
ERPT	Exchange Rate Pass-Through	GSO	Vietnam General Statistics Office
FDI	Foreign Direct Investment	SBV	State Bank of Vietnam
IFS	International Financial Statistics	SCIC	Vietnam State Capital Inv. Corporation
IMP	Import Price	SC	Schwarz Information Criterion
D(LIMP)	IMP in Difference of Logarithm	SOE	State Owned Enterprise
HP	Hodrick-Prescott	REER	Real Effective Exchange Rate
HoSE	Hochiminh City Stock Index	VAR	Vector Auto Regression
OECD	Organization of Econ. Coop. and Dev.	VND	Vietnamese Dong
ODA	Official Development Assistance	WBI	World Bank Indicators
I(n)	Integration of Order n	WTO	World Trade Organization
IZ	Industrial Zone		
LOP	Law of One Price		
LCP	Local Currency Pricing		

1. Introduction

In many international economic discussions, the exchange rate is often put at the centre due to its important roles in economic stability. It is necessary to recall that many recent financial crises in emerging economies such as in Mexico in 1994, Thailand, Indonesia, and Korea in 1997, Russia and Brazil in1998, Argentina in 2000, and Turkey in 2000; and again in 2001 were more or less related to an exchange rate crisis. The exchange rate, among others, is one of the factors connecting national economies. Due to this connecting characteristic, the exchange rate is the cause of some regional or global financial crises. Rapid globalization and internationalization contribute to the interdependence of economies. The exchange rate, therefore, has become more and more important. However, the exchange rate not only has an external impact but also an internal impact on the economy. One of the most important impacts of the exchange rate on an economy is its impact on inflation. The impact of the exchange rate on inflation is broadly termed as the exchange rate pass-through (ERPT) to inflation.

The ERPT is specifically defined as the percentage change in destination-currency import prices resulting from a one percent change in an exchange rate between the exporting and importing countries (Goldberg and Knetter 1996). The importance of the ERPT has been generally analyzed by various economists. Two identified important roles of the ERPT are the forecasting capacity of inflation and its policy implications on monetary policy.

Basically, the most important role of the ERPT is its influence in the forecasting capacity of inflation, which is very important for any central bank in conducting monetary policy. Having underpinned with a good assessment of the ERPT, the central bank is able to understand the influence, degree and timing, of any exchange rate shock to change in inflation. Therefore, the central bank, especially one with an inflation targeting regime, can respond in a timely way with proper monetary policy to keep inflation within the targeted area. Taylor (2000) discovers the relationship between the level of inflation and degree of the ERPT where a low inflationary environment tends to support a low ERPT. Because inflation has the characteristic of inertia, current low inflation will lead to low inflation in the future and high inflation normally predicts incoming high inflation in the future.

Taylor explores the degree to which inflation influences the pricing power of firms. He argues that in a low inflation environment, a rise in costs induced by an exchange rate shock might not lead the firm to increase the price of goods, as an increase in price will make the firm less competitive. If the firm anticipates that the shock in price is temporary, it will absorb the increase in costs by lowering its mark-up, and thus its profit margin to keep the price stable.

Using the same argument, high inflation can lead to a higher pricing power of firms. The higher pricing power implies that the firm is able to increase prices in response to cost rises induced by an exchange rate shock. The shock in exchange rate can lead the firm to adjust the price accordingly if the firm expects the inflationary pressure in the market to be persistent. This is because, in the presence of persistent inflation, the increase in price seems to be reasonable. The adjusting decision of price due to exchange rate change therefore implies an increase in the level of the ERPT. Some studies such as Dornbusch (1987) and Hooper and Mann (1989) realize that the correlation between high inflation and high level of the ERPT is limited in some industries such as automobile and manufacture.

The level of the ERPT has some implications. First, the level of the ERPT implies the pricing power of foreign exporters. A low level of the ERPT implies that foreign exporters will not choose to adjust the price due to exchange rate shock, while a high level of the ERPT means firm is able to adjust the price in response to exchange rate shock. A quick adjustment of price

implies that the firm has a strong pricing power and hesitance in price adjustment means less pricing power. Second, coupled with an inflation forecasting capacity, the level of the ERPT will help the central bank in determining monetary policy. If the assessment reveals that the ERPT is low, the central bank will be less concerned by the inflation impact of exchange rate shocks. As a result, the central bank will focus fully on other objectives such as growth and export competitiveness in designing exchange rate policy as well as monetary policy. In the context of a high level of the ERPT, however, the central bank will have to be more concerned with the inflationary impact of the exchange rate shocks. Large fluctuations of the exchange rate will be translated into inflationary pressure on the economy. It is therefore difficult to conduct a suitable exchange rate policy.

After the Vietnam War ended in 1975, Vietnam adopted a closed policy where a paradigm of self-supply economy was applied. Foreign factors were generally prevented from having any influence. After 10 years of implementation, Vietnam overcame a series of problems such as food and commodity shortages; poor production capacity; and sluggish economic growth, to name but a few. After the deregulation policy with the introduction of money into the economy, large-scale inflation was observed. All of the problems were identified as having their roots in the mechanism of the closed policy. In 1986, Vietnam implemented comprehensive reform. A reform policy called "doi moi" or renovation policy was decided during the Sixth National Congress of the Communist Party. The renovation policy was to shift the economy from centrally-planned to market-based.

In the centrally-planned economy, economic decisions were made by the Government. Annually, political leaders decided the volumes of production for all sectors in the economy. Based on these "assignments", factory executives carried out their jobs, completing the designated production. The problem was that political leaders often did not correctly estimate the domestic demand; hence discrepancies appeared between supply and demand.

Furthermore, foreign trade was extensively restricted. Only several state-owned enterprises (SOEs) were given authority to undertake foreign trade in the form of receiving foreign aid and paying foreign debt. Hence, shortages in domestic supply were not fulfilled by foreign supply. In the context that only SOEs were allowed, shortages of supply of goods and services became a growing problem. In the absence of competition from private and foreign enterprises, which were legally prohibited, the SOEs face no constraints to reform. Since the domestic production capacity was weak and imports were also limited, Vietnamese suffered much economic hardship arising from shortages of food and the inability to meet individual needs.

The closed policies had serious consequences for the economy such as a slow economic growth rate and high inflation. During the period 1975-1990, the Vietnamese economy grew sluggishly. Several crises such as food shortages and hyperinflation were observed. Because of weak agriculture and manufacturing industries, unfavorable weather could easily lead to food shortages. The hyperinflation period in the late 1980s (with the highest inflation rate of 453 percents observed in 1986[1]) broke out when Vietnam introduced the currency. The previous "coupon economy[2]" was replaced by paper money. Some argue that coupon was the cause of the hyperinflation in late 1980s as the coupon economy did not measure inflation. The inflation was thus hidden.

In the financial sector, a mono-banking system, where the State Bank of Vietnam (SBV) acted as both the central bank and the commercial lender of the economy, was adopted. As a matter of

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[1] See IMF (2006) for details
[2] In this economy, payment was calculated in number of coupons. The salary recipients then used the coupon in exchange for the goods already specified on the coupon face.

fact, in the economy, where economic activities were not monetized, commercial banks were not needed. The monetary policy, the major function of the central bank, was therefore useless. The exchange rate policy was only to serve as an accounting means for measuring foreign aid and GDP. Individuals were not allowed to hold foreign exchange.

When the open policy started, a series of structural changes to the economy took place, leading to the present policy frameworks, which may be described as follows. First, many forms of economic agents including the state, private, and foreign agents are allowed and protected by law. Although, competition among economic agents is recognized by law, the Government also encourages forms of co-operation between the private and state sectors. The market mechanism is respected in all economic activities. State-owned enterprises (SOEs) still play an important role in the economy, but the private sector is becoming more and more central in the creation of GDP. A stronger private sector puts much pressure on the incumbent SOEs that are said to have a lot of problems such as ineffective use of capital, soft-budget constraints, and slow innovation. Fiercer competition from the private sector as well as foreign counterparts has in fact caused many SOEs to become bankrupt. However, many other SOEs, which are determined to innovate in their ways of doing business, thus enhancing their competitiveness, have survived and become very competitive.

Second, the government has reduced intervention in economic operations. Administrative decisions are eradicated and business autonomy is appreciated. Enterprises have to proactively analyze the market in order to adjust their decisions on production and distribution. This factor has in part helped enterprises enhance their competitiveness and efficiency.

Third, foreign trade restrictions under the previous regime were removed with the start of open policy. All economic agents are now allowed to undertake export and import operations. Like several economic "tigers" such as Singapore, Hong Kong, Taiwan and newly industrialized economies (NIEs) in Asia, the open policy aims to change Vietnam into an export-led economy where export industries are identified to assist the development of other industries in the economy. In order to materialize this intention, the Vietnamese government established many export processing zones (EPZs) and industrial zones (IZs) which receive lots of preferential measures such as tax and tariff reductions and exemptions, so as to attract foreign enterprises. After nearly 15 years, the success of these EPZs and IZs indicates that the policy has been correct.

Fourth, in the financial sector, the open policy allows for the introduction of money, and the monetary policy becomes an important part of macroeconomic policy. The monobank system was terminated and replaced by two-tier banking where commercial banks are separately established to act as lenders of the economy. The State Bank of Vietnam (SBV) serves as the central bank, retaining the power to be the lender of the last resort for commercial banks. The SBV focuses on designing suitable monetary policy for intervening in the economy to meet certain objectives. Although several credit crises were observed in the early renovation period, the SBV has extensively implemented reform programs toward becoming a modern central bank. Various monetary policy instruments pertaining to interest rates, exchange rates, discount rates, and reserve requirements have been gradually designed and adopted. In fact, these monetary policies were successful to a certain point. Very high interest rates and fixed exchange rate policies were said to help Vietnam out of the inflation crisis in the late 1980s. Over time, monetary policy has been brought into conformity with international trends and standards. The interest rate has been liberalized since 2001. Referring to the exchange rate policy, instead of keeping it fixed, the SBV has gradually allowed exchange rate to fluctuate in response to the situation in the economy. At present, as defined by the IMF, Vietnam is currently implementing a conventional pegged exchange rate regime .

Although the Vietnamese economy has achieved great success in economic growth with foreign trade booming, the economy is facing with some constraints such as rising inflation, increased trade imbalance, higher import penetration, dollarization and increasing capital inflow. These constraints, on one hand, cause the exchange rate regime under pressure of fluctuation and, on the other hand, pose a question on the role of exchange rate in transmitting the foreign pressure to inflation. The transmission from foreign pressure to inflation is made through the exchange rate channel that is further broken down into two smaller channels: the first channel is from exchange rate change to import price change, and the second one is from exchange rate change to inflation. While the former is known as the ERPT, the latter, which covers the first one, is pass-through from exchange rate to inflation. This research aimed *"(1) to measure the level and timing of the ERPT, (2) to evaluate the impact of changes in the exchange rate on inflation, and (3) to recommend appropriate polies from these outcomes"*.

There are many studies on the issue of ERPT. Generally, they followed two approaches of analyzing the issue. First, economists such as Dornbursh (1987), Feinberg (1986), and Krugman (1986) analyzed the microeconomic behavior of firms to affect the degree of ERPT. The second approach, followed by various current academics such as Taylor (2000), McCarthy (2000) used macro variables for seeking out the level and timing of ERPT in an economy or groups of economies. This research basically follows the latter approach. Thanks to the available data, the period of 2001-2006 is examined by traditional VAR method using macroeconomic variables.

This paper consists of four parts. The next part reviews monetary policy in Vietnam in general and provides some updated information. Part 3 covers the method of study and data issues. This chapter represents the outcome of regression analysis and some brief comments on the results of regressions. Some factors that might affect the results are also covered in this chapter. This chapter also discusses the data description. Due to data constraints, proxies are used. After obtaining the regression results, comments are presented. Based on the results and evidence explored in this chapter, Part 4 presents some conclusions of the study. Moreover, Part 4 is also used to provide policy implications for the Vietnamese authorities based on the study. Constraints for the benefit of future study are also outlined.

2. Review of Economy and Monetary Policy in Vietnam

In order to derive a good assessment of the ERPT, it is necessary to have an overview of Vietnam's monetary policy in general as well as the exchange rate policy in particular. In this chapter, I will discuss the history of monetary policy and exchange rate policy in Vietnam during the period 1991-2006. I will also briefly discuss the foreign exchange intervention and the fluctuation of exchange rate, so that we can have better forecasting of the future interaction of exchange rate policy. As the topic is the ERPT on inflation, the evolution of inflation in Vietnam in recent years is also mentioned.

2.1.   Overview of Vietnamese Economy in the Post-*Doi Moi*

A quantum leap in the economic renovation of Vietnam was seen during the Sixth National Congress of Communist Party held in December 1986. A renovation policy popularly known as "*Doi Moi*" was adopted, aimed at shifting economic priority from heavy industries to three major economic programs, namely: the production of food, consumer goods and exports; the reduction of state intervention in business; and the promotion of foreign and private investment. The Seventh and the Eighth National Congresses of the party in 1991 and 1996 further confirmed the commitment to a "socialist oriented multi-sector economy operating under the market mechanism and state management".

Figure 1: Annual GDP Growth Rate for Period 1986-2003
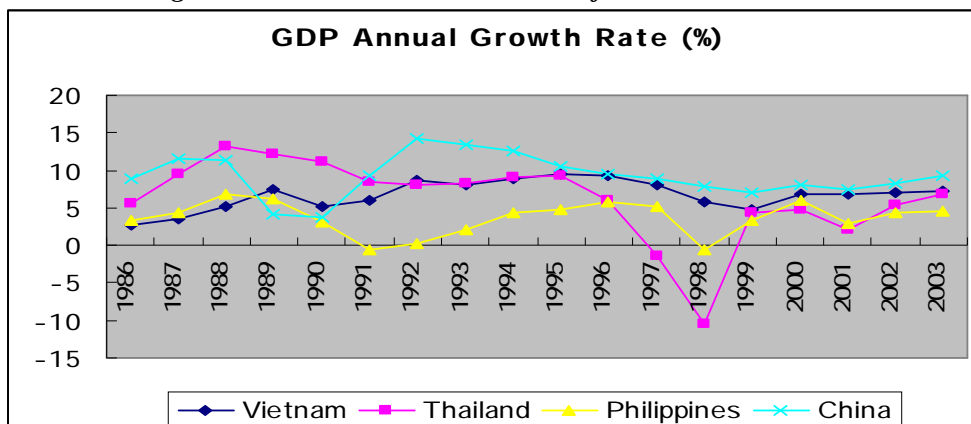
Source: WBI data

Since the implementation of the open policy in 1986, the reported economic growth rate has been high for a long period. The annual GDP growth rate has reached and surpassed the growth rates of some economies in the region (e.g. Figure 1). The persistent shortages of food and consumer goods in the past were resolved as the new policy helped increase the production of these goods to better meet domestic demand. Moreover, the production was not only to serve domestic needs, but also to serve export purposes. As the productivity of SOEs was low, the policy tried to encourage the participation of the private sector and foreign counterparts which were considered to be financially strong, better equipped and managerially experienced.

In recent years, the government has issued a series of supportive policies to reinforce the SOEs. In order to help the SOEs, reform policies center on three areas including (i) strengthening financial discipline and operational performance in SOEs; (ii) accelerating the process of transforming non-strategic SOEs into privately controlled and managed firms and (iii) ensuring market-based economic decision-making in SOEs (IMF, 2003). One of the most important policies for the development of SOEs is an equitization[3] policy in which private ownership is allowed in the SOEs. Even though in the early period of reform, the equitization focused on non-strategic SOEs as a pilot basis, indicators on financial soundness, efficiency and management at equitized SOEs have shown that the reform policies are working well.

As a result, Vietnamese manufacturing industries have developed rapidly. The domestic productivity of both state and private enterprises has increased to meet rising domestic demand. The participation of foreign invested enterprises, on one hand, strengthens the serving capacity of production industries for domestic needs. On the other hand, their existence puts pressure on the Vietnamese counterparts to reform. Further, foreign enterprises also employ and train Vietnamese workers to international standards. As they became more exposed to foreign and private competition, the SOEs had to reform. Some SOEs have extensively restructured and developed to be able to compete with foreign firms.

Over the 20 years of the open policy, Vietnam has achieved certain economic successes. First, a series of reforms helped the economy out of persistent crises observed at the end of 1980s and early 1990s. Hyperinflation had been restrained to less than 10% by the mid 1990s. After the crises of domestic shortage were fully resolved, the economy started increasing exports from 1995 with the large-scale entries of foreign enterprises. As a result, the economic growth rate has consistently stood at 8% for 15 consecutive years since 1995 (Figure 1).

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[3] Meaning: to privatize. The equitization applies for Vietnamese SOEs

Regarding the involvement of Vietnam in the international economic system, Vietnam has started joining many economic organizations. The country is now a member of economic groups such as APEC, AFTA and the WTO. A new height of global economic integration was set when Vietnam succeeded in joining the WTO in 2006. As a result of economic integration, a series of tariff and non-tariff barriers to trade have been reduced and/or eliminated. Import duties have been substantially reduced while most export products enjoy zero export tax rates. Requirements for authority approvals on contracts and licenses for shipments have been abolished.

In addition to economic reforms, land reforms had also paved the way for the introduction of private right of usage and rights to inherit, exchange, mortgage and lease. Although, the ownership right still belongs to the state as regulated by the Constitution, it is observed that a clearer provision of rights on designated land has facilitated business activities as well as satisfied individuals' needs.

In recent years, the economy has run through a series of structural changes including a series of large scale equitization programs and other transformation of state owned enterprises. Specifically, the Government set up the state capital investment corporation (SCIC) with the ultimate function of receiving and managing the state assets and capital in state-owned firms under the equitization process. Further, many state corporations have been transformed into multi-sector economic groups.

2.2. Current Situation in Vietnam

2.2.1. High Inflation

Figure 2: Annual CPI Inflation During the Period 1986-2007
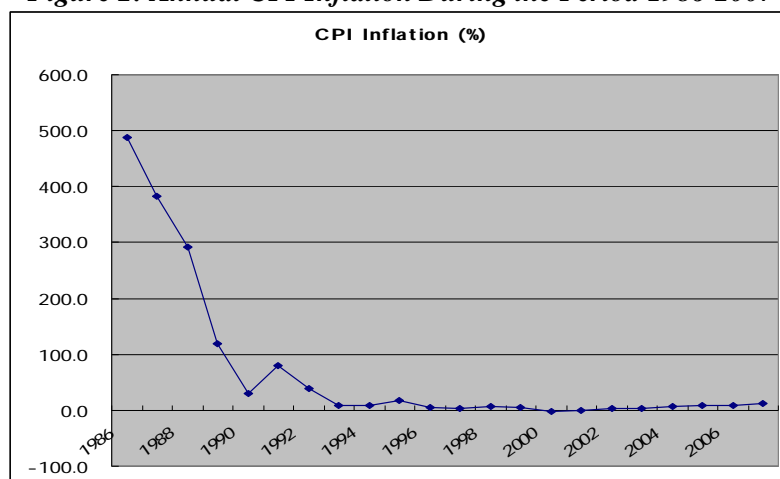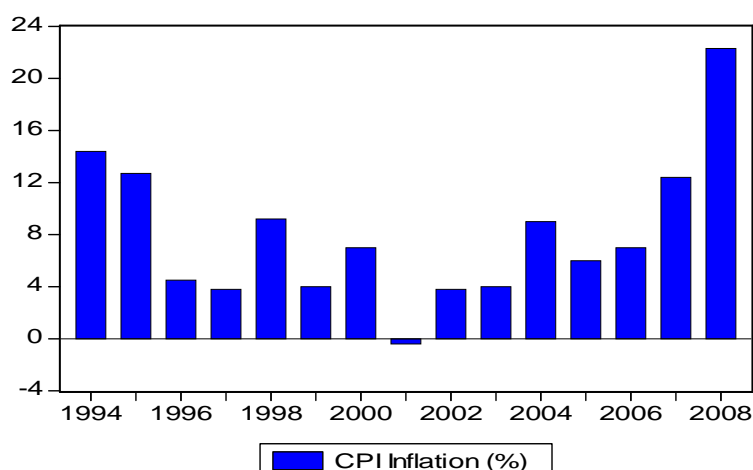

Source: GSO

Following price liberalization and a series of structural economic reforms in the late 1980s, inflation picked up enormously to become a crisis with the highest annual inflation of 487.2 percent in 1986 (Figure 2). The hyperinflation was then remedied by the implementation of a very tight monetary policy in which the SBV raised monthly interest up to 12 percent. The SBV also rigidly pegged the VND to the USD to anchor domestic inflation with that of the U.S[4]. With this firm policy measure, the large liquidity was absorbed. The inflation fell sharply. Inflation came down to a single digit number from 1995, and continued this trend until early 2000. The year 2001 saw the first-ever deflation in Vietnam's history where the headline inflation was from -0.4 percent (Figure 3). The deflation was reportedly caused by the adverse impact of the Asian

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[4] It is difficult to state that the fixed exchange rate helped curb hyperinflation in Vietnam during that time, but it is a fact that the SBV has successfully brought down inflation in a short period.

financial crisis in 1997 on the export-led economy of Vietnam (IMF, 2006). However, the deflationary period was soon followed by a pick-up of inflation which peaked at 12.46% in 2007 and soars in year 2008 when the projected CPI inflation is 22.3%.

*Figure 3: Quarterly CPI Inflation During Period of 1994-2008*

Source: GSO, Vietnam Venture Group[5], and CIEM Projection for 2008

Inflation created great harm to the living standard of citizens. The breakdown of inflation (to be discussed later) reveals that prices of food, which accounts for nearly 50% of the Vietnamese consumption basket, increased very rapidly during that time. As a result, although they were supported by several national minimum wage increases during 2003-2007[6], the Vietnamese people suffered very much. Although Vietnam is a net exporter of oil, the rapid increase of the world oil price, which touched its highest level in the history at 126USD per barrel in quarter 1 of 2008, has signaled a continuing trend of inflation.

2.2.2. Growing Trade Imbalance and Increasing Import Penetration

Figure 4:Trade Balance During 1998- Projected 2008
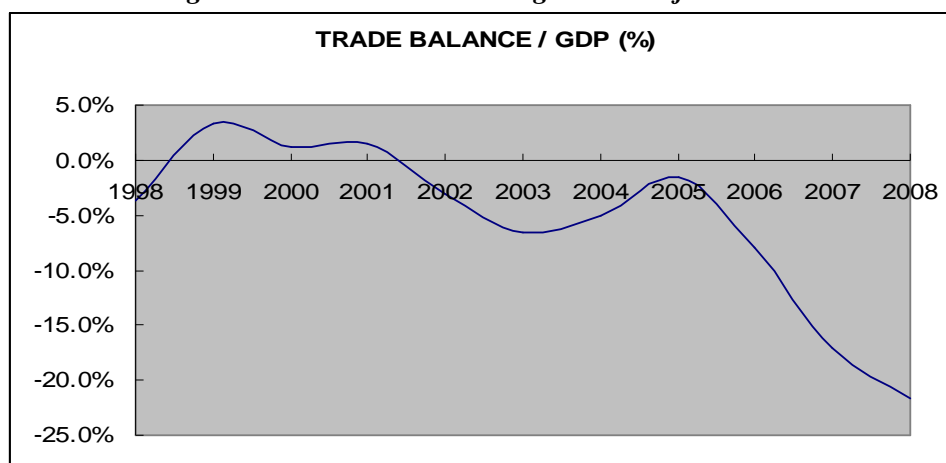
Source: IFS and GSO and own calculation.

Although the open policies set priority on export industries by allowing many EPZs and IZs, Vietnam has persistently been suffering from a situation of trade deficit over the last ten years. A rare case of trade surplus was observed during the period 1999-2001, the same as the period of deflation, should not be seen as an improvement in trade management but rather as a sign of the

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[5] www.vvg-vietnam.com
[6] GSO

adverse impact of the Asian financial crisis. After this short period of trade surplus, the deficit recurred in 2002 and then continued on and peaked at 12.3 billion USD due to a surge of imports after WTO accession. Even though a trade deficit is a normal phenomenon in emerging economies, the increasing trade deficit relative to GDP growth has posed a critical issue about the sustainability of the trade balance and management of external debt.

Figure 4 shows the upward trend of the trade deficit in terms of GDP. The trend seems to be underpinned by the larger external exposure of Vietnam (e.g. WTO accession, upcoming bilateral trade agreements with Japan and China). To reverse the condition, depreciation of the VND would help improve export capacity while mitigating import demand. However, it is difficult to let the currency depreciate in the context of a large capital inflow (to be discussed later) and inflationary pressure. As the matter of fact, the large pick-up of inflation in 2007 was a product of an SBV intervention in the exchange rate market with ineffective sterilization policies.

Figure 5: Percentage of IMPORTS per GDP, Projected 2008
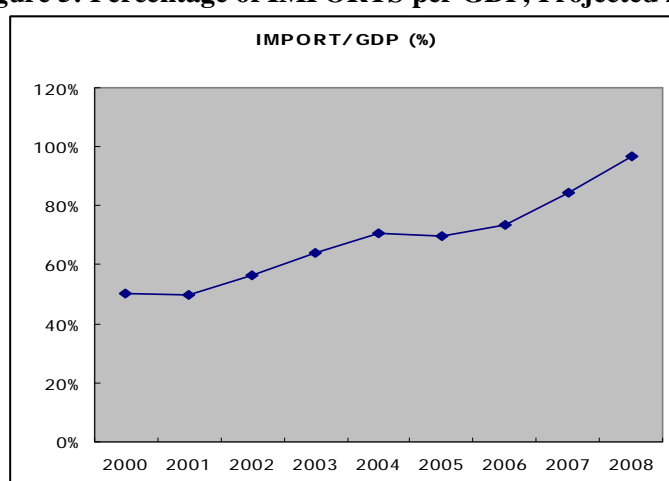
Source: Own calculation from GSO.

Along with the growing trade deficit, the import penetration as measured by percentage of imports to GDP has grown very rapidly from nearly 50% in 2000 to 84% in 2007, one year after WTO accession, and is projected at 97% for 2008. Even though several papers found little misalignment in the exchange rate arrangement, the growing imports relative to exports and GDP have indeed shown that it is time to reconsider the exchange rate regime for Vietnam.

Figure 6: Composition of Import Price Index

Source: GSO

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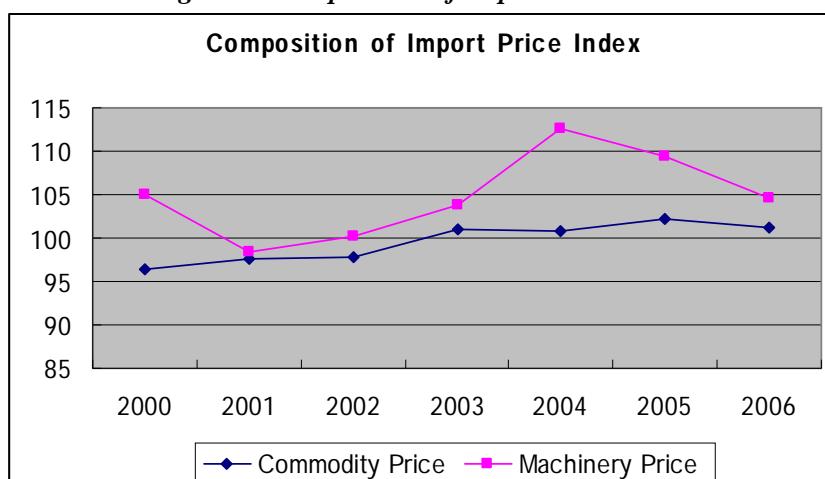
The breakdown of import price indicates the effect of external exposure on the Vietnamese economy. As Vietnam is a transitional economy moving toward a market-based economy, large amount of machinery is needed to restructure the economy. As it becomes more integrated into the world economy, it is easier for Vietnam to promote import activities. However, the persistent increase of the imported machinery price index may again confirm the trend of continuing high inflation.

In the context of surging oil price, and growing import penetration, exchange rate is very important channel in determining the impact of foreign price fluctuations into domestic inflation. Although exchange rate plays a role of transmitting foreign supply shock to domestic market, the change in exchange rate itself also has certain implications to inflation depending on the level of ERPT.

It is noticed that foreign exporters have monopolistic power in the Vietnamese market through the use of foreign currency in trading. Because the VND is a non-convertible currency, suffering high domestic value loss in terms of inflation, hard currencies such as the U.S. dollar, Euro, and Japanese Yen are usually used in invoicing. Consequently, foreign exporters will be free from the impacts of fluctuation in the exchange rate. Another issue is the dollarization in the economy. Dollarization, mentioned in the next section, exacerbates the seriousness of the ERPT into inflation as the economy is highly indexed. In Vietnam, many prices are formally or unofficially pegged to the dollar. Individuals prefer to quote their property in dollars or gold. Similarly, automobile firms tend to invoice for cars in dollars. Therefore, any unfavorable change in the exchange rate will lead to an immediate impact on the prices of indexed commodities, thus raising inflation.

2.2.3. Large Capital Inflow and Persistent Dollarization

Driven by a high growth economy, capital inflows started coming into Vietnam in the early 1990s. The flow capital reversed when the Asian financial crisis broke out. However, the recovery of economic growth in the region has again attracted a flow of capital. Following the trend of capital inflow into the region, the capital inflow into Vietnam regained its impetus when the Vietnamese economy rapidly grew. Basically, capital inflow to Vietnam is normally in the form of foreign direct investment (FDI), portfolio investment and official development assistance (ODA). In the 1990s, FDI and ODA were two major components. The FDI growth generally reflected the encouraging policies of the Vietnam government, under which export oriented industries were promoted. The booming of the domestic economy, the WTO accession, and the consolidation of the legal framework, where foreign investment and domestic investment law were unified with the objective of simplified procedures in licensing and administration, are causing the second wave of FDI in recent years. Portfolio investment appeared with the establishment of the Vietnam securities market and the Government plan for SOE equitization. Although the plan for SOE equitization started in the late 1990s, the strong determination of the Government to speed up the process really excited foreign investors. As a matter of fact, portfolio investment spurred as the Vietnamese stock market, represented by the VN-index, doubled in size in 2006. Many investment funds, hedge funds and financial conglomerates stepped in to search for profits.

As shown in Figure 7 above, an increasing trend of net capital inflow has coincided with the blooming of the stock market presented by the VNindex, the Vietnamese stock market index of the Hochiminh City Stock Exchange (HoSE).

Figure 7: VN-Index and Net Capital Inflow
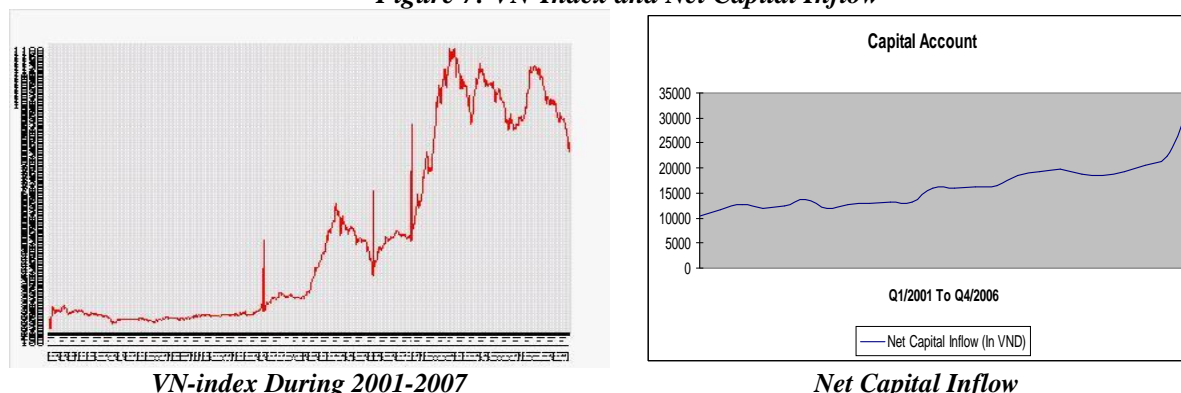
VN-index During 2001-2007	*Net Capital Inflow*
Source: The State Securities Commission	Source: Own calculation based on data from IFS

Basically, the reason for capital mobility is profits. Capital flow implies a relative difference in rate of return between capital recipient country and capital owners' country. In fact, there are several factors called the "pull"[7] and "push"[8] factors (Prasad et al. 2003). The structural changes in the global financial system as well as the domestic financial sector determine the movement of FDI and other forms of capital flows. However, high capital inflows impose difficulties on the recipient economy. The immediate impact is exchange rate fluctuation. In the context of huge capital inflows, in order to keep the exchange rate stable, thus protecting export competitiveness, the central bank has to intervene in the foreign exchange market. If it is unsterilized intervention, the absorption of foreign exchange implies a supply of liquidity. Consequently, provided other things remain stable, inflation is observed. Even in the case of sterilized intervention by the central bank, it is extremely difficult to keep domestic prices stable in the context of huge capital inflows. Reserve requirements cannot increase forever. The above hypothetical phenomenon is, in reality, currently observed in Vietnam.

Serious dollarization appeared at the beginning of the 1990s when the country was suffering an inflation crisis. At that time, citizens were much concerned about inflation and were therefore pushed to hold the dollars, thus protecting the value of their property. After a long period of favorable inflation after 1995-2002, the dollarization became less severe. The pick-up of inflation recently might cause people to recall the hard experience of inflation in the early 1990s, hence causing them to collect the dollars. Indexation is notably seen in real estate transactions where many traders prefer to set the price in dollars or gold. Fluctuations in values of dollars and gold have immediate impacts on the dollars and gold indexed prices of real estate, thus contributing to increase consumer prices. As a policy response, the plan by the SBV for a convertible VND in 2010 will probably curtail the dollarization problem. In order to have a convertible VND, the SBV will have to target inflation to maintain the domestic value of the VND. Otherwise, people will seek refuge in strong foreign currency.

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[7] Pull factors arise from changes in policies and other opening-up in capital recipient countries including liberalization of capital accounts and the domestic stock market and large scale privatization programs.

[8] Push factors include business-cycle conditions and macroeconomic policy changes in industrial countries. In the longer run, push factors include the rise in the importance of institutional investors in industrialized countries and demographic changes.

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2.3. Monetary Policy in Vietnam

2.3.1. Overview of Monetary Policy

During the period 1990-1991, Vietnam experienced a series of crises such as hyperinflation, and the aftermath of massive destruction in credit funds. However, in a new-born two-tier banking system, the State Bank of Vietnam (SBV) was successful in stopping hyperinflation, promoting economic growth and consolidating confidence in the banking system. According to Quang (2006), in this period, the SBV basically used a high interest rate and a fixed exchange rate for curbing inflation. The short term interest rate was raised to 12% per month in order to absorb excessive liquidity in the economy.

The ensuing period of 1992-1995 was marked by the establishment of an exchange rate management mechanism which included a foreign exchange circulation fund and two centers for foreign exchange transactions. The SBV announced daily the official exchange rate as a benchmark for commercial banks to set their exchange rate, within a 5% band. A reserve requirement was also introduced during this period. Quang (2006) states that since the reserve requirement was ineffective in affecting credit for the economy through credit supply, the SBV used alternative policies such as a refinancing facility, policy directed lending, and a credit line to achieve the targets. But those policies still were not able to help the SBV achieve its inflation targets.

During the period 1996-1998, the SBV kept on using the interest rate tool, with a margin of 0.35% for the monthly interest rate, to deal with inflation issue. This was in fact successful in bringing down the inflation. Because of the adverse impact of the Asian financial crisis, the economy grew sluggishly in the presence of deflation in late 1990s and early 2000. In response to this macro economic situation, the SBV announced a ceiling rate in order to keep the interest rate low. Besides, the SBV also removed regulations on the interest rates of individual accounts, saving deposits and demand deposits. As for the treatment of commercial banks, the same refinancing rate was applied to all credit institutions regardless of ownership. In 1997, a milestone was set when the Law on the State Bank of Vietnam was issued, paving the way for extensive banking reform. All objectives were clearly defined with a view to promoting the accountability, transparency, and credibility of the central bank.

In mid-2000, the SBV replaced the ceiling rate with a basic interest rate that credit institutions would use to set their lending rate with a band of fluctuation. However, the year 2003 set a landmark in the financial history when the SBV decided to abandon the basic interest rate, and the interest rate was thus floated.

2.3.2. Executing Agency, Legal Framework and Monetary Policy Strategy

2.3.2.1. Executing Agency

In Vietnam, the State Bank of Vietnam (SBV) is responsible for conducting monetary policy, acting as the central bank. As stated in the Law on the State Bank, the SBV is endowed with the capacity to print the currency, implement banking reform, carry out open market operations, license and oversee commercial and foreign banks in Vietnam, and deal with other monetary policy issues. As the SBV belongs to the government, it has to coordinate with other governmental ministries in formulating policy.

In serving as the central bank, the SBV is authorized to exercise all central bank functions such as printing currency, providing liquidity to the economy, governing the money market and open

market operations, acting as the lender of last resort for commercial banks, and establishing interbank settlement[9]. In addition to the SBV, the National Monetary Policy Advisory Board (NMPAB), which is headed by deputy prime minister, takes part in devising monetary policy in Vietnam. Even though meetings of the NMPAB are not regularly held, some of the most important decisions on monetary policy have been set during such meetings.

2.3.2.2. Legal Framework

The late 1980s became a milestone in Vietnam's financial history when the mono-bank system was demolished and a new two-tier banking system was introduced. The first legal documents that supervised the operations of the banking system were an Ordinance[10] on the SBV and an Ordinance[11] on banks, credit co-operatives and finance companies. These Ordinances motivated the origination of a series of commercial banks, joint stock banks, credit co-operatives and finance companies. Following the Ordinance, the SBV served as the central bank, acting as the lender of last resort when the banking system needed one. In 1997, the Ordinances were replaced by several Laws, namely the Law on the SBV[12], and the Law[13] on Credit Institutions. These Laws were subsequently amended and supplemented in 2003.

In a comparison of the Ordinance and the Law on the State Bank, it is noticed that the goals and targets for conducting monetary policy are not mentioned in the former but are in the latter. In the Law, the National Assembly oversees the conduct of national monetary policy and the annually targeted inflation rate, in consideration of a balanced budget and economic growth rate. Meanwhile the Government reports to the National Assembly on the national monetary policy, annual inflation target, and annual monetary aggregate[14].

Furthermore, the new Law also paved the way for the establishment of the NMPAB. As mentioned, the NMPAB is chaired by deputy prime minister. Members include the Governor of the SBV as standing member, representatives from Ministry of Finance, Ministry of Planning and Investment and relevant agencies and banking sector specialists. The ultimate task of the NMPAB is to advise the Government on monetary policy issues. It is interpreted that the Law holds the National Assembly and the Government, of which the SBV is an integrated part, as responsible for the monetary policy setting. The National Assembly, together with the Government, sets monetary policy objectives and the stance of monetary policy. Apart from setting the policy objectives, it also supervises the implementation of monetary policy. The strong involvement of the Government in the implementation of monetary policy, at least de jure, suggests that the instrument independence of the SBV is limited (Carmen, 2006). The dependence of the SBV on the Government is clearly reflected in a new Decree[15] on the organizational structure and operational authority of the SBV. The new Decree specifies that the SBV is a body of the Government. The SBV is under close guidance of the Government on monetary issues.

Along with the transformation from the Ordinance to Law on the SBV, the Ordinance on banks, credit co-operatives, and finance companies was upgraded into the Law on Credit Institutions which distinguishes institutions into bank and non-bank institutions. The revision of the Law in 2003 opened the way for the creation of policy banks which do business on a non-profit basis.

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[9] Article 5 of the Law on the SBV (1997) and revisions in 2003
[10] Ordinance 37/LTC-HDNN8
[11] Ordinance 38/LTC-HDNN
[12] Law 01/1997/QH10
[13] Law 02/1997/QH10
[14] Article 3 of the Law on the SBV
[15] Decree 52/2003/NĐ-CP

2.3.2.3. Monetary Policy Strategy

According to the Law on the State Bank, the aims of monetary policy are "to stabilize the value of the currency, curb inflation, enable socio-economic development, maintain defense and security and bolster the people's living standard"[16]. Given these endowed objectives, Carmen (2006) realizes that while the "stabilization of the value of the currency" is interpreted as stabilization of the exchange rate, differently from the price stability objective. It is noted that the SBV faces with conflicting multiple monetary goals between socio-economic development, which is closely related to economic growth, and the price stability.

Theoretically, there is a tradeoff between inflation and economic growth. A central bank has to consider pursuing one of the two goals. By the Law, the SBV is assigned to follow both. It leads to the situation that the SBV sometimes faces a dilemma in formulating policy to pursue the multiple monetary goals. Therefore, Carmen (2006) further claims that while the hierarchy of targets is not firmly established, the economic policy of Vietnam suggests that economic growth is the de facto primary target of the Government.

According to the Five-year Plan of Development on Social and Economic Development Strategy formed by the Communist Party, the Government is responsible for formulating the action plan for the five-year period, and the SBV designs the action plan for the banking sector. Under this action plan, the strategy for monetary policy, as interpreted by Carmen (2006), is to set annual targets for the depreciation of the VND, for total liquidity (M2) and for credit in the economy.

2.3.3. Conduct of Exchange Rate Policy

2.3.3.1. Overview of Exchange Rate Evolution

Before 1988, Vietnam operated a fixed and multiple exchange rate system with two official exchange rates for foreign trading and non foreign trading (or internal exchange rate). The latter was applied to transactions among domestic economic agents and also used for state budgeting in regard to foreign aid mainly coming from the former Council of Mutual Economic Assistance (CMEA) and Soviet Union. Based on the argument that there was large spread between official exchange rate and "black market" exchange rate, in 1988 the SBV decided to greatly devalue VND by 300% for trade transactions[17] and 850% for non-trade transactions[18]. In March 1989, these two exchange rates were unified to a single rate and stood at VND4500/USD, approaching the level of the parallel foreign exchange market (Thanh, 2000).

As a result of the major depreciation of the exchange rate, an increase in input prices led to an increase in costs of production, and thus inflation. Inflation rate rose from 34.7% in 1989 to 67.5% in 1991. In facing this situation, the SBV decided to increase the nominal deposit rate to 12% per month to keep the real interest rate positive. The very high nominal interest rate attracted a lot of deposits from individual and legal entities. It is necessary to note that the exchange rate was fixed in a discretionary way by the Government or pursuant to agreements signed by Vietnam and other countries. As the matter of fact, the exchange rate was not very meaningful since the government monopolized foreign trade and strictly controlled foreign exchange.

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[16] Article 2 of the Law on the State Bank of Vietnam (1997)
[17] from VND225/USD to VND900/USD
[18] from VND368/USD to VND3500/USD

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Figure 8: Nominal Exchange Rate During the 1986-2006

Nominal VND/USD Evolution
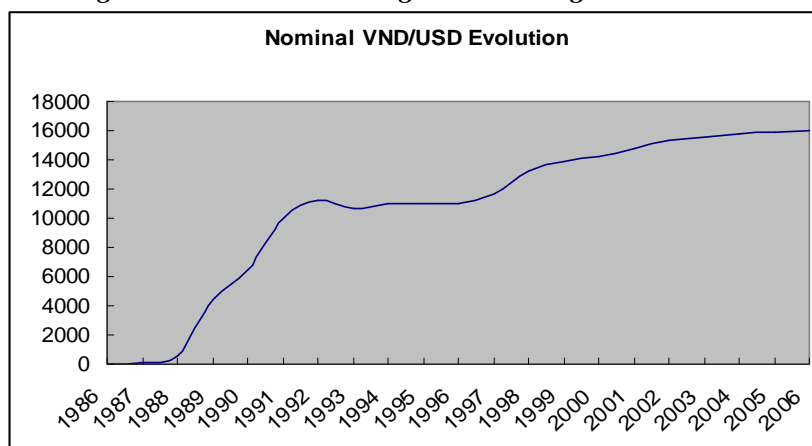
Source: IFS

During the period 1989-1991, after unifying the multiple exchange rates, the SBV started a new regime whereby it announced the official exchange rate for financial institutions to follow. This official exchange rate was set based on auction-based rates at two foreign exchange floors in Hochiminh city and Hanoi, where the SBV played an overwhelming role in influencing the demand and supply of foreign exchange. The exchange rate regime was as follows: the SBV announced the official exchange rate, and financial institutions determined their selling and buying exchange rate within a band. The trading band for spot transactions was +/- 0.5% in August 1991. However, the Government still kept strict control over foreign exchange by issuing various regulations on foreign exchange management[19] According to these regulations, all foreign exchange earnings had to be deposited with or sold to banks. In 1992, restrictions[20] were imposed on foreign exchange transfers through border entrance and exit controls.

The period 1992-1998 is seen as a fixed exchange rate regime where the VND was set, fixed and pegged to the dollar. The objective of exchange rate policy during this time was to stabilize the macro-economy.

In 1994, the two foreign exchange transactions floors were replaced by a new inter-bank foreign exchange market for all financial institutions, among which the SBV played an influential role as the seller and buyer of last resort for foreign exchange. In the inter-bank foreign exchange market, the SBV established its role by a mechanism of announcing the official exchange rate. In general, the nominal exchange rate under this mechanism was quite stable. Due to a band of only +/- 0.5% on the official exchange rate, the market exchange rate was not very volatile. The band was then widened to 1% in 1996. Thanh (2000) sees that in early 1992, the SBV made an intervention in the foreign exchange market when it tried to revalue the nominal exchange rate from VND 14,000 at the end of 1991 to VND 12,000. The exchange rate remained stable during the period 1993-1996 at around VND 10,000-11,000 per USD.

Because of the Asian financial crisis in 1997, currencies of most economies in the region fell sharply relative to major currencies. The currencies of hard-hit economies such as Thailand, Indonesia, and the Philippines fell more precipitously compared with the VND. As a result, VND became overvalued relative to those currencies (Ohno 2003). Faced with the falling of foreign reserves plus the increases in BOP deficits, the exchange rate band was further widened to +/- 5% in February and to +/- 10% in October 1997. In February 1998, the official central rate itself

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[19]   Decree 161/HDBT on foreign exchange rate management, Order 330, Decision 337, Decision 396
[20]   Decision 175-QD/NH7

was devalued from 11,175 VND/USD to 11,800 VND/USD, and to 12,998 VND/USD (Aug., 1998) and the band was narrowed down to 7% (one-side band) (Hien, 2007)

Until early 1999, the SBV had been successful in controlling the exchange rate. First, the exchange rate volatility was reduced to stabilize the macro economy and to control inflation. Second, the official exchange rate was adjusted so that it moved closer to the market exchange rate (Hien, 2007). Since frequent adjustment of the official exchange rate and trading bank rates risked jeopardizing market confidence in the sustainability of the exchange rate, in February 1999, Vietnam adopted a managed floating exchange rate regime. Under this regime, the SBV announced the official exchange rate in the inter-bank foreign exchange market based on previous transactions. Based on the official exchange rate announced by the SBV, credit institutions set their trading exchange rates within a band of +/- 0.1%[21]. In 2002, the band was increased to 0.25% and currently stands at +/- 0.75% in December 2007. As the result of this new arrangement for the exchange rate regime, the official exchange rate has been close to the prevailing market exchange rate, and the exchange rate regime is partly considered as a flexible regime.

Since 2005, the IMF has categorized the Vietnamese exchange rate regime as a de facto conventional fixed peg. In December 2005, a new Law on foreign exchange management was issued in order to boost economic growth and improve the balance of payments, thus achieving a phased approach to the convertibility of the VND to foreign currency. Also in the same year, Vietnam agreed to the obligations of Article VIII of the IMF Articles of Agreement, and current account transactions were liberalized. An Ordinance on Foreign Exchange Management was enacted in December 2005 effective from 1 June 2006, and is characterized by the liberalization of current account transactions and relaxation of controls over capital account transactions.

2.3.3.2. Fluctuation of the Exchange Rate

Figure 9: Nominal Effective Exchange Rate
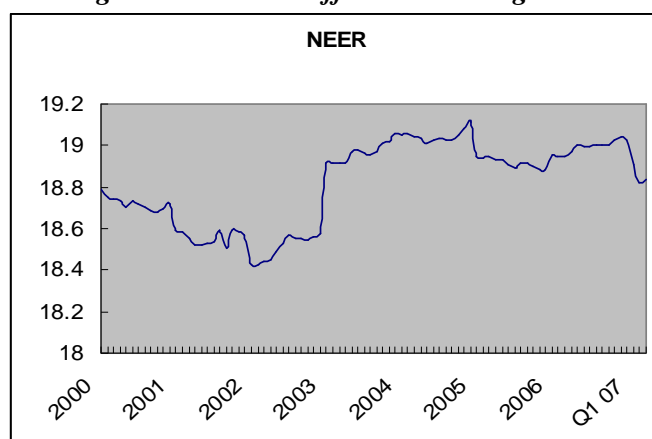
Source: Own Calculation[22] based on IFS data

During the period 1992-1995, the real effective exchange rate (REER) appreciated greatly due to the impact of deregulation in the early stages of reform and the strong growth of FDI (IMF, 2003). Meanwhile, the appreciation of the REER in the period 1995-1998 was caused by high inflation and strong capital inflows including FDI, ODA and export receipts (IMF, 2003 and 2006). Because of the adverse impact of the Asian financial crisis, the reversal of capital flows including FDI and export receipts had caused deterioration in the balances of payments of many regional economies, hence leading to a general depreciation of most currencies. The larger

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[21] Decision 65/1999/QD-NHNN7
[22] See Appendix 1 for details of calculation method

depreciation of other currencies in the region relative to the VND in nominal terms made the VND more expensive to these regional currencies. As a result, the export competitiveness of Vietnamese commodities in the world market was weakened. The SBV had to intervene in foreign exchange markets to keep the VND value relatively lower than those of other currencies, thus leading to a depreciation of the nominal effective exchange rate (NEER) and thereby, the REER in 1999. However, the NEER and REER were relatively stable in the deflation period 2000-2001 when exports recovered.

Figure 10: CPI based Monthly Real Effective Exchange Rate
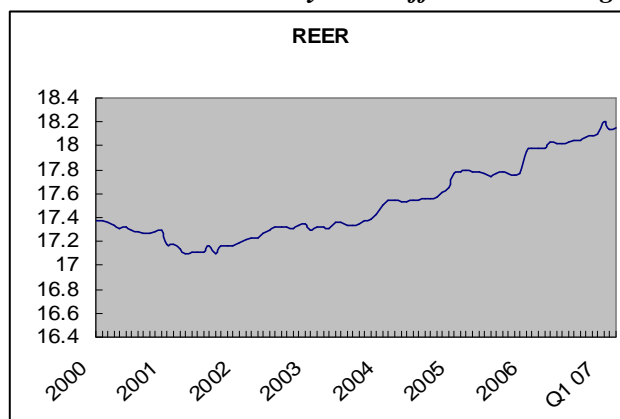
Source: Own calculation[23] based on IFS

As shown in Figures 9 and 10, during 2001-2003, both the NEER and the REER confirmed an appreciation of the VND. The appreciation signal reversed the following year when the NEER of the VND significantly depreciated by 11.5% between 2003 and 2004. According to Figure 10, in the period 2003-2007 the REER followed a trend of gradual depreciation. According to a report of the IMF (2004), the depreciation of the REER was to a great extent due to the depreciation of US dollar against other major currencies at the same period. The VND was said to be de factor pegged to the dollar, thus depreciating. In addition, the increased openness of the economy was attributed to the depreciation of the REER. Even though the VND followed the trend of gradual depreciation, in 2004 and 2006, a limited appreciation of VND was observed. The appreciation of the REER has resulted from high inflation since the end of 2004 (IMF, 2006). Interestingly, the IMF (2006) states that the appreciation of REER has not affected external competitiveness because of the growing share of Vietnam in world and Asia trade since 1999.

Theoretically, there is a mixed explanation regarding the movement of the REER. The IMF (2006) finds that the current depreciation of the REER is consistent with the economic fundamentals and that the VND currently does not appear to be significantly misaligned. However, following the argument of Balassa-Samuelson[24], if Vietnam gains productivity increases in traded industries, an appreciation of the VND and inflation in non-traded sectors will be observed. In fact, we observed the latter but not the former. This implies an intervention of the SBV in the foreign exchange market.

2.3.3.3. SBV Intervention on Exchange Rate

In order to intervene in the exchange rate, central banks basically use monetary policy and the foreign exchange reserve. In Vietnam the SBV tends to use both to influence the exchange rate. In response to growing capital inflows, the SBV intervened in foreign exchange market by buying foreign exchange, thus selling the VND. This is reflected in the performance of balance

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[23] See Appendix I for details
[24] To be discussed in chapter 3

of payments and foreign exchange reserves since 2004. The increase of foreign exchange reserve increases with the increase of capital inflows. However, the gradual depreciation of the real and nominal effective exchange rate implies that the SBV has made foreign exchange interventions.

Figure 11: Indication of SBV Intervention

Foreign Correlation Reserve and Capital Account
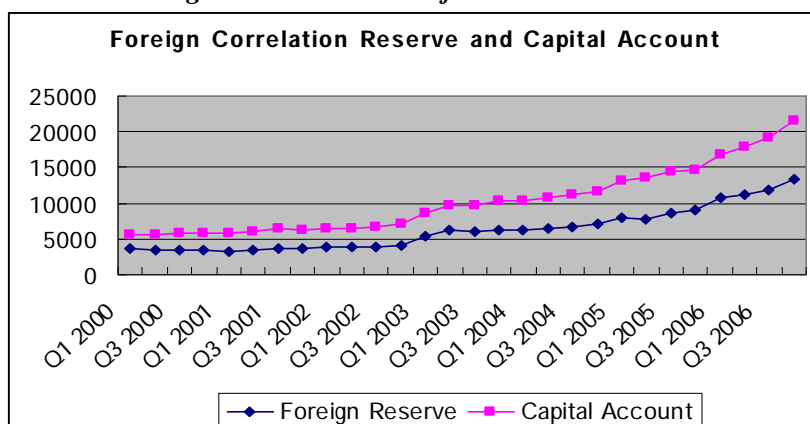
Source: IFS

The expansion of the stock market has attracted a lot of portfolio investment capital. Figure 11 shows an increase capital account at the same time as the faster increase in foreign reserve.

Figure 12: Interest Rate in Vietnam
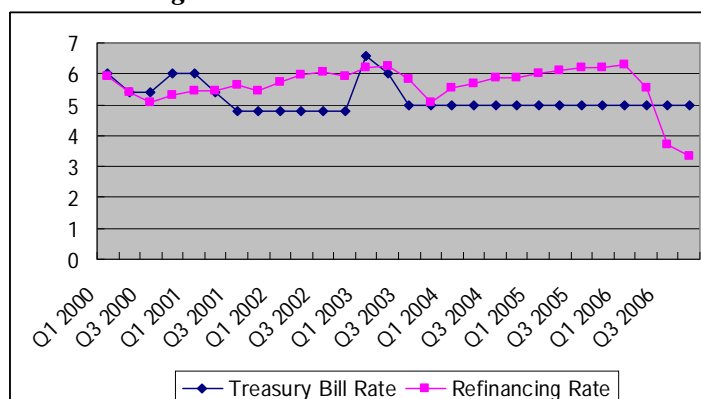
Source: IFS

Other evidence of SBV intervention is the interest rate instrument. During the period 2004-Q1 2006, the refinancing rate was adjusted to grow. The SBV has three times raised the refinancing and discount interest rate. According to interest parity theory, an increase in interest rates would attract capital inflows, thus leading to the appreciation of the nominal exchange rate. In fact, depreciation of the observed nominal exchange rate (Figure 8) might reflect the fact that the SBV tried to keep the exchange rate stable by undertaking a sterilized foreign exchange intervention (Hien, 2007). The picture of foreign exchange intervention became clearer in the year 2007 when the SBV used an amount of 144 trillions VND to buy 9 billions USD, thus keeping the exchange rate stable in the presence of large capital inflow. However, sterilized policies such as increasing reserve requirement ratio, sale of government bonds were considered ineffective to absorb the excessive liquidity, which was followed by rising inflation.

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2.4. Determinants of Inflation[25]

Empirical studies of the IMF (2003 and 2006) on inflation identified some of the determinants or causes of the prevailing inflation in Vietnam until 2003. According to the empirical results, food supply and oil shocks and the administered prices and demand pressure played important roles in deciding the level and trend of CPI inflation. The study in 2003 also found that core inflation is very sensitive to changes in oil price shocks and to exchange rate changes.

2.4.1. Food and Oil shocks

Before 2001, food and foodstuffs accounted for over 60 percent of the CPI basket. The weight of food decreased to 48 percent when the living standard survey of 2000 was released (IMF 2003). According to the IMF (2006), food price inflation in Vietnam was higher and more volatile than in other countries in the region and was the most important contributor to the pick-up of inflation in 2004.

Table 1: Decomposition of CPI Inflation

Contribution to CPI Inflation (Period Average)				
	2003	2004	2005	Jan 2006 - Aug 2006
CPI Inflation	3.2	7.7	8.3	7.8
Food and Foodstuff	1.1	5.4	4.9	3.8
Housing, Construction and Transportation	1	0.7	1.4	1.7
Others	1.1	1.6	2	2.3

Source: IMF (2006)

During the period 2003-2006, the average increase in food price accounted for nearly 53 percents of CPI inflation. According to Table 1, in 2004, and 2005 the pick-ups of inflation of 7.7 and 8.3 percent were contributed by 5.4 and 4.9 respectively, of price increases in food and foodstuffs. It is reasoned that the increase in international food prices, especially rice, of which Vietnam is the world's second largest exporter, contributed to CPI inflation in 2004. Moreover, the IMF (2006) argues that because of an outbreak of bird avian influenza, which occurred in early 2004, demand for substituted foods such as beef, fish and seafood prices increased, while widespread droughts subsequently led to supply shortfalls for other domestically-produced food products.

While food is largely attributed as the cause of the CPI inflation during the mid 2000s, petroleum price increases had both modest direct and indirect effect on inflation during the period 2001-2005. The direct effect of the petroleum price is through fuel and lubricants. The increase in petroleum price has immediate impact on the fuel and lubricants price. Meanwhile, the indirect effect is through public transport and electricity. Soaring petroleum price directly raises the cost of transport and electricity, thus weakening competitiveness of industries that heavily depends on electricity and transport. However, the effect of petroleum on inflation may be small because of the low weight of petroleum products in the CPI.

In order to reduce the adverse impact of external shock on domestic inflation, the government used a combination of import duty reductions and the management of administered prices. In response to the rising pressure of world oil price, the domestic petroleum price was increasingly adjusted (nine times) during the period from the end of 2003 to August 2006, but the domestic prices still remains below the world levels. In 2006, the government allowed domestic petroleum enterprise to increase the price in April and August by 18.5 percent (IMF, 2006). However, the indirect effect of oil shocks, through the increases in prices of housing and construction

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[25] I draw heavily on arguments of IMF (2003 and 2006)

materials, transportation and telecommunications, garments and household goods and equipment, seems to be substantial.

2.4.2. Administered Prices

During the early stages of the transition to a market mechanism system, prices were heavily administered. One reason for this was the hyperinflation observed right after the institution of general price deregulation in 1986. In response to high inflation, the Government decided to impose heavy price controls[26] on commodities such as rice, cement, urea fertilizer and steel for construction. Recently, such regulations were removed and prices were liberalized to some extent. Still, prices of key commodities and services including electricity, water, petroleum products, air tickets, bus fares, postal services and telecom charges are set by the government. The administered prices currently account for less than 10 percent of the CPI basket (IMF, 2003). However, high inflation was observed after price controls were liberalized and during the period when the administrative controls on some prices were tightened. It is possible to assume that inflation might have been understated during the period of heavy price administration. While it is difficult to construct a correlation between price deregulation and the pick-up of inflation, price liberalization could play a role in increasing the impact of monetary conditions on inflation (IMF, 2003).

2.4.3. Demand Pressures

Theoretically, excess demand is closely linked with a pick-up of inflation. The output gap, the most common measure of excessive demand, is normally defined as the gap between actual output and potential output in which the latter is the level of output consistent with stable inflation. When output grows above its long term potential rate, inflation would start to increase as production growth leads to higher demand for employees and wages, thus leading to higher costs of production and firm prices (IMF, 2003). In reality, the potential output is measured by computing the trend of actual output. As I use monthly data, which is influenced by the business cycle, and the output gap changes the sign in 1997, the time of the Asian financial crisis, and reverses in 2004, signaling the full economic recovery from the financial crisis.

Figure 13: Output Gap of Yearly Industrial Output 1995-2006
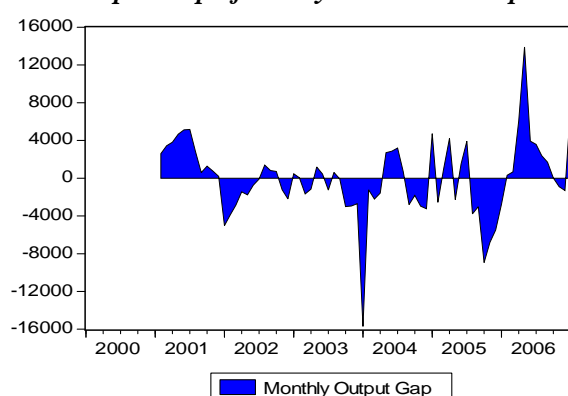
Source: The SBV Data

The increasing demand has partly been underpinned by the rising of wages in both the civil services sector and in foreign invested enterprises. It is easily noticed that the price of non-traded goods has increased rapidly after each wage increase since 2003[27]. Coupled with rising food prices, inflation in non-traded goods undermined the value of wage increases, thus jeopardizing

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[26] Decision 137 of April 27 1992
[27] During the period of 2003-August 2007, four occasions of minimum wage increase were observed (GSO).

the quality of living of citizens. In Figure 13, a positive gap starting from early 2004 also signals a new trend of rising demand after a long period of 1997-2003 when the economy was adversely affected by the Asian financial crisis.

3. Method of Study, Data Description, Empirical Results and Analysis

3.1. Method of Study

In order to derive the method for analyzing the ERPT which is the percentage change of import price due to a percent change in exchange rate, it is necessary to start with the relationship between exchange rate and import price. As previously mentioned, a complete ERPT is a complete translation of exchange rate change to import price, while a partial ERPT does not fully transmit the full exchange rate change to the import price change. A zero ERPT means that exchange rate change does not affect the import price. The exchange rate change will definitely affect the price of imports and the price of imported inputs for production.

Following the Law of One Price exchange rate theory, we have:
$$P_h^m = EP_f^x \qquad (1)$$
where h denotes the home country, f is foreign country. P_h^m is the import price measured in home country currency. P_f^x is the exporting price measured in foreign currency, E is the exchange rate between home currency vis-à-vis foreign currency (home currency/foreign currency).

According to Hooper and Man (1989), Goldberg and Knetter (1997) and Campa and Goldberg (2002), it is assumed that foreign exporting firms have sizeable power in setting the price. The pricing setting behavior of foreign exporting firms depends on the markup ($Markup^x$) on marginal cost of production (C_f^x) of foreign exporting firms as follows:

$$P_f^x = Markup^x C_f^x \qquad (2)$$

Hooper and Man (1989) argue that an exporting firm's markup is dependent on the market demand pressure in both foreign and home market (Y)[28], and competitive pressure in the home country market. The competitive pressure in the importing market is measured by the profit margin, i.e. price over production costs. The markup is then presented as follows:

$$Markup^x = \left(\frac{P_h}{EC_f^x}\right)^\alpha Y^\beta \qquad (3)$$

where $\left(\frac{P_h}{EC_f^x}\right)^\alpha$ represents competitive pressure in the home market and Y^β represents demand pressure in both home and foreign market and $0 < \alpha < 1; \ \beta > 0$.

From (1), (2) and (3) we arrive at the import price as follows:

$$P_h^m = E\left(\frac{P_h}{EC_f^x}\right)^\alpha Y^\beta C_f^x \qquad . \qquad (4)$$

We simplify (4) to reveal:
$$P_h^m = (EC_f^x)^{1-\alpha} P_h^{\ \alpha} Y^\beta \qquad . \qquad (5)$$

The logarithm of the above equation and the lower case characters will reveal the result as:

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[28] In the case of home market, the demand pressure is positively correlated to import penetration since it is to mean the demand for import goods

$$p_h^m = (1-\alpha)e + (1-\alpha)c_f^x + \alpha p_h + \beta y \quad . \qquad (6)$$

Equation (6) is interpreted to mean that import price is influenced by the exchange rate (e), marginal cost of production of foreign firm (c_f^x), the home country price level (p_h) and market demand for both home and foreign country (y).

Equation (6) also indicates the ERPT of the home country. As previously argued, the ERPT of the home country is $(1-\alpha)$, showing the elasticity of import price with respect to exchange rate. If $\alpha = 0$, we have complete or full pass-through[29] effects and the exporting firm faces no competition in exporting. It is thus capable of adjusting the price at any time. On the other hand, if $\alpha = 1$, the exchange pass-through is zero, the exporting firm faces tough competition in exporting and thus has no power to adjust the price. Incomplete pass through is defined as α between zero and one.

In practice, researchers usually use a control variable so as to better reflect the movement of import prices, such as oil shocks to represent supply shocks on the world market, and monetary policy in the home country which indicates the policy response to a given situation. The output gap is used to present the shock in demand pressure.

In order to analyze the movement of ERPT, we rearrange the function (6) for α, since the level of the ERPT equals $(1-\alpha)$, there is an inverse relationship between α and the level of ERPT. We have:

$$\alpha = \frac{p_h^m - e - c_f^x - \beta y}{p_h - e - c_f^x} \qquad (7)$$

From (7) we find that:

- If y increases (rising demand in both home and foreign markets), α decreases and ERPT increases and vice versa. The import penetration represents the proportion of imported goods in CPI basket. As the domestic demand increases with the rise of import goods to satisfy domestic needs, it is possible to state that import penetration can indicate a rise in domestic demand and therefore increases the ERPT.
- If p_h increases, raising inflation in the home market, α decreases and ERPT increases and vice versa;
- If p_h^m decreases, α decreases and ERPT increases and vice versa;
- A decrease in e or a depreciation of the currency leads to decrease in α and an increase in ERPT[30] and vice versa.

Therefore, a change of the ERPT will reflect the impact of the factors mentioned above on the pricing behaviors of firms. Although, it is difficult to disaggregate the role of each factor in determining the ERPT, it is possible that the most influential factors can be identified.

3.2. Empirical Framework

Since the objective is to ascertain the level of ERPT in Vietnam and its pass-through to domestic prices as well as the role of exchange rate in transmitting the impact of shock to inflation, the

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[29] Even though the ERPT of 1 is defined as complete pass-through, it should be noticed that there are cases that ERPT is greater than 1, indicating that foreign exporters are overreacting to exchange rate shocks (Lian An, 2006).
[30] Because α is generally less than 1, it follows that in function (7), a similar decrease in both denominator and nominator make the function smaller.

VAR approach is adopted to capture the level of ERPT and its transmission into domestic prices. It is realized that many empirical researchers follow a well-quoted paper by McCarthy (2002) to use the VAR method to examine the pass-through effect of exchange rate and import price changes into producer (PPI) and consumer (CPI) inflation. McCarthy (2000) examines the ERPT in industrialized countries through analyzing the model of pricing along a distribution chain, that is from an exchange rate change to the import price (IMP), the producer price (PPI) and finally to the consumer price (CPI). Though data on the PPI are not available, the distribution chain model is used with a relaxation on PPI. This relaxation will not pose any problems for the results the ERPT, however the pass-through from exchange rate to domestic prices is possible to be affected.

Following the above arguments of method of study, the oil prices are used to capture the foreign pressure and output gap is for domestic demand pressure. Both variables are to indicate y. Nominal effective exchange rate is used to represent the exchange rate. Effective import price of major trading partners is used in the model. The home price level (p_h) is represented by consumer price index to reflect the change in price in domestic market. In order to capture the effect of the Government policy responses, the broad money is added to the model.

Therefore, the unrestricted VAR (the normal VAR) of the following format is used:

$$Y_t = \Gamma_0 + \sum_{i=1}^{n} B_i Y_{t-i} + u_t \quad [31]$$

where Y_t is the 6 vector of variables [Oil prices, NEER, GAP, IMP, CPI, M2] which are explained in more detail in the next section. B_i are coefficient matrices of size 6x6, u_t is error disturbance, and Γ_0 is the intercept.

The monthly data during the period M1:2001 until M2:2007 is used with a total of 73 observations. The data is extracted from the General Statistics Office of Vietnam (GSO), IMF International Financial Statistics (IFS) and the SBV. All the data, except for output gap, is seasonally adjusted and in the form of a logarithm[32]. The data is explained in detail as follows:

Exchange Rate:
The normalized nominal effective exchange rate (NEER) is used because it better reflects the exchange rate of Vietnam with its respective trading partners. The NEER is expressed in terms of VND/foreign currency. Therefore, an increase of the NEER means a depreciation of the VND, and a decrease of the NEER means an appreciation of the VND. All exchange rate data is extracted from IFS. The NEER is normalized to 100 in year 2000. The details regarding measurement of NEER are presented in Appendix 1. The trading activities of the country are high at the end and beginning of the year and thus are influenced by seasonal factors, and it is reasonable that the NEER is affected by these factors. The seasonal adjustment is made to remove this effect. Since the NEER is Integrated of Order 1 I(1) (i.e. containing a unit root or non-stationary variable), the difference of logarithm of the NEER, which reveals I(0) or stationary, is used in the conventional VAR model.

Output Gap (GAP):
By definition, the output gap is the difference between real output and potential output. An excess of real output over potential output implies that the economy is growing over its long-run capacity or, in other words, over the full employment capacity; therefore the output gap is used to imply excess demand in the economy. The excess of real output over potential output is

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[31] Following the formula of Lian An (2006)
[32] Since log-transformed data is normally distributed, it produces a better result than the untransformed data.

reflected by a positive output gap, while real output lower than a potential one means a negative output gap. In reality, the traditional method of measuring the output gap is the residuals from a regression of the log of industrial production indices on a constant plus linear and quadratic trend. This method is proposed by Hodrick and Prescott, called Hodrick-Prescott method. The output gap does not need to be seasonally adjusted because the seasonal effects are removed through the smoothing of output in the HP method. The Eviews software is embedded with HP method function to calculate the GAP.

Oil Prices:
Oil prices are used to present a supply shock to the economy. The supply shock will definitely influence the import price and thus the consumer price. Oil prices are extracted from the IFS where the UK Brent oil price indices are found. Since oil prices are affected by seasonal issues, a seasonal adjustment of the oil inflation is applied. The Augmented Dickey-Fuller (ADF) test reveals that the oil prices are I(1) or non-stationary, the difference of oil price index (in logarithm) is taken to achieve a I(0) or stationary variable which can be used with the conventional VAR.

Consumer Price Index (CPI):
Conventionally, CPI is used to measure domestic inflation. In this study, both the CPI and inflation are used interchangeably. CPI (CPI of January 2000=100) is used as based period to measure the inflation. The data is extracted from IFS. The CPI is seasonally-adjusted to remove any seasonal effect. The CPI is always high at the beginning and the end of the year, and at the time of holidays. An ADF test reveals that the CPI is I(1) so the difference of the logarithm CPI is applied to arrive at a stationary variable.

Import Price Index (IMP):
The data on import price index is calculated by transforming the export price index of trading partners with Vietnam as follows:

$$IMP = \sum_{i=1}^{k} \left(EXP_i \right)^{wi}$$

where EXP_i is the export price index of trading partner i, and wi is the trade weight (import weight) of that trading partner with Vietnam. The number of trading partners is presented in Appendix I with the report from GSO. Like the CPI, the IMP is seasonally affected, and seasonal adjustment is used to remove the seasonal effect. The ADF test also indicates that the IMP contains a unit root, (i.e. I(1) or non-stationary variable) and the difference of the IMP is used in unrestricted VAR.

Broad Money (M2):
In contrast to other papers which use the short term interest rate to reflect the monetary response to CPI inflation, broad money (M2) is used as a proxy for the monetary response because M2 can better reflect the monetary policy response. In Vietnam, as the interest rate is sometimes not very effective, the SBV uses other monetary instruments such as reserve requirement, refinancing facility or even "window guidance"[33] to respond to the market. Therefore, short term interest rate might not reflect the determination of the monetary authority in the market. Similar with the CPI, M2 is considered to be seasonally variable because monetary policy usually has to response to seasonal matters. A seasonal adjustment is thus used. In addition, the ADF test also reveals a unit root in M2 (i.e. I(1), a non-stationary variable). The difference of M2 will be used in unrestricted VAR.

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[33] This implies that the SBV uses administrative orders to State-owned commercial banks, with which the SBV is very influential, to achieve monetary targets.

3.3.Empirical Results

EViews software version 5.0 is used to implement all tests. The calculation of the NEER and the IMP is made by the author.

Unit Root Test:
The Augmented Dickey Fuller (ADF) Unit Root Test reveals that all variables except for GAP are integrated of order I or I(1) (i.e. non-stationary); the difference of I(1) variables arrive at I(0) or stationary variables; the unrestricted VAR of for stationary variables is used to estimate the time series relationship between variables. All ADF Unit root test results are presented in Appendix II.

Vector Auto Regression (VAR) Estimation:
The result of lag length tests presented in Appendix II reveals that the testing optimal lag, in different criteria, is significant at both 4 and 9. Out of three tests of lag length, the SC test and LR test confirm the same answer of lag 4, while the AIC test results in a lag length of 9. As the AIC tends to select complicated lag, the SC selection, with shorter lag length of 4, is used. The lag length were conventionally used in many studies including Taylor (2000), IMF (2003) and Lian An (2006) where the lag length ranges from 4 to 6 (e.g. 4 for Taylor, 2000). In economic term, it is reasonable that the impact of shocks in oil prices, exchange rate, output gap, and monetary policy tend to be effective after 4 months

Except for the GAP, all the other variables are in the format of logarithm and difference, and the result in regression will be shown in D(LNEER), D(LIMP), D(LCPI), and D(LOIL).

Impulse Response Test:
The impulse responses to the related variables presented below are estimated over a period of two-year (24 months) horizon. Cholesky[34] was used to track the impact from one factor to the other factor depending on the ordering. The order of variables represent the transmission of shock as: D(LOIL), D(LNEER), D(LIMP), GAP, D(LCPI), and D(LM).

Responses to an Exchange Rate Shock: According to the accumulated impulse response results displayed in Figure 2 of the Appendix II, the one standard deviation of D(LNEER) leads to positive response of D(LIMP), GAP. As for D(LCPI), the result shows a slight decrease in the first fourth periods and increase from period 5 to period 15 after the shock. The reversal in the following periods implies a die-out of the exchange rate impact. In a few periods following the exchange rate shock, the D(LM2) increases and represents a large reversal in later periods. In general, the responses are reasonable. A depreciation of the currency leads to increase in import price, and thus favoring net export to increase output. The rise of import price results a pressure in consumer price. In response to rise of consumer price, a tightening monetary policy will help curb the price pressure.

In order to measure the pass-through coefficients, the translation of shock from one standard deviation to one percent is made. Various papers [35] have applied the method called standardization of the exchange rate shock to measure the pass-through level.

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[34] The Cholesky method is different from the Generalized Impulse which does not depend on the VAR ordering.
[35] McCarthy (2000), Lian An (2007); Ito and Sato (2006). See the Appendix I for details of the formula.

Table 2: Standardized Exchange Rate Pass-Through Coefficients

Pass-Through Coefficients					
Period	**IMP**	**CPI**	**Period**	**IMP**	**CPI**
1	-0.37	-0.1	**13**	0.24	0.11
2	0.77	-0.05	**14**	0.07	0.06
3	0.1	-0.09	**15**	0.13	0.03
4	0.95	-0.11	**16**	-0.01	0
5	1.32	0.03	**17**	-0.08	-0.03
6	1.04	0.13	**18**	-0.06	-0.06
7	1.03	0.15	**19**	-0.09	-0.08
8	0.48	0.2	**20**	-0.12	-0.09
9	0.92	0.2	**21**	-0.18	-0.11
10	0.48	0.21	**22**	-0.19	-0.13
11	0.36	0.21	**23**	-0.19	-0.14
12	0.21	0.13	**24**	-0.21	-0.15
Average	**0.61**	**0.08**		**-0.06**	**-0.05**

As shown in Table 2, the ERPT level is in the IMP column and pass-through of exchange rate to consumer price is in the CPI column. Basically, the pass-through of exchange rate shock to prices is large in the first year and retreats in the following year.

Concerning the ERPT, in the first year, the general average ERPT is 0.61, meaning that 61% of the exchange rate change is transmitted into import price. In particular, the period 3 to 7 shows a complete pass-through. Especially, the periods 5 through 7 indicates a more than complete pass-through implying overreactions of firms due to an exchange rate shock. This is reasonable because most of import contracts are signed on the basis of future delivery. When exporters and importers perceive a shock in exchange rate at the time of contract signing, they will incorporate this change into the contract to be delivered in the following months. From the coefficients of ERPT, it is possible to conclude that the impact of exchange rate is really removed in 15 month after the shocks. Within 15 months, the ERPT is in the band of 0.07 – 1.32[36] or 0.61 on average.

Compared with the ERPT, pass-through of exchange rate to consumer prices is minor and slower. A positive shock in exchange rate leads to positive response of CPI from period 5 to period 15. The highest response of CPI is seen in period 10 and 11 after the shock when CPI increases by 0.21 percent in response to 1 percent depreciation of the currency. Although the average pass-through in the first year is 0.08, it becomes 0.16 if the negative response is taken out. This result is smaller than pass-through of 0.25 for the first year as measured in IMF(2003). There are several reasons to explain for this change. First, the average CPI inflation for period of 1995-2003 used in the IMF study of 5.4 is slightly higher than that of 4.9 in period of 2001-2006. Taylor(2000) hypothesizes that lower inflationary environment generally leads to lower the pass-through. Therefore, lower inflation in period of 2001-2006 relative to period of 1995-2003 can explain for the lower pass-through. Second, the less dollarization in the economy in current period is another factor to explain for the decreased pass-through of exchange rate to consumer

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[36] The coefficient of -0.37 is not mentioned since the first period is normally considered unaffected by the shock.

prices. As argued in Chapter III, the level of pass-through is positively linked with degree of dollarization. The less dollarized the economy is, the lower the pass-through. Third, deregulation in interest rate policy from beginning of 2000's could potentially reduce the pass-through. When the SBV is equipped with stronger policy instrument, the SBV is capable to response to price pressure. Hence the impact of exchange rate change on consumer prices was reduced, so was the pass-through.

It is reasonable that the response of CPI is smaller than that of IMP due to exchange rate shock. Because the impact of exchange rate shock dies out along the model of pricing along the distribution chain (Taylor, 2000), that is the impact of the exchange rate change is transmitted to import price, producer price[37] and consumer price. Ito et al. (2005) argues that the impact of the exchange rate on CPI is much more indirect and remote than that of imported prices. The level of pass-through from exchange rate to CPI also depends on the monetary policy regime. If the monetary policy is accommodative or pro-cyclical to prices due to changes of imported prices, the CPI pass-through may become higher, while a counter-cyclical monetary policy will minimize the level of pass-through.

Responses to an Import Price Shock: Figure 3 in Appendix II displays the responses of related variables to a one standard deviation of D(LIMP). Due to a positive shock in D(LIMP), there follows a rise in D(LCPI) and reduction in GAP and D(LM2). As argued, the import prices increase with the consumer prices. Facing with rising pressure in consumer price, tightening monetary policy is adopted by the central bank. The reduction in GAP in this case tends to be a result of monetary tightening rather than the shock in import price.

Responses to an Oil Shock: Figure 1 in Appendix II presents the impulse responses due to a one standard deviation shock of D(LOIL). The shock in oil prices lead to positive responses in D(LNEER), D(LIMP), D(LCPI) and D(LM2) and negative response of GAP. Shock in D(LOIL) will lead to increase in foreign interest rate thus causing depreciation of the currency, as seen by an increase in D(LNEER). In degree of response, it is noted that the response of D(LNEER) is much smaller than those of D(LIMP) and D(LCPI). This means that the rising of import price is more due to rising cost in foreign firms than a result of exchange rate depreciation. The negative response of GAP is reasoned that higher import price increases the cost for imported inputs for local production. Hence, rising costs depress the production as denoted by reduction in GAP. The positive response of D(LM2) in the context of rising D(LCPI) is reasonable because the rising price in this case is a cost-push inflation. Tightening monetary policy can hardly reduce the inflation but potentially further depress the economy.

Responses to a Monetary Policy Innovation: It is worth discussing the impact of a monetary policy innovation on related variables as displayed in Figure 6 of Appendix II. Following one standard deviation shock in D(LM2), the D(LIMP), GAP, and D(LCPI) positively response, while D(LNEER) slightly decreases. The impact of monetary expansion on exchange rate is normally explained through the interest rate parity effect. Therefore, reduction in domestic interest rate is supposed to depreciate the currency. If the interest rate parity holds, the D(LNEER) will increase. The decrease in D(LNEER), i.e. appreciation, rules out the covered interest rate parity. However, there is an alternative explanation for this appreciation if the GAP is considered. Expansionary monetary policy signals future economic growth, thus stimulating foreign capital. In this way, the D(LNEER) decreases. The response of GAP is further supported by a finding that Vietnamese firms are highly leveraged[38]. Increase in GAP eventually leads to

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[37] In my study, I skip this variable due to data unavailability.
[38] Quang (2006) analyzes the monetary transmission mechanism for the period of 1994-2004 and finds that the in comparison with exchange rate and asset price channel, the traditional interest rate channel seems to outperform the role where bank channel is the most important one.

rising D(LCPI). Compared with the rise in D(LCPI), D(LIMP) shows a larger response to a monetary policy expansion.

The significant response of D(LIMP) can be reasoned that because monetary expansion signals a prospective of economic growth as noted by increase in GAP, this scenario encourages the demand for imported goods, which is further underpinned by increased import penetration. In receipt of large orders from Vietnam, foreign exporters will increase the exporting prices to maximize their profit. The larger response of D(LIMP) in later periods shows that demand for goods increases with prospective of economic growth. The adjustment of price indicates the presence of pricing power of foreign firms as also shown by firms' overreaction in analysis of the ERPT.

Response to GAP: The responses of related variables to a one percent shock in output gap, the demand shock, are presented in Figure 4 of Appendix II. Due to one standard deviation shock in GAP, there follows a slight decrease in D(LCPI) and D(LM2). The decrease in D(LCPI) shows that the positive shock in output gap does not lead to rising consumer prices. If monetary policy makers perceived that demand pressure does not cause inflation, the pro-growth policy would have been made. In fact, the policy makers adopt the tight monetary policy. This response is reasoned that because the policy makers misperceive the inflationary pressure of demand shock they tighten the monetary policy to preemptively counter inflation.

Response to a Consumer Price Shock: The result of impulse responses due to a one S.D. shock in D(LCPI) is presented in Figure 5 of Appendix II. Along the Cholesky decomposition, figure displays only response of D(LM2). The test result shows that, the monetary authorities increase the money supply in response to positive shock in consumer prices. It is difficult to justify this policy if the cause of inflation is not known. If the inflation is caused by rising oil price, i.e. cost-push inflation, the positive response of monetary policy can further fuel the inflation on one hand, it helps promote economic growth on the other hand. If the inflation is caused by expansionary monetary policy in the last period and/or by expansionary fiscal policy, the expansionary monetary policy will further fuel the inflation.

Variance Decomposition:
We used the Cholesky Variance decomposition in 24 periods and the order of variables D(LOIL), D(LNEER), D(LIMP), GAP, D(LCPI) and D(LM2).

As argued by Taylor (2000), the result of variance decomposition test helps confirm conclusions about the ERPT and related issues. To be specific, a high level of the ERPT implies a high transmission from exchange rate change to import price change, but if the change in exchange rate plays a small role in variance of import price, the exchange rate will not be important in determining the movement of import price. Therefore it is necessary to analyze the variance decomposition of targeted variables.

The result in Figure 7 of Appendix II on variance decomposition of import price shows that among factors influencing the D(LIMP), D(LOIL) plays the most important role in determining variance of D(LIMP). It means that foreign firms concern mostly on the pressure in foreign market when setting the price. D(LNEER) and D(LCPI) have smaller effect on variance of the D(LIMP) than that of D(LOIL), though the effects are larger than those of GAP and D(LM2).

In the Figure 8 of Appendix II on CPI Variance decomposition, the variance of D(LCPI) is largely affected by D(LIMP), D(LOIL) and D(LM2) with similar degree. In the case of D(LOIL) and D(LM2), the effects tends to increase with the time. One year after the shock, nearly 18 percents of D(LCPI) variance are determined by D(LM2) and D(LOIL, implying the role of

monetary policy and oil shock on the inflation. The impact D(LNEER) and GAP on variance of D(LCPI) is minor. In the impulse test, the exchange rate does create an impulse on consumer price in the coefficient of pass-through, coupled with result of D(LCPI) variance decomposition, it is possible to conclude a small impact of exchange rate on consumer price.

The result in Figure 9 of Appendix II represents variance decomposition of GAP. It indicates that D(LOIL) has largest role in determining the variance of GAP. Specifically, around 20 percents of GAP variance are influenced by D(LOIL). GAP variance is also affected by D(LIMP) and D(LCPI), while D(LNEER) and D(LM2) have mere impact. The result signals a poor impact of accommodative monetary policy.

The results in Figure 10 of Appendix II displays the variance decomposition of D(LM2). The figure presents a similar impacts of D(LOIL), D(LNEER), GAP, D(LIMP) on D(LM2) variance, though the degree of impact is not large, i.e. around 10% of D(LM2). While D(LCPI) slightly influences the variance of D(LM2). From the previous arguments, it is noted that monetary policy is used to respond to foreign shocks, import price and output gap than to consumer price. The focus of monetary policy on output gap can be considered as misconduct of the policy makers since the GAP is not a cause of inflation as concluded.

In Figure 11 of Appendix II, D(LOIL) and D(LM2) have large impact on variance of D(LNEER). While GAP, D(LIMP), and D(LCPI) have smaller to none impact on the variance of the D(LNEER). The influential impacts of D(LOIL) and D(LM2) on D(LNEER) variance are reasonable since both variables lead to change in interest rate parity between domestic market and foreign countries, thus causing fluctuation of exchange rate.

Granger Causality Test:
To further confirm the above result, the Granger Causality tests were performed on all variables but D(LOIL). The results are presented in Table 1 of Appendix II. As for the D(LNEER), the result shows that D(LOIL), D(LCPI), and D(LM2) have Granger causality on D(LNEER). While monetary policy causes the movement of exchange rate through traditional interest rate channel, the increase in money supply through exchange rate intervention also has immediate influence on exchange rate. D(LOIL) also has impact on the D(LNEER) through the change in foreign interest rate. Rising inflation causes the movement of exchange rate through price level differentials.

In the case of D(LIMP), all factors but GAP shows to have Granger causality on the movement of import price. Although, D(LNEER) has direct impact on the D(LIMP), the D(LM2) presents a statistically significant result on D(LIMP). As argued in previous section, a strong pricing power allows foreign firms to quickly adjust price in response to increase in demand.

As for the GAP, none of the results show a statistically significant impact on this variable. While GAP and D(LIMP) are found to have Granger causality on the D(LCPI). The direct cause of D(LIMP) on D(LCPI) is reasonable and supported by other tests. Result of D(LM2) shows that D(LOIL) and D(LNEER) do have Granger causality on D(LM2), implying that monetary policy is guided by shocks in foreign demand and import price.

3.4.Empirical Analysis

From the preliminary analyses of the above test results, the summary of findings is as follows:

First, the impulse response test of exchange rate reveals the pass-through of exchange rate to import price and consumer price. After being standardized, the pass-through coefficients are

measured. The table 2 (page 74) shows coefficients of pass-through to import prices and consumer prices. In general, the impact of exchange rate shock is more effective in the first year, and retreating in the second year. In particular, as for the pass-through to import price, i.e. ERPT, the pass-through coefficient in the first year is 0.61. Moreover, several periods of complete pass-through and larger than one pass-through are observed 4 months after the shocks. The larger than one pass-through indicates an overreaction of foreign firms. This also implies a pricing power of the firms.

In order to have a better understanding about the level of the ERPT in Vietnam, a peer comparison of ERPT coefficients between Vietnam and foreign economies was attempted, hence the level of the ERPT of developing and emerging economies were also reviewed. During the period 1986-2004, Ito et al. (2005) report the short run ERPT for (i) Indonesia (0.53), Korea (1.05), Thailand (1.27), and Singapore (0.59), Campa and Goldberg (2002) report that the short run ERPT for 23 OECD countries reported in is 0.46, and 0.47 for 10 euro area economies (except for Luxemburg and Greece). In the study for emerging economies, Zorzi et al. (2007) find that the ERPTs in the period of 1975-2004 for 12 emerging countries and economies in Asia, Latin America, and Central and Eastern Europe are in the range of 0.12 – 1.54 in 4 quarters and -0.12-1.99 in 8 quarters. The average levels of the ERPT are 0.78 and 1.04 for 4 quarters and 8 quarters, respectively. In more details, the average levels of the ERPT for Asian emerging economies including Hong Kong, Korea, Singapore and Taiwan are 0.37 and 0.54 in 4 quarters and 8 quarters, respectively. From the reviews, it is possible to conclude that the ERPT level in Vietnam is moderate.

Second, another part of table 2 represents the CPI pass-through coefficients. Basically, the degree of CPI pass-through is much smaller than that of import price. This is reasonable as the impact of change tends to reduce along the chain of pricing from foreign shock to consumer price. The highest pass-through is observed in 10 and 11 months after the shock showing a slow transmission of impact from import price in period 6 and 7. The impact of exchange rate to consumer price seems to be completely gone after 15 periods. The averaged pass-through coefficient of 0.16 excluding the negative impact in the first year are also slightly smaller than 0.25 of previous study by IMF(2003). The different result is potentially caused by various factors including different inflation levels, different degree of dollarization, and deregulation of interest rate policy. While different inflationary levels lead to different level of pass-through as argued by Taylor(2000), the less dollarization indicates less indexation of goods and services to the dollar, therefore shocks in exchange rate have smaller impact on consumer prices. Deregulation of interest rate policy can reduce the pass-through as the policy help the SBV to promptly response to any price shocks.

In the study by Ito et al. (2005), the short run pass-through of exchange rate to CPI is quite low in analyzed economies and countries such as 0.09 in Hong Kong, 0.11 in Indonesia, 0.08 in Korea, 0.01 in Malaysia, 0.02 in the Philippines, 0.08 in Thailand, and 0.1 in Taiwan. As for emerging economies, the pass-through is a little higher[39] as shown in the study by Zorzi et al. (2007) with the levels of 0.24 and 0.45 in 4 quarters and 8 quarters respectively. Comparing with emerging economies, it is concluded that pass-through coefficient of 0.16 is not very high.

Third, oil prices and monetary policy show a significant impact on consumer prices. Impulse response test of oil prices and monetary policy innovation and variance decomposition of consumer prices show that shocks in oil prices and monetary policy are the cause of rising consumer prices in Vietnam. Although the pass-through of exchange rate change into import prices and consumer prices are moderate, the rising consumer prices are also caused by increase

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[39] This does not mean that the two studies are similar in all characteristics.

in import prices due to rising cost of production in foreign firms. The adjustment of export prices in foreign firms is led by rising cost of production rather than exchange rate changes.

Fourth, it is noted that demand pressure does not cause the inflationary pressure in Vietnam. Impulse response test of output gap and variance decomposition of consumer prices both confirm that the effect of output gap on rising inflation is very small. However, the monetary policy makers seem to make a mistake in response to increase in growing demand, which does not cause inflation, by tightening the monetary policy.

Fifth, the monetary policy is not very effective managing the economic growth. The Granger causality test shows in insignificant result for monetary policy on output gap. Impulse response test of monetary policy presents a minor impact on gap from monetary innovation, while variance decomposition of gap indicates a very small proportion of monetary policy in variance of output gap.

Sixth, while tightening the monetary policy in the presence of demand shock is explained by the misperception of the policy makers, they make a good assessment in detecting the cost-push inflation. In impulse response test of oil shock, the positive response of monetary policy in presence of shock in oil prices shows that the monetary authorities perceive the oil prices-induced inflation. If the monetary policy was effective in promoting economic growth, easing monetary policy in the presence of inevitable cost-push inflation can promote economic growth. In fact, ineffectiveness of monetary policy in promoting economic growth indicates that the expansionary monetary policy creates a little benefit from an expensive cost of inflation.

4. Conclusions

First, basically the ERPT in Vietnam is incomplete. After few periods of full and larger than one level of the ERPT, the ERPT starts decreasing. The impact of an exchange rate change on import price expires after 15 months. In the first year, the full and larger-than-one ERPT in after 5 and 7 months indicate the overreaction of foreign firms due to exchange rate shocks. The adjustment price also implies that foreign firms have certain pricing power in Vietnam. In comparison with level of the ERPT in other countries, it is noted that the degree of pass-through from exchange rate change to import prices in Vietnam is moderate.

Second, the tests also reveal the pass-through coefficients of an exchange rate change to consumer prices. It is realized that the degree of exchange rate pass-through to consumer prices is smaller than that to import prices. This is reasonable because the pass-through decreases along the pricing chain. Similar with the import prices, the impact of exchange rate change on consumer prices tends to die out in the second year. After 15 months, the impact of exchange rate on consumer prices is completely removed. In the first year, a one percent depreciation of the currency can be translated into an average of 0.08 percent increase in consumer prices. If the negative response of consumer prices is taken out, the one percent depreciation increases consumer prices by 0.16 percent. Compared with the study by IMF(2003), the level of pass-through found in this research is lower. The reduction of pass-through coefficients of exchange rate to consumer prices is caused by several factors including different inflationary environment, less dollarization, and deregulation of interest rate policy. While the hypothesis of Taylor(2000) about correlation between level of inflationary environment and pass-through level is applied in Vietnam, the less dollarization reduces the impact of exchange rate changes on prices. Stronger monetary policy instrument with interest rate liberalization potentially influence the level of pass-through. Interest rate liberalization allows monetary authorities to react promptly to inflationary pressure.

Policy Recommendations:
Based on the conclusions and findings resulting from the study, the following policy implications are presented:

Although the SBV has multiple policy objectives including price stability and economic growth, in the current state of rising inflation, it is recommended that the State Bank of Vietnam has to pursue policies to contain the inflation. Because the inflation in Vietnam is mostly caused by shocks in oil prices and accommodative responses of monetary policy, stopping an expansionary monetary policy can curb the inflation. Although such a policy can do little for cost-push inflation, tightening monetary policy can stop fueling the inflation.

Even though, the degree of pass-through from exchange rate to import and consumer prices is moderate, pursuit of exchange rate intervention toward currency depreciation can cause the domestic market more prone to foreign inflation directly on one hand. The ineffective sterilized intervention indirectly leads to inflation through the injection of liquidity on the other. Both effects will further fuel the inflation. Therefore, stopping exchange rate intervention is recommended to deal with Vietnam's inflation.

Given the stimulus of capital inflows, it is expected that the currency will eventually appreciate after the reduction of foreign exchange intervention. Following the reversal of the exchange rate movement, net exports will be adversely affected. A short-run slowdown of the economy is anticipated. In the short run, the trade deficit will still be financed by the surplus in the capital account, but the persistence of the trade deficit will put the economy at risk when the capital flows reverse. As mentioned in Chapter II, since a signal of trade deficit reversal is yet to come, the currency appreciation should be a transitory policy. In order to ensure the stability of the economy, the preferred option is a favorable exchange rate where export competitiveness is also protected while reducing intervention.

Since the pass-through of exchange rate change to import prices and consumer prices is moderate, it is recommended that a more flexible exchange rate regime with a larger band of fluctuation can allow the SBV to promptly respond to both domestic shocks and foreign shocks, while bearing less risk of the impact of exchange rate change on inflation.

With the finding that domestic demand shock does not cause inflation, it is recommended that the Vietnamese monetary authorities should not tighten the monetary policy in the situation of rising domestic demand. An easing monetary policy can help promote the economic growth without creating inflation.

Future Work:
Even though the study has provided a clear picture of the current level of the ERPT and evaluated the impact of the exchange rate on inflation in Vietnam, it is necessary to state that the study was faced with certain constraints regarding data sufficiency.

The most often used traditional method of study in the field is a distribution chain that measures the impact of supply shocks through exchange rate to import price, producer price and consumer price. The advantage of this method is that it allows us to estimate the role of each channel in exchange rate channels, namely exchange rate-import price, import price-producer price and producer price-consumer price, in transmitting the impact of supply shock to inflation. The unavailability of producer price would present a cutoff in the channel.

In many studies, researchers managed to establish the long run relationship between the exchange rate and related variables and the impact of structural changes to the ERPT. With the

limited span of my data, covering 6 years from 2001 to 2007, it is not possible to capture the long run relationship of the exchange rate and import price. Furthermore, the period studied does not cover the impact of potential structural changes in the economy due to WTO accession, and the current level of the ERPT might change with the incorporation of such events. These issues are left for future study.

Bibliography

Adolfson, Malin (2001), "Monetary Policy with Incomplete Exchange Pate Pass-Through", Stockholm School of Economics, Department of Economics, SSE/EFI Working Paper Series in Economics and Finance.

Afonso, Ferreira and Andreu Sanso, "Exchange Rate Pass-Through: the Case of Brazilian Export of Manufactures".

Anaya, Jose Antonio Gonzalez (2000),"Exchange Rate Pass-Through and Partial Dollarization: is there a link?", World Bank Conference on Dollarization in Latin America.

Bacchetta, P., and E., Van Wincoop (2002),"Why Do Consumer Prices React Less Than Import Prices to Exchange Rate", Journal of European Economic Association.

Balassa, Bela (1964) "The Purchasing Power Parity Doctrine: A Reappraisal", The Journal of Political Economy, Vol. 72

Bekaert, Geert and Hodrick, Robert J., (2000), "Expectations Hypothesis Testing" AFA 2001 New Orleans Meetings.

Betts, C., and M Devereux (1996), "The Exchange Rate in a Model of Pricing To Market", European Economic Review, Vol. 40.

Campa, M. Jose and Goldberg, Pinelopi Koujianou (2002), "Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon", NBER Working Paper 8934.

Campa, Jose Micheal, Goldberg, Linda and Gonzales, Minguez (2005), "Exchange Rate Pass-Through to Import Prices in Euro Area" Working Paper, Banca Espana.

Carmen, Ulrich (2006), "Monetary Policy in Vietnam: The Case of a Transition Country", Graduate Institute of International Studies, Geneva, Switzerland, BIS working paper 31.

Choudhri, Ehsan U. and Dalia S. Hakura (2001), "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?", IMF Working Paper 01/194

Chowdhury, Mainul Islam and Siddique , Syed Fahad (2006), "Exchange Rate Pass-Through in Bangladesh" Bangladesh Bank Working Paper Series No. WP0607.

Devereux, M., C. Engel (2001), "Endogenous Currency of Price Setting in a Dynamic Open Economy Model, NBER Working Paper No. 8559

Devereux, M., C. Engel and P. Storgaard (2004), "Endogenous Exchange Rate Pass-Through When Prices Are Set in Advance", Journal of International Economics, Vol 63

Dornbusch, Rudi (1987), "Exchange Rates and Prices", NBER Working Paper No.1769.

Engel, C.
a. (2002), "The Responsiveness of Consumer Prices to Exchange Rates: A Synthesis of Some New Open Economy Macro Models", The Manchester School, 70, pp 347-371

    b.   (2005), "Equivalence Result for Optimal Pass-Through, Optimal Indexing for Exchange Rates and Optimal Choice for Export Pricing" NBER Working Paper No.11209.

Egert, Balarz; Imed Drine; Kirstens Lommartzsch and Christophe Rault (2003), "The Balassa-Samuelson Effects in Eastern and Central Europe: Myth or Reality" Journal of Comparative Economics.

Feinberg, M. Robert (1986), "The Interaction of Foreign Exchange and Market Power Effects on German Domestic Prices", The Journal of Industrial Economics.

Goldberg, Pinelopi Koujianou and Knetter, M. Michael (1997), "Goods Prices and Exchange Rates: What Have We Learned?", Journal of Economic Literature.

Goldfajn, Ilan and Sergio Ribeiro la Costa Werlang (2000), "The Pass-Through from Depreciation to Inflation: A Panel Study", Working Paper No. 5 Banco Central de Brazil, Brasilia.

Hien, Mai Thu, (2007) "Solutions of Exchange Rate Policy in Transition Economy of Vietnam" PhD Dissertation

Hooper, Peter and Mann, Catherine L.,. (1989), "Exchange Rate Pass-Through in the 1980s: the Case of the U.S. Imports of Manufactures", Brookings Papers of Economic Activity, 1

IMF:
    a.   (2003) Olà Unteroberdoerster, Rania Al-Mashat, Shanaka J. Peiris (All APD), Qing Wang (PDR), and Erik Lueth (FAD): Vietnam: Selected Issues
    b.   (2006, November): Baker, Carol; Patrizia Tumbarello (both APD) and Faisal Ahmed (PDR): Vietnam: Selected Issues

Ito, Takatoshi and Sasaki, Yuri N., and Sato, Kiyotaka (2005), "Pass-through of Exchange Rate Changes and Macroeconomic Shocks to Domestic Inflation in East Asian Countries", Research Institute of Economy, Trade and Industry (RIETI) Discussion Paper Series 05-E-020.

Ito, Takatoshi and Sato, Kiyotaka (2006), "Exchange Rate Changes and Inflation in Post-Crisis Asian Economies: VAR Analysis of the Exchange Rate Pass-Through", NBER working paper 12395.

Isabelle, Mejean (2004), "Exchange Rate Movements and Export Prices: An Empirical Analysis", University of Paris.

Karim, Barhoumi (2005), "Exchange Rate Pass-Through into Import Prices in Developing Countries: An Empirical Investigation", Economics Bulletin, vol. 3

Khundrakpam, Jeevan Kumar (2007) "Economic Reforms and Exchange Rate Pass-Through to Domestic Prices in India", BIS Working Papers No. 225

Knetter, Michael
    a.   (1989) "Price Discrimination in U.S and German Exporters", The American Economic Review, Vol 79

    b.   (1994) "Is Export Price Adjustment Asymmetric? Evaluating the Market Share and Marketing Bottlenecks Hypotheses", Journal of International Money and Finance 13(1).

Kovacs, Mihaly Andras (Hungary); Jaromi Bene and Milan Klima (Czech); Jakub Borowski, Maciej K. Dudek, Panlina Sotomska and Krzysztofik (Poland); Frantisik Hajnovic (Slovakia) and Tina Zumer (Slovenia), (2002) "On the Estimated Size of BS Effect in CEC5 Countries"

Krugman, Paul (1987), "Pricing to Market When the Exchange Rate Changes" NBER working Paper No. 1926.

Leigh, Daniel and Marco Rossi (2002), "Exchange Rate Pass-Through in Turkey", IMF Working Paper No.204

Lian, An (2006), "Exchange Rate Pass-Through: Evidence Base on Vector Autoregression with Sign Restrictions" MPRA paper No. 527.

Marston, Richard (1990), "Pricing To Market in Japanese Manufacturing", Wharton School, University of Pennsylvania, Philadelphia.

McCarthy, John (2002), "Pass-Through Exchange Rate and Import Prices in Domestic Inflation in Some Industrialized Economies", Research Department, Federal Reserve Bank of New York.

McDonald, Ronald (1997) "What Determines Real Exchange Rate? the Long and the Short of It", Journal of International and Financial Markets, Institutions and Money.

Ohno, Kenichi (2003), "Exchange Rate Management of Vietnam: Re-Examination of Policy Goals and Modality" Vietnam Development Forum.

Przystupa, Jan, (2002) "The Exchange Rate in the Monetary Transmission Mechanism", the National Bank of Poland、NBP Bureau of Macroeconomic Research Working Paper No. 25/2002.

Pollard, P S and C C Coughlin (2004), "Size Matters: Asymmetric Exchange Rate Pass-Through at the Industry Level", FRB Working Paper series 2003-029C, The Federal Reserve Bank of St Louis.

Prasad, Eswar S., Kenneth Rogoff, Shang-jin Wei and M. Ayan Kose (2003), "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence", IMF Working Paper No. 220

Quang, Pham Chi (2006), "Monetary Transmission Mechanism in Vietnam: A VAR Approach in the Period of 1990-2004" East Asian Development Network (EADN) Working Paper No.29.

Rowland, Peter (2004) "Exchange Rate Pass-Through to Domestic Prices: the Case of Columbia".

Rogoff, Kenneth (1996) "The Purchasing Power Parity Puzzle" Journal of Economic Literature, Vol. 34

Sahminan, (2002), "Exchange Rate Pass-Through to Import Price: Empirical Evidence from Some Southeast Asian Countries", Department of Economics, The University of North Caroline at Chapel Hill.

Samuelson, Paul (1964), "Theoretical Notes on Trade Problems", The Review of Economics and Statistics, Vol. 46, No. 2.

Taylor John B., (2000), "Low Inflation, Pass-Through and the Pricing Power of Firms" European Economic Review.

Thanh, Vo Tri ; Minh, Dinh Hien; Truong, Do Xuan; Thanh, Hoang Van; Quang, Pham Chi, (2000), "Exchange Rate Arrangement in Vietnam: Information Contents and Policy Option" East Asian Development Network (EADN), Individual Research Project.

Vigfusson, Robert J.; Nathan Sheets; and Joseph Gagnon (2007), "Exchange Rate Pass-Through to Export Prices: Assessing Some Cross Countries Evidence", International Discussion Paper.

Webber, A.G. (2000), "Newton's Gravity Law and Import Prices in the Asia Pacific", Japan and the World Economy Volume 12.

Zorzi, Micheal Ca; Haln, Elke; Sanchez, Marchelo, (2007) "Exchange Rate Pass-Through in Emerging Economies", European Central Bank Working Paper Series No. 739.

Appendix I

Measuring the NEER:
In total, 73 economies have trade with Vietnam. However, 11 major economies account for nearly 82% of trading. Taiwan, which accounts for 8.2% of foreign trade with Vietnam, is not a member of the IMF. Therefore, the data on Taiwan dollar vs. USD is not available. The other major 10 economies account for 73.9 % of Vietnam's foreign trade.

Table 1: Major Trading Partners

No	Economies	Trade Weight* (%)
1	Euro Area	11.7
2	US	6.8
3	Japan	13.4
4	China	11.3
5	Korea	6.7
6	Singapore	9.8
7	Thailand	4.0
8	Malaysia	3.0
9	Australia	4.5
10	HongKong SAR	2.7
Total		73.9

The trade weight is calculated on the basis of a 5 year average of major trading partners which account for 76.8 percent of Vietnam foreign trade. One country (Taiwan), which has 3.8 percent of foreign trade of Vietnam, does not have available data. The data to compute trade weight is based on reports of the GSO.

The Nominal Effective Exchange Rate (NEER) and The Real Effective Exchange Rate (REER) are measured on following formula.

$$NEER_j = \prod_{i=1}^{N} (e_{i,j})^{W_i}$$

$$REER_j = \prod_{i=1}^{N} (\frac{d_j e_{i,j}}{d_i})^{W_i}$$

where:
N is the number of trading partners with Vietnam.
- $e_{i,j}$ is the exchange rate between VND v.s currency of trading partner i. Because the direct exchange rate between VND and respective trading partner is not available, I decided to convert from VND/USD and Respective currency/USD. All exchange rates are the monthly average rate. The data on exchange rates is extracted from IFS.
The $e_{i,j}$ is computed through the following formula

$$e_{i,j} = \frac{e_{VND/USD}}{e_{CU/USD}}$$ where $e_{CU/USD}$ is the exchange rate between respective currency v.s USD

- W_i is the trade weight of economy i with Vietnam
- d_j and d_i are CPI of Vietnam and trading partner i, respectively.

Measuring the Pass-Through Coefficients:

In order to calculate the pass-through coefficients, it is better to translate the shock into one percent shock in exchange rate. The shock in one S.D. of D(LNEER) is equivalent to 0.001778 as measured by one standard deviation of D(LNEER). The shocks at time t=0 also leads to the change in exchange rate in period i. The change in import price in period i as reported in the impulse response is a result of one S.D. change of D(LNEER) at time t=0 (ei) and change in D(LNEER) at time t=i. Therefore, to break down the effect of one percent change in t =0, the accumulated changes of D(LNEER) at time t=i equal Ei = ei+0.001778.

Leigh and Rosi (2002) measure the pass-through coefficients as follows:

$$PT_{t,t+i} = \frac{P_{t,t+i}}{E_i}$$

Where $P_{t,t+i}$ is the change in indices in period i in response to the initial shock in exchange rate, E_i is the accumulated impact change of exchange rates to their own shocks.

Table 2: Pass-Through Coefficients

Period	D(LNEER)	Ei	D(LIMP)	D(LCPI)	D(LIMP)/Ei	D(LCPI)/Ei
1	0.00117	0.00295	-0.00109	-0.00030	-0.37	-0.10
2	0.00067	0.00244	0.00226	-0.00014	0.77	-0.05
3	0.00086	0.00264	0.00029	-0.00026	0.10	-0.09
4	0.00077	0.00255	0.00280	-0.00032	0.95	-0.11
5	0.00080	0.00258	0.00390	0.00008	1.32	0.03
6	0.00086	0.00263	0.00306	0.00039	1.04	0.13
7	0.00060	0.00238	0.00303	0.00046	1.03	0.15
8	0.00069	0.00246	0.00141	0.00058	0.48	0.20
9	0.00074	0.00252	0.00271	0.00060	0.92	0.20
10	0.00075	0.00253	0.00140	0.00063	0.48	0.21
11	0.00076	0.00254	0.00105	0.00062	0.36	0.21
12	0.00077	0.00255	0.00062	0.00037	0.21	0.13
13	0.00076	0.00254	0.00071	0.00034	0.24	0.11
14	0.00082	0.00260	0.00020	0.00018	0.07	0.06
15	0.00082	0.00260	0.00038	0.00009	0.13	0.03
16	0.00083	0.00261	-0.00004	0.00001	-0.01	0.00
17	0.00082	0.00260	-0.00023	-0.00009	-0.08	-0.03
18	0.00083	0.00261	-0.00019	-0.00018	-0.06	-0.06
19	0.00085	0.00263	-0.00026	-0.00022	-0.09	-0.08
20	0.00085	0.00263	-0.00034	-0.00027	-0.12	-0.09

21	0.00084	0.00262	-0.00053	-0.00033	-0.18	-0.11
22	0.00084	0.00262	-0.00055	-0.00038	-0.19	-0.13
23	0.00085	0.00263	-0.00056	-0.00042	-0.19	-0.14
24	0.00086	0.00263	-0.00062	-0.00044	-0.21	-0.15

Appendix II

A. Augmented Dickey-Fuller Test of Unit Root

1. LCPI

➢ LCPI Level

Null Hypothesis: LCPI has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.094972	0.9999
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCPI)
Method: Least Squares
Date: 01/28/08   Time: 16:04
Sample (adjusted): 2000M03 2007M02
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPI(-1)	0.007544	0.003601	2.094972	0.0393
D(LCPI(-1))	0.529837	0.096943	5.465470	0.0000
C	-0.033701	0.016786	-2.007729	0.0480
R-squared	0.445533	Mean dependent var		0.003894
Adjusted R-squared	0.431842	S.D. dependent var		0.004056
S.E. of regression	0.003057	Akaike info criterion		-8.707419
Sum squared resid	0.000757	Schwarz criterion		-8.620604
Log likelihood	368.7116	F-statistic		32.54312
Durbin-Watson stat	2.144913	Prob(F-statistic)		0.000000

LCPI First Difference

Null Hypothesis: D(LCPI) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.282770	0.0188
Test critical values:	1% level	-3.511262	
	5% level	-2.896779	
	10% level	-2.585626	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCPI,2)
Method: Least Squares
Date: 01/28/08   Time: 16:05
Sample (adjusted): 2000M04 2007M02
Included observations: 83 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCPI(-1))	-0.300824	0.091637	-3.282770	0.0015
D(LCPI(-1),2)	-0.197811	0.108172	-1.828669	0.0712
C	0.001253	0.000490	2.558136	0.0124

R-squared	0.223025	Mean dependent var	7.11E-05
Adjusted R-squared	0.203600	S.D. dependent var	0.003457
S.E. of regression	0.003085	Akaike info criterion	-8.688768
Sum squared resid	0.000762	Schwarz criterion	-8.601340
Log likelihood	363.5839	F-statistic	11.48169
Durbin-Watson stat	2.046340	Prob(F-statistic)	0.000041

LCPI is Integrated of Order 1 : I(1)

2. LIMP

> **LIMP_ Level**

Null Hypothesis: LIMP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.139970	0.9408
Test critical values:	1% level	-3.509281	
	5% level	-2.895924	
	10% level	-2.585172	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LIMP)
Method: Least Squares
Date: 01/28/08   Time: 16:06
Sample (adjusted): 2000M02 2007M02
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMP(-1)	-0.002606	0.018615	-0.139970	0.8890
C	0.012776	0.085313	0.149757	0.8813
R-squared	0.000236	Mean dependent var		0.000836
Adjusted R-squared	-0.011809	S.D. dependent var		0.011938
S.E. of regression	0.012008	Akaike info criterion		-5.983269
Sum squared resid	0.011968	Schwarz criterion		-5.925795
Log likelihood	256.2889	F-statistic		0.019592
Durbin-Watson stat	2.047705	Prob(F-statistic)		0.889023

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> **LIMP_ First Difference**

Null Hypothesis: D(LIMP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.328269	0.0000
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LIMP,2)
Method: Least Squares
Date: 01/28/08   Time: 16:07
Sample (adjusted): 2000M03 2007M02
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LIMP(-1))	-1.034909	0.110943	-9.328269	0.0000
C	0.000942	0.001320	0.713462	0.4776
R-squared	0.514841	Mean dependent var		-7.87E-05
Adjusted R-squared	0.508924	S.D. dependent var		0.017205
S.E. of regression	0.012057	Akaike info criterion		-5.974860
Sum squared resid	0.011920	Schwarz criterion		-5.916983
Log likelihood	252.9441	F-statistic		87.01660
Durbin-Watson stat	1.979805	Prob(F-statistic)		0.000000

LIMP is Integrated of Order 1 _ I(1)

3. LM2

➢ LM2_ Level

Null Hypothesis: LM2 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.780571	0.9997
Test critical values:	1% level	-3.522887	
	5% level	-2.901779	
	10% level	-2.588280	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM2)
Method: Least Squares
Date: 01/28/08   Time: 16:07
Sample (adjusted): 2001M02 2007M02
Included observations: 73 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM2(-1)	0.004907	0.002756	1.780571	0.0793
C	-0.043556	0.035524	-1.226112	0.2242
R-squared	0.042745	Mean dependent var		0.019663
Adjusted R-squared	0.029263	S.D. dependent var		0.010060
S.E. of regression	0.009912	Akaike info criterion		-6.363135
Sum squared resid	0.006976	Schwarz criterion		-6.300383
Log likelihood	234.2544	F-statistic		3.170432
Durbin-Watson stat	2.207666	Prob(F-statistic)		0.079261

➢ **LM2_ First Difference**

Null Hypothesis: D(LM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.857724	0.0000
Test critical values:	1% level	-3.524233	
	5% level	-2.902358	
	10% level	-2.588587	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM2,2)
Method: Least Squares
Date: 01/28/08   Time: 16:08
Sample (adjusted): 2001M03 2007M02
Included observations: 72 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM2(-1))	-1.054849	0.119088	-8.857724	0.0000
C	0.020651	0.002625	7.865781	0.0000
R-squared	0.528490	Mean dependent var		-4.54E-05
Adjusted R-squared	0.521754	S.D. dependent var		0.014691
S.E. of regression	0.010159	Akaike info criterion		-6.313471
Sum squared resid	0.007225	Schwarz criterion		-6.250231
Log likelihood	229.2850	F-statistic		78.45927
Durbin-Watson stat	2.004284	Prob(F-statistic)		0.000000

LM2 is Integrated of Order 1 _ I(1)

4. LNEER

➢ **LNEER_ Level**

Null Hypothesis: LNEER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.323122	0.9782
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEER)
Method: Least Squares
Date: 01/28/08   Time: 16:09
Sample (adjusted): 2000M03 2007M02
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEER(-1)	0.005522	0.017090	0.323122	0.7474
D(LNEER(-1))	-0.297098	0.121689	-2.441451	0.0168
C	-0.025138	0.078822	-0.318925	0.7506
R-squared	0.068656	Mean dependent var		0.000272
Adjusted R-squared	0.045660	S.D. dependent var		0.001187
S.E. of regression	0.001160	Akaike info criterion		-10.64596
Sum squared resid	0.000109	Schwarz criterion		-10.55914
Log likelihood	450.1301	F-statistic		2.985547
Durbin-Watson stat	1.798272	Prob(F-statistic)		0.056099

LNEER_ First Difference

Null Hypothesis: D(LNEER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.73259	0.0001
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNEER,2)
Method: Least Squares
Date: 01/28/08   Time: 16:09
Sample (adjusted): 2000M03 2007M02
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEER(-1))	-1.293531	0.120524	-10.73259	0.0000
C	0.000331	0.000128	2.581218	0.0116
R-squared	0.584154	Mean dependent var		7.13E-05
Adjusted R-squared	0.579083	S.D. dependent var		0.001778
S.E. of regression	0.001154	Akaike info criterion		-10.66848
Sum squared resid	0.000109	Schwarz criterion		-10.61060
Log likelihood	450.0760	F-statistic		115.1885
Durbin-Watson stat	1.792699	Prob(F-statistic)		0.000000

LNEER is Integrated of Order 1 _ I(1)

5. LOIL

➢ **LOIL_ Level**

Null Hypothesis: LOIL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.615630	0.8607
Test critical values:	1% level	-3.509281	
	5% level	-2.895924	
	10% level	-2.585172	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOIL)
Method: Least Squares
Date: 01/28/08   Time: 16:10
Sample (adjusted): 2000M02 2007M02
Included observations: 85 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOIL(-1)	-0.014682	0.023849	-0.615630	0.5398
C	0.080529	0.115433	0.697628	0.4874
R-squared	0.004546	Mean dependent var		0.009683
Adjusted R-squared	-0.007448	S.D. dependent var		0.083010
S.E. of regression	0.083318	Akaike info criterion		-2.109050
Sum squared resid	0.576181	Schwarz criterion		-2.051575
Log likelihood	91.63460	F-statistic		0.379000
Durbin-Watson stat	2.192392	Prob(F-statistic)		0.539823

LOIL_ First Difference

Null Hypothesis: D(LOIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.11704	0.0000
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOIL,2)
Method: Least Squares
Date: 01/28/08   Time: 16:10
Sample (adjusted): 2000M03 2007M02
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOIL(-1))	-1.113082	0.110021	-10.11704	0.0000
C	0.010262	0.009151	1.121432	0.2654

R-squared	0.555205	Mean dependent var	0.000356
Adjusted R-squared	0.549780	S.D. dependent var	0.124274
S.E. of regression	0.083386	Akaike info criterion	-2.107162
Sum squared resid	0.570158	Schwarz criterion	-2.049285
Log likelihood	90.50079	F-statistic	102.3545
Durbin-Watson stat	2.028767	Prob(F-statistic)	0.000000

LOIL is Integrated of Order 1 _ I(1)

6. GAP_ Level

Null Hypothesis: GAP has a unit root
Exogenous: Constant
Lag Length: 11 (Automatic based on SIC, MAXLAG=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.10901	0.0000
Test critical values:	1% level	-3.540198	
	5% level	-2.909206	
	10% level	-2.592215	

*MacKinnon (1996) one-sided p-values.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GAP)
Method: Least Squares
Date: 01/28/08   Time: 16:11
Sample (adjusted): 2002M01 2007M02
Included observations: 62 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GAP(-1)	-1.342722	0.120868	-11.10901	0.0000
D(GAP(-1))	0.223253	0.111542	2.001512	0.0509
D(GAP(-2))	0.109104	0.102117	1.068425	0.2906
D(GAP(-3))	-0.012963	0.092673	-0.139883	0.8893
D(GAP(-4))	-0.139326	0.083059	-1.677425	0.0998
D(GAP(-5))	-0.255960	0.073297	-3.492077	0.0010
D(GAP(-6))	-0.380053	0.063486	-5.986438	0.0000
D(GAP(-7))	-0.506370	0.053615	-9.444517	0.0000
D(GAP(-8))	-0.637300	0.043645	-14.60205	0.0000
D(GAP(-9))	-0.765257	0.033680	-22.72174	0.0000
D(GAP(-10))	-0.896939	0.023846	-37.61344	0.0000
D(GAP(-11))	-1.030014	0.014826	-69.47340	0.0000
C	-3591.658	649.4468	-5.530335	0.0000

R-squared	0.998111	Mean dependent var	-4874.167
Adjusted R-squared	0.997648	S.D. dependent var	105154.0
S.E. of regression	5099.904	Akaike info criterion	20.09587
Sum squared resid	1.27E+09	Schwarz criterion	20.54188
Log likelihood	-609.9720	F-statistic	2157.025
Durbin-Watson stat	0.854161	Prob(F-statistic)	0.000000

Gap is stationary

B. Lag Selection

VAR Lag Order Selection Criteria
Endogenous variables: D(LNEER) D(LCPI) GAP D(LIMP) D(LM2)
D(LOIL)

Exogenous variables: C

Date: 02/14/08   Time: 17:00

Sample: 2000M01 2007M02

Included observations: 64

Lag	LogL	LR	FPE	AIC	SC	HQ
0	562.4633	NA	1.13e-15	-17.38948	-17.18708	-17.30974
1	732.2054	302.3532	1.74e-17	-21.56892	-20.15215	-21.01078
2	879.3676	234.5397	5.55e-19	-25.04274	-22.41160	-24.00620
3	957.0590	109.2536	1.63e-19	-26.34559	-22.50008	-24.83065
4	1066.641	133.5533*	1.90e-20	-28.64504	-23.58516*	-26.65169
5	1090.084	24.17560	3.68e-20	-28.25263	-21.97838	-25.78089
6	1135.053	37.94204	4.35e-20	-28.53289	-21.04427	-25.58274
7	1179.780	29.35238	6.86e-20	-28.80563	-20.10263	-25.37707
8	1254.993	35.25617	6.83e-20	-30.03104	-20.11367	-26.12408
9	1412.005	44.15960	1.48e-20*	-33.81266*	-22.68092	-29.42730*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

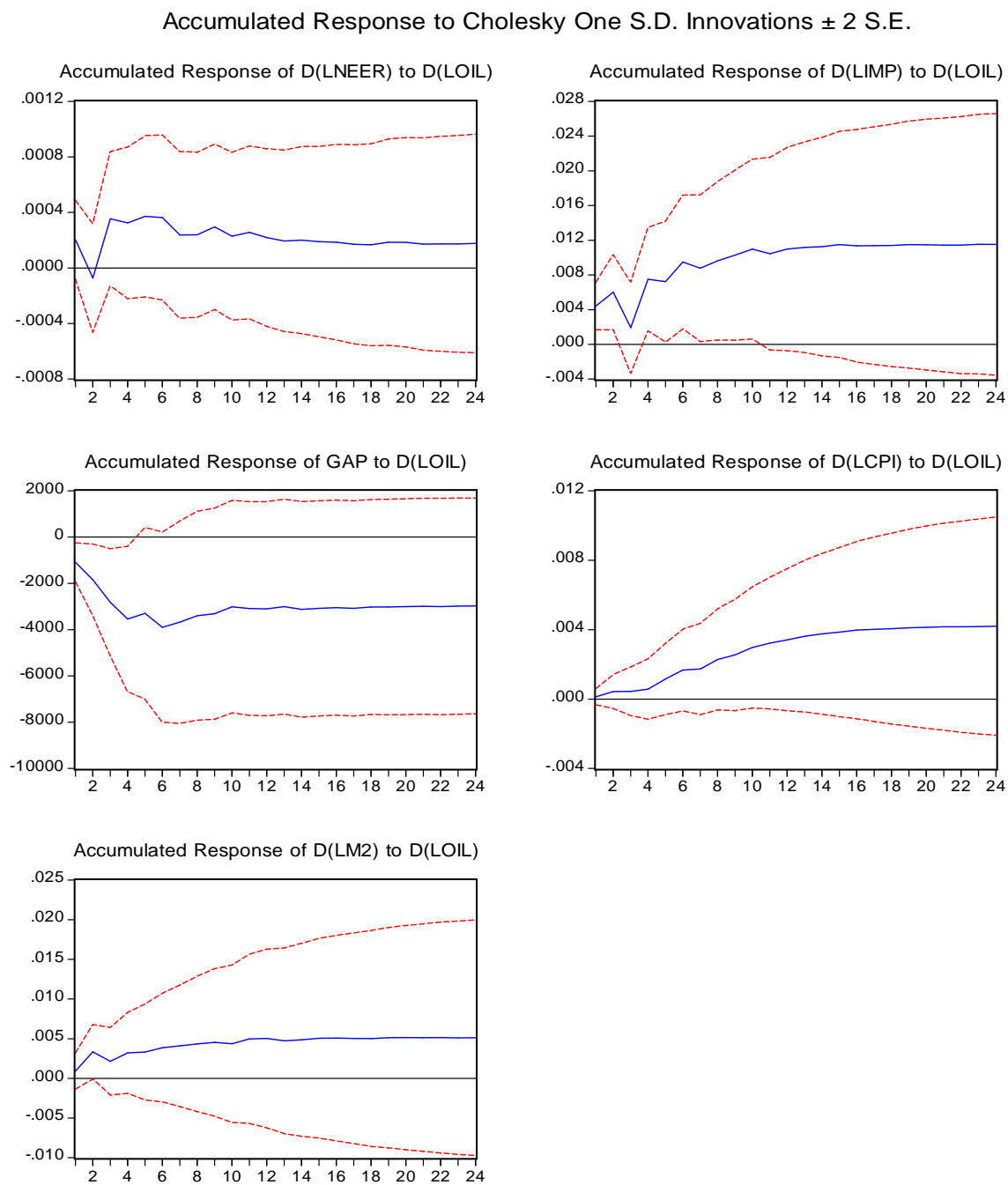## C. The Impulse Response Test

Figure 1: Reponses to Oil Shock

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of D(LNEER) to D(LOIL)

Accumulated Response of D(LIMP) to D(LOIL)

Accumulated Response of GAP to D(LOIL)

Accumulated Response of D(LCPI) to D(LOIL)

Accumulated Response of D(LM2) to D(LOIL)

Figure 2: Responses to Exchange Rate Shocks

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.
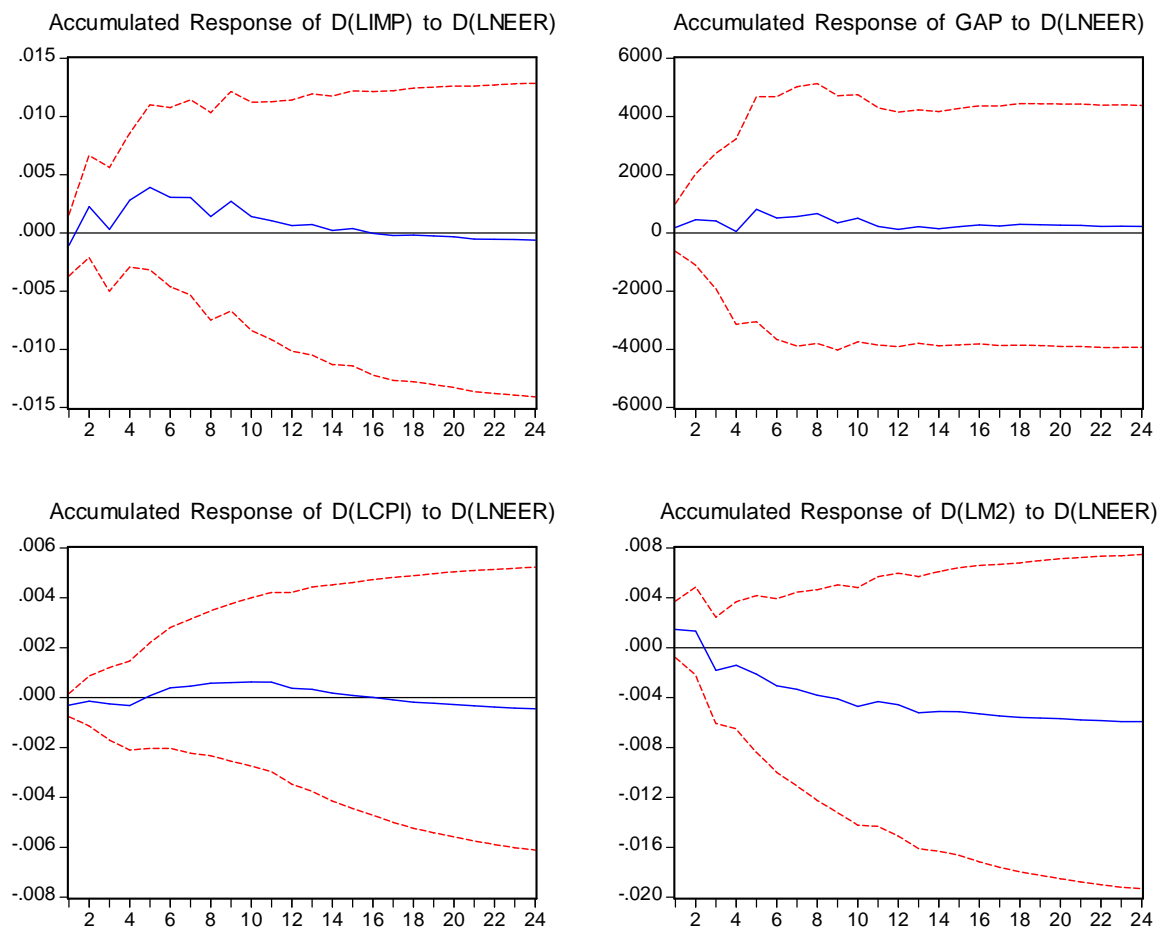
Figure 3: Response to Import Price Shock

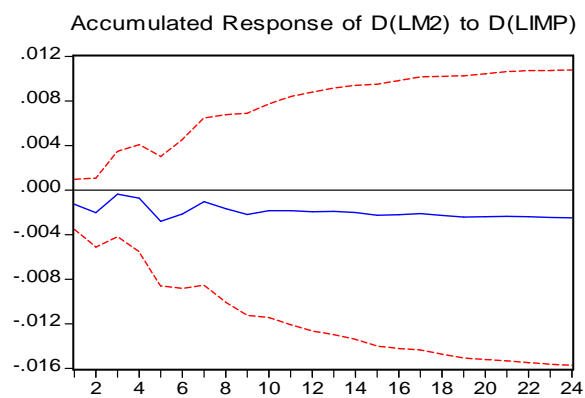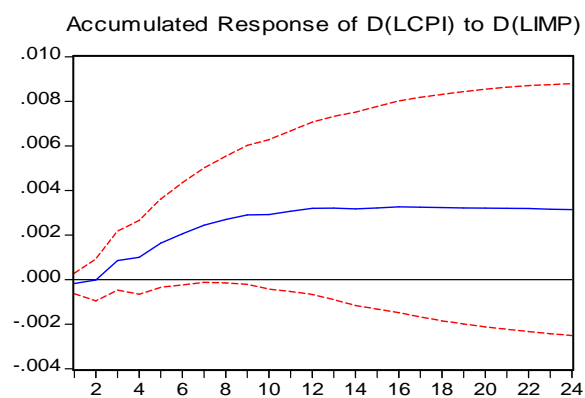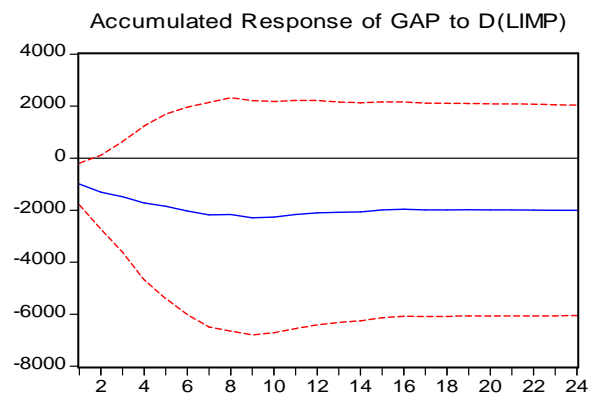Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of GAP to D(LIMP)

Accumulated Response of D(LCPI) to D(LIMP)

Accumulated Response of D(LM2) to D(LIMP)

Figure 4: Response to GAP

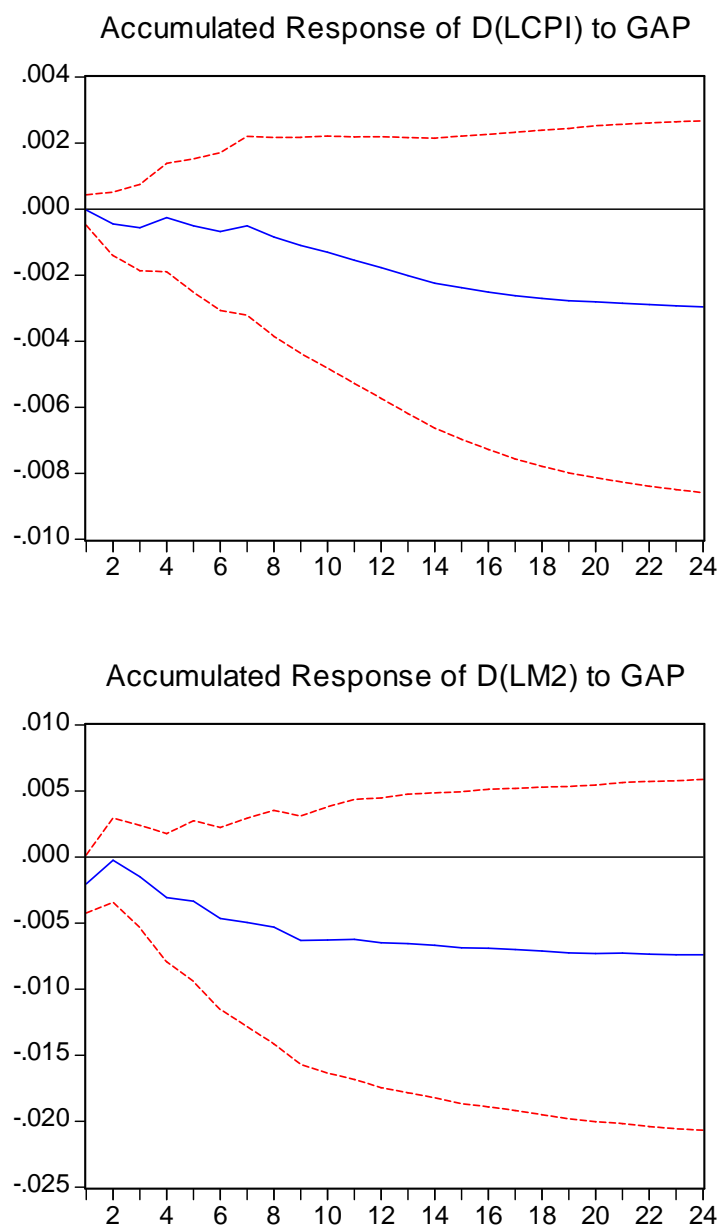# Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of D(LCPI) to GAP

Accumulated Response of D(LM2) to GAP

Figure 54: Response to Consumer Price Shocks
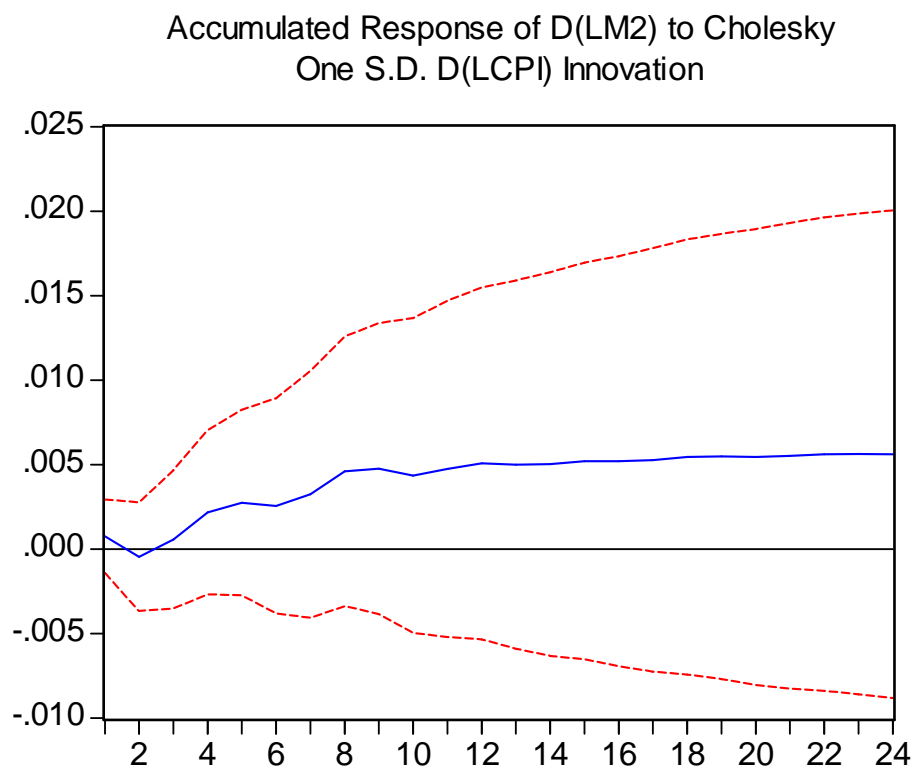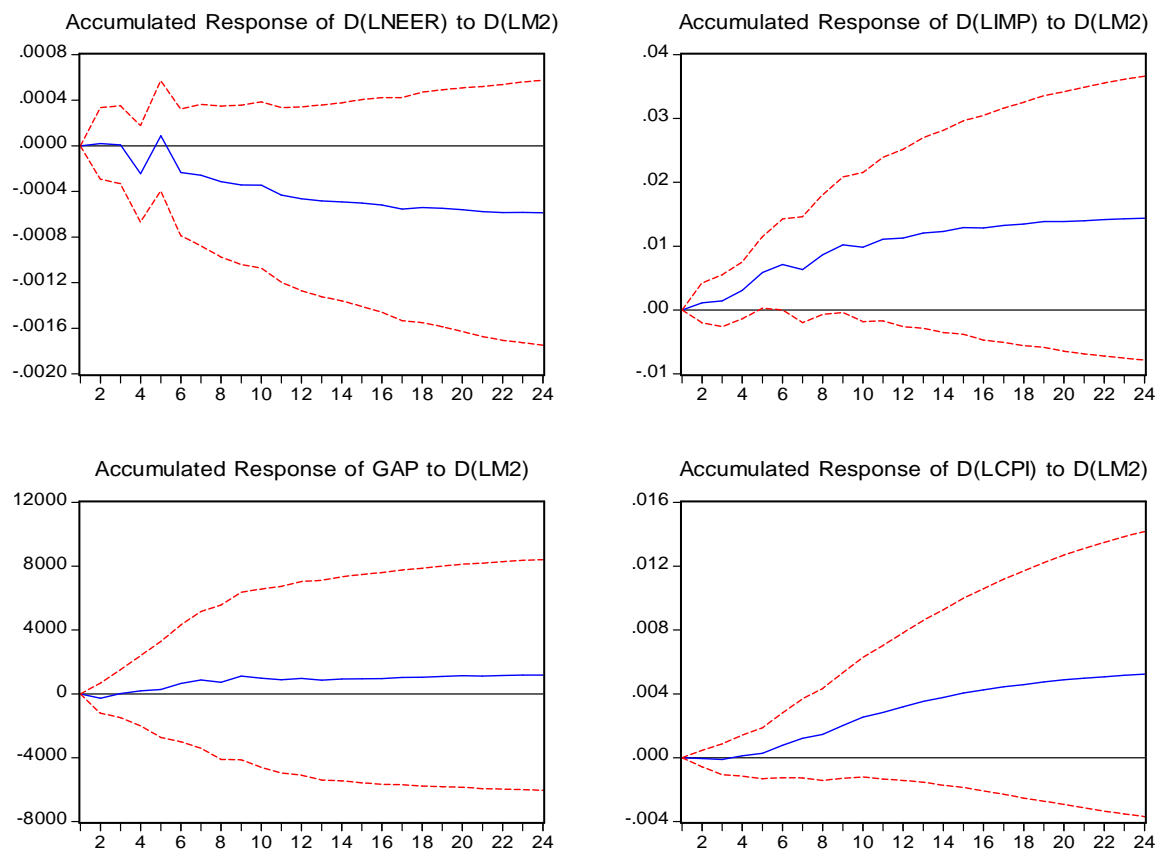
Accumulated Response of D(LM2) to Cholesky
One S.D. D(LCPI) Innovation

Figure 6: Response to Monetary Policy Innovation

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of D(LNEER) to D(LM2)

Accumulated Response of D(LIMP) to D(LM2)

Accumulated Response of GAP to D(LM2)

Accumulated Response of D(LCPI) to D(LM2)

Granger Causality Test:

Table 1: Results of the Tests

Dependent variable: D(LNEER)				Dependent variable: D(LM2)			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
D(LOIL)	9.500358	4	0.0497	D(LOIL)	7.335318	4	0.1192
GAP	1.367266	4	0.8499	GAP	4.435092	4	0.3503
D(LIMP)	3.180333	4	0.5281	D(LNEER)	6.773094	4	0.1484
D(LCPI)	6.887385	4	0.142	D(LIMP)	2.120024	4	0.7137
D(LM2)	6.567814	4	0.1606	D(LCPI)	3.159329	4	0.5315
All	26.6827	20	0.1444	All	19.99634	20	0.4582

Dependent variable: GAP				Dependent variable: D(LIMP)			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
D(LOIL)	1.63882	4	0.8018	D(LOIL)	6.549918	4	0.1617
D(LNEER)	3.256117	4	0.5159	GAP	7.236571	4	0.1239
D(LIMP)	2.188526	4	0.7011	D(LNEER)	2.120653	4	0.7136
D(LCPI)	5.977146	4	0.2009	D(LCPI)	6.837365	4	0.1447
D(LM2)	0.937108	4	0.9192	D(LM2)	8.857389	4	0.0648
All	12.98996	20	0.8778	All	28.33732	20	0.1017

Dependent variable: D(LCPI)			
Excluded	Chi-sq	df	Prob.
D(LOIL)	1.854679	4	0.7625
GAP	4.377923	4	0.3573
D(LNEER)	18.64534	4	0.0009
D(LIMP)	6.286212	4	0.1788
D(LCPI)	0.87147	4	0.9286
All	35.42452	20	0.018

Variance Decomposition

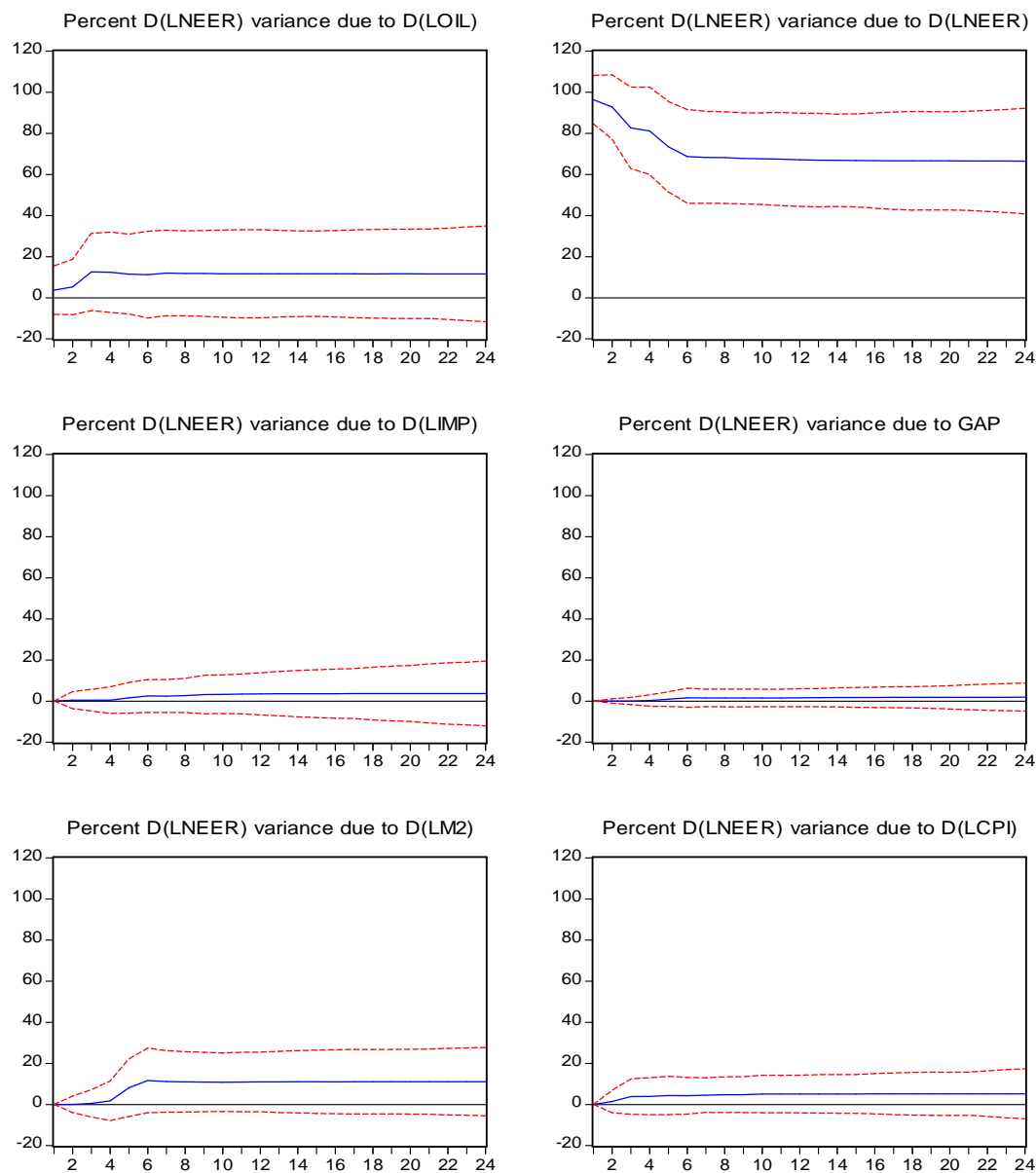*Figure 7: Exchange Rate Variance Decomposition*

Variance Decomposition ± 2 S.E.

Percent D(LNEER) variance due to D(LOIL), Percent D(LNEER) variance due to D(LNEER), Percent D(LNEER) variance due to D(LIMP), Percent D(LNEER) variance due to GAP, Percent D(LNEER) variance due to D(LM2), Percent D(LNEER) variance due to D(LCPI)

Figure 8: Import Price Variance Decomposition

Variance Decomposition ± 2 S.E.
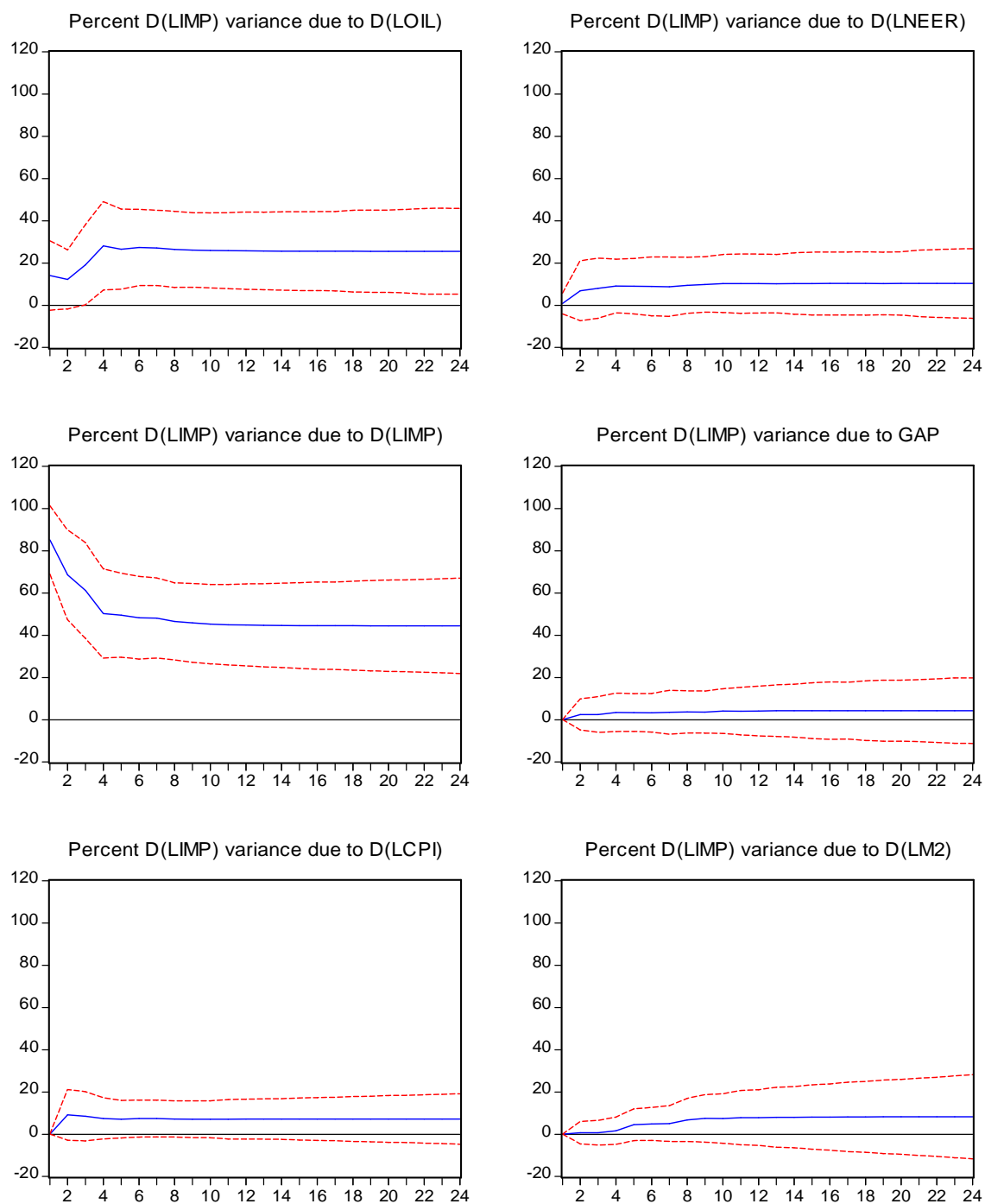
Figure 9: Output Gap Variance Decomposition

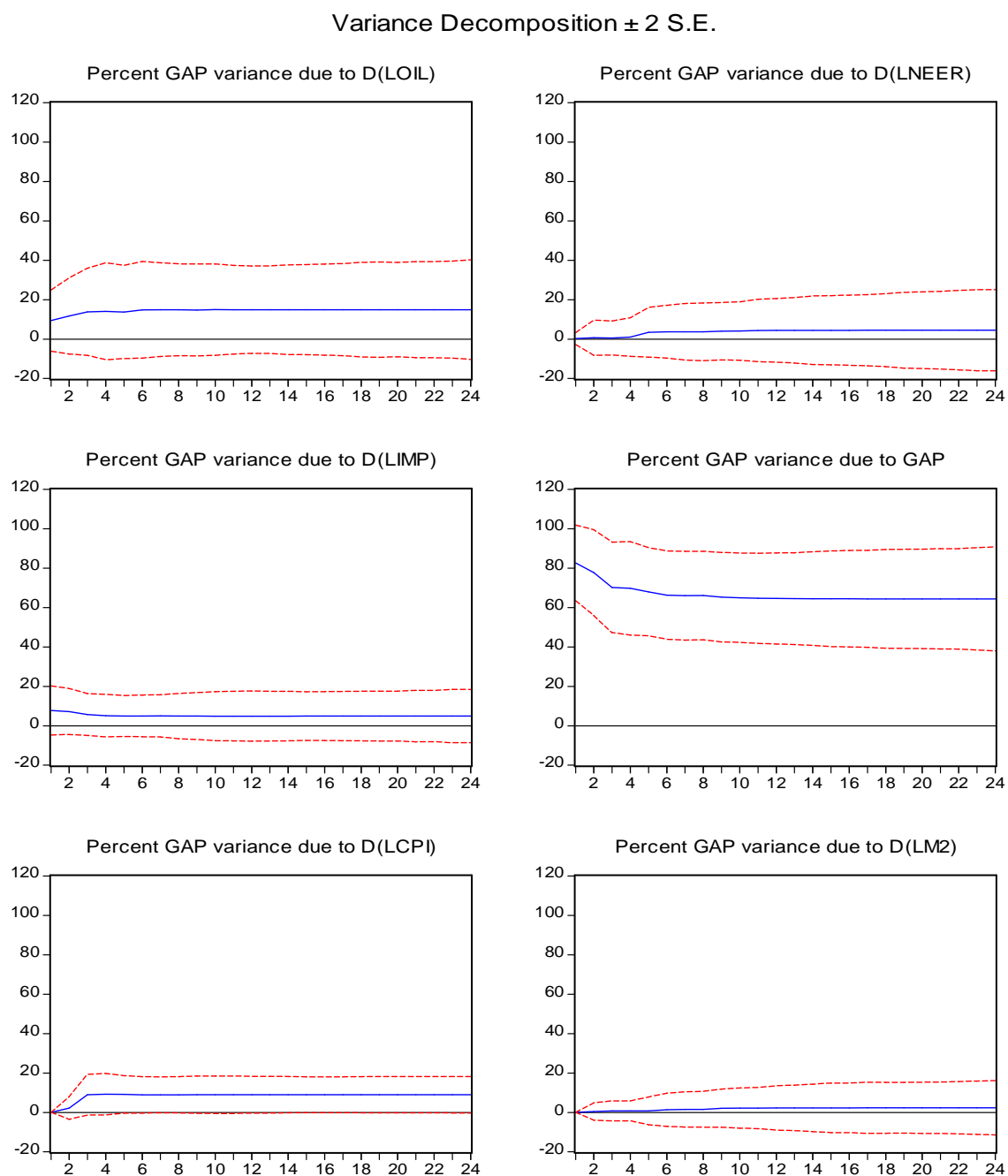Variance Decomposition ± 2 S.E.

Figure 10: CPI Variance Decomposition
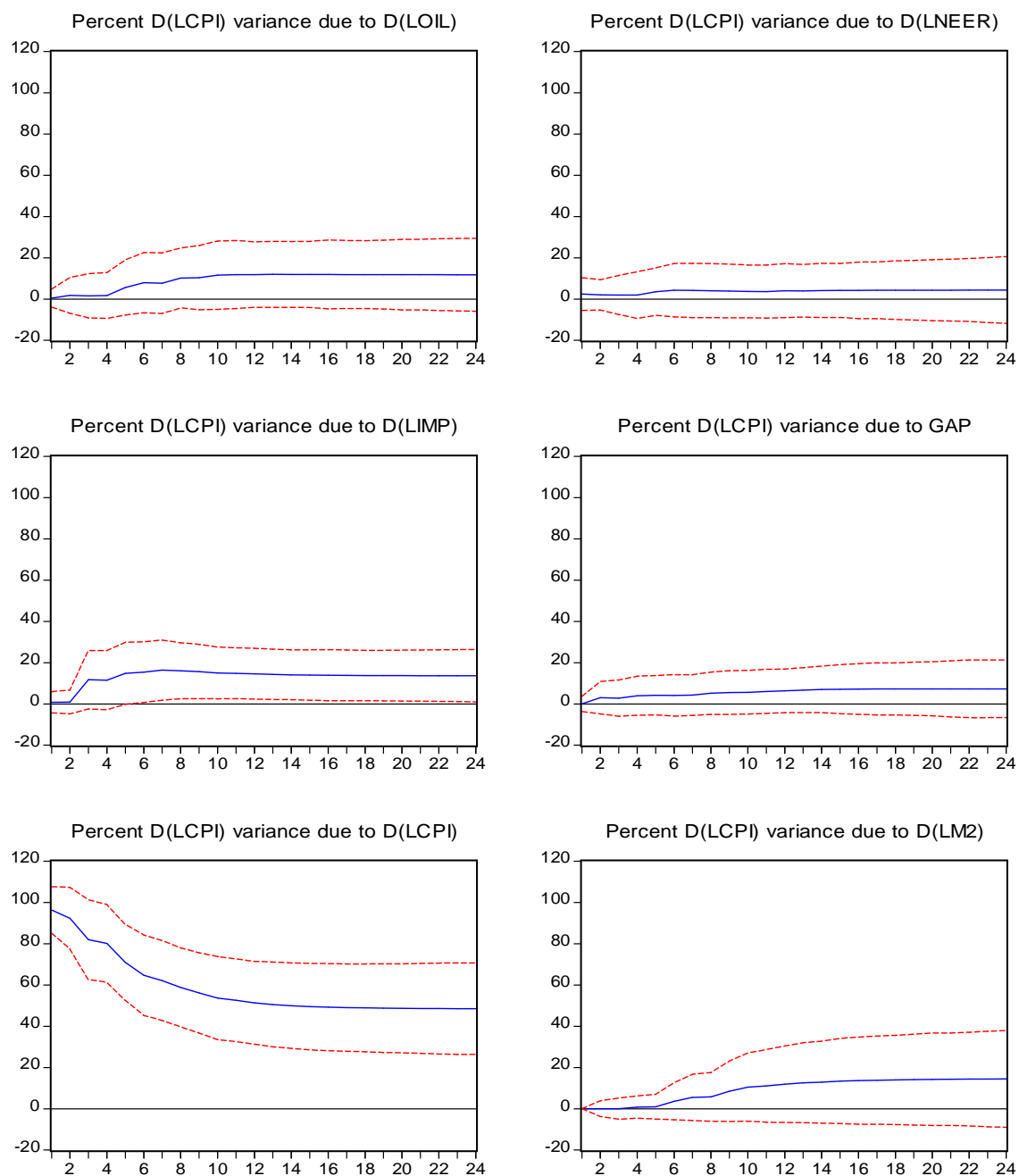
Variance Decomposition ± 2 S.E.

Figure 11: Monetary Policy Innovation Variance Decomposition

Variance Decomposition ± 2 S.E.