EAST ASIAN DEVELOPMENT NETWORK (EADN)

INDIVIDUAL RESEARCH PROJECT

EXCHANGE RATE ARRANGEMENT IN VIETNAM:

INFORMATION CONTENT AND POLICY OPTIONS

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Abbreviation

ADF test	=	Augmented Dickey-Fuller test
AFTA	=	ASEAN Free Trade Area
Agribank	=	The Bank for Agriculture and Rural Development
AMC	=	Asset Management Company
ASEAN	=	Association of Southeast Asian Nations
BBC	=	'Band-Basket-Crawl' (system)
BIDV	=	The Bank for Investment and Development of Vietnam
BOPs	=	Balance of Payments

CAVN	=	Current Account balance measured in bill.VND
CEPT	=	Common Effective Preferential Tariffs
CIEM	=	Central Institute for Economic Management, Vietnam
CIF	=	Cost – Insurance – Freight
CMEA	=	Council for Mutual Economic Assistance
CPE	=	Centrally-planned economy
CPI	=	Consumer price index
CU	=	Currency in circulation
DF test	=	Dickey-Fuller test
DLX	=	ΔLog(X) = Growth rate of variable X (eg. DLCPI = inflation)
EADN	=	East Asian Development Network
ECM	=	Error Correction Model
ER	=	Exchange rate
ERRo	=	Error terms from cointegration between money, prices and output
FDI	=	Foreign direct investment
FE	=	Foreign exchange
FECs	=	Controls over foreign exchange
FOB	=	Free on Board
GDP	=	Gross domestic product
GSO	=	General Statistic Office of Vietnam
GVN	=	The Government of Vietnam
HSER	=	parallel selling ER in Hanoi
IMF	=	International Monetary Fund
Incombank	=	The Industrial and Commercial Bank
IND	=	Real industrial output
JSBs	=	Joint-stock banks
M	=	Money aggregate
M1	=	CU plus demand deposits
M2	=	Broad money (M1 plus time deposits plus foreign currency deposits)
MARS	=	Market Average Exchange Rate System
MPE	=	Modified planned economy
MPI	=	Ministry of Planning and Investment of Vietnam
NDA	=	Net domestic assets
NFA	=	Net foreign assets
NPLs	=	Non-performing loans
NTBs	=	Non-tariff barriers
OER	=	Official exchange rate
OLS method	=	The method of Ordinary Least Squares
OMO	=	Open market operations
PEO	=	Pacific Economic Outlook
REER	=	Real effective exchange rate
RER	=	Real exchange rate

SBVN	=	The State Bank of Vietnam
SDOM_LIBOR	=	Short-term (domestic) lending interest rate – LIBOR
SER	=	Selling interbank exchange rate
SOCBs	=	State-owned commercial banks
SOEs	=	State-owned enterprises
SSER	=	parallel selling ER in Ho Chi Minh City
UNDP	=	United Nation Development Program
VAR	=	Vector Autoregressive (model)
Vietcombank	=	The Bank for Foreign Trade of Vietnam
VND	=	Vietnamese Dong
WEO	=	World Economic Outlook
WTO	=	World Trade Organization

Summary

Vietnam undertook its first steps towards economic reforms at the beginning of the 1980s. As a result, it moved away from a strictly centrally-planned to a 'modified' planned economy. The program of Renovation (*Doimoi*) was initiated in 1986, but it was only in the spring of 1989, that Vietnam adopted a comprehensive reform package aimed at stabilizing and opening the economy, enhancing freedom of choice for economic units, and promoting competition so as to change fundamentally the economic management system in Vietnam towards a market-oriented economy. Some important steps have been taken on the road to a more market-oriented financial system. The role of the exchange rate (ER) policy has been reassessed significantly since 1989 when the ER was unified by a sharp devaluation of the official rate. During the 1990s, the Vietnamese Dong (VND) was effectively pegged to the United States Dollar (USD) with several discrete realignments, especially during 1990-91 and 1997-1999. The ER control has been considered by Vietnamese authorities an important macroeconomic instrument for ensuring low inflation and stability of the financial system, promoting exports, controlling imports, and enhancing economic growth.

The research presented in this study attempts to give an overall picture of the ER arrangement in Vietnam and associated policies as well as to examine the ER's interrelationship with and its impacts on the main macroeconomic variables in the context of economic reforms in Vietnam during the 1990s. The focus of the research is as follows:

- To find out the information content (marginal predictive content) of the ERs and monetary aggregates (CU, M1, M2) together with the changes in output and prices;
- To identify the significance and the magnitude of the impacts of changes in the ER on inflation and output growth;
- To examine the capability of the State Bank of Vietnam (SBVN) in maintaining an independent and effective monetary policy in the context of a pegged ER and capital inflows;
- To search for an appropriate option for the SBVN to have a smooth shift to a more flexible and rational ER arrangement.

Besides a description of ER arrangement/policy in Vietnam since the market-oriented reforms in 1989, and a review of the changes in the ER policy and movements in the major macrovariables, the quantitative and econometric research methods were used in the analyses. In discussing ER arrangement and ER policy choices, along with the

policy implications of our quantitative assessments, reference is made to relevant theories and historical lessons of other countries.

Based on the quantitative and econometric assessments, we found that the usefulness of both monetary and ER policies has generally been very limited as predictors of the main macroeconomic variables such as output and prices, while microeconomic behaviour has become more market-oriented. The changes in monetary aggregates (CU, M1, M2) do not contain any advance information on inflation and (real industrial) output fluctuations, which seem to have been largely demand determined. The rates of change in ERs have altered significantly the Granger-causality between output growth, inflation, and money growth; however, this did not help to predict future movements of inflation.

Moreover, the lagged changes in money supply (especially in M2 as the most important policy target) have not generally been significant determinants of depreciation in exchange rates. The changes in nominal ERs (Official ERs and Interbank ERs) served, albeit inconsistently, as a leading indicator for output growth, but this causality was not stable. Current inflation and (real industrial) output growth have been mostly explained by their past movements. *Real* depreciation rates have had a positive and rather significant impact on output growth, though the magnitude was very unstable. Thus, in a changing institutional environment in Vietnam, firm's behaviour has become more market-oriented. At the same time, as the estimated 'offset' coefficients were statistically significant and not different from -1, the SBVN has been faced with the difficulty in maintaining an independent and effective monetary policy while holding to a pegged exchange rate regime.

These findings are also consistent with our descriptive analysis that during the 1990s, financial reforms in Vietnam, though considerable, still did not keep pace with economic development and the financial sector remains fragile; the formulation and implementation of effective monetary instruments remain rudimentary. Also, in the context of high trade and current account deficits together with the real appreciation of the VND during 1993-96, Vietnam may need to move towards a more flexible ER policy. This is also supported by the fact that the impact of changes in ERs on inflation became much weaker and insignificant or much less significant during the second half of 1990s.

Expressed differently, other things being equal, there could be room for Vietnam to move to a more flexible ER regime without a considerable increase in the inflation rate. Moreover, the lack of a comprehensive and flexible approach in dealing with ERs and interest rates for both domestic and foreign currencies has created the problem of policy inconsistency, which was exposed in the periods of 1993-96 and 1997-2000. The

excessive application of import restrictions and FE controls were utilized as an excuse for delaying desirable financial reforms.

Since February 1999, the SBVN has moved to the market average ER system (MARS). However, a number of problems relating to the equilibrium rate, the thinness of the interbank market, the rigidity in movement of the ER, and the need to having policy consistency, raise question about the appropriateness of this arrangement.

The research concludes that, as Vietnam has committed to further structural reforms and more active participation in regional and world markets, an ER regime with greater flexibility becomes more appropriate. In practice, there are two common ER arrangements that could be adopted: the 'band-basket-crawl' (BBC) scheme and the MARS. After evaluating the advantages and disadvantages of these two systems, this study suggests that the BBC system appears more appropriate for Vietnam. However a smooth exit to a new BBC regime would very much depend on the determination of a (new) central parity, the coordination with other macropolicies and structural reforms, and the establishment of policy credibility.

Chapter I

INTRODUCTION

For an open economy, issues surrounding the exchange rate (ER) are often both important and controversial. The determination of an equilibrium rate and the interrelationship rates have with components of aggregate demand (e.g. consumption, exports, and imports) and aggregate supply (through production costs), as well as its impact on capital flows, on the independence of monetary policy, and on the effectiveness of macroeconomic policies in attaining and maintaining macroeconomic stability are significant concerns of all policy-makers. A search of the literature in this field reveals both arguments for fixed and freely floating ER regimes. We argue below that there is a rationale for some degree of ER management, between these two extreme regimes, allowing an economy to combine the advantages of both regimes while limiting their disadvantages. Through this discourse we acknowledge that different types of ER arrangements are appropriate for different countries, depending on their degree of openness, structural characteristics, the existence of possible external shocks, and macroeconomic environments. For many developing economies or economies in transition that are in the process of establishing market institutions and striving for trade liberalization, including a gradual opening of the capital account, setting an appropriate ER regime is very important. And although there is in general a broad consensus in the literature that a fixed ER together with a fairly open capital account is not, in the long run, sustainable, the appropriate choice of ER controls arrangements in a number of economies remains controversial.[1]

For Vietnam, an economy in transition from a centrally-planned economy (CPE) to a market-oriented one, studies on the impact of previous and current ER policies can play a role in pointing towards future appropriate ER strategies. Prior to the 1980s, Vietnam's economy was essentially a CPE. During the 1980s, Vietnam could be seen as a modified-planned economy (MPE) where some microeconomic reforms were undertaken. However, up to 1989 the official ER served mainly as an accounting device to enable the consistent conversion between foreign and domestic prices. The official fixed ER stood consistently lower than that prevailing in the market.

In 1989 when Vietnam embarked on radical reform towards a market-oriented economy, the fixed and market ERs were unified though a sharp devaluation of the official ER. This devaluation had a very positive impact on exports and economic

[1] There is a well-known trilemma: ER stability, full financial integration, and monetary independence. If a country attempts to achieve ER stability and monetary independence, it needs to introduce capital controls. If a country attempts to have full financial integration and monetary independence, it needs to adopt the floating ER regime. If a country attempts to achieve ER stability and full financial integration, the very

activities and successive ER adjustments were closely correlated with the inflation rate, especially during the period of 1990-1991. Since then, influencing the ER has been regarded by the State Bank of Vietnam (SBVN) as an important macroeconomic instrument for ensuring low inflation and stability of the financial system, promoting exports, controlling imports, and improving economic performance.

However, this instrument has been used with reserve and passively. During the period of 1993-1996, the nominal ER remained relatively stable; and as inflation fell, there were concerns about an overvalued Vietnamese Dong (VND). It is estimated that over this period the real ER (RER) and the real effective ER (REER) appreciated by about 20% and 15%, respectively[2]. This appreciation was used by many to explain the reason for current account deficits at that time. Although exports grew at a high rate they remained lower than imports, resulting in very high current account deficits (peaking in 1996 at 12% of Gross Domestic Product (GDP)).

During the period of 1997-99, pressures to devalue the VND increased as financing current account deficits became more difficult due to a slow down in foreign direct investment (FDI), thin foreign currency reserves with a concurrent decline in growth of exports. Worries of overvaluation of VND have become more acute following the East Asian economic crisis that led to sharp devaluation of crisis countries' currencies, and thus reducing the competitiveness of Vietnamese commodities. A recent relaxation of macroeconomic policies, especially the so-called measures of stimulating domestic demand, could have the added pressure. Further trade liberalization that Vietnam is calling for, may also require a devaluation of the VND in order to offset its effects on the general level of domestic prices.

Under pressure to devalue with an accompanying 'fear' of bad outcomes of a sharp devaluation under the introduction of a flexible ER regime, the SBVN has adopted a combination of a 'cautious' ER policy which has allowed the VND to devalue modestly and gradually (similar to an adjustable fixed rate regime) while keeping strict control over foreign exchange. Vietnam has also imposed stronger controls over imports and current account transactions. As a result, trade and current account deficits have decreased, to about 4-5% of GDP in 1997-98[3]. Well-founded 'fear' comes not from the intricate relationship between the (real) ER and the trade balance, but rather from the fact that Vietnamese policy-makers are ill- equipped to understand how changes in the ER impact upon economic activity in general, and on inflation, capital inflows and debt

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rigid fixed ER such as the currency board system or a currency union should be considered (see, for example, Isard 1995 and Shirai 2000).

[2] See definition of real ER and real effective ER in Chapter III

[3] A decrease in imports was partly due to the slow-down in economic activity. In 1999, for the first time the trade deficit was nearly zero and the current account was in surplus.

payments, in particular. In Vietnam, production in many sectors is dependent on imports of capital and intermediate goods; foreign debt is heavily influenced by state-owned enterprises and the state budget.

Thus, the following are necessary for the country to settle issues surrounding ER determination:

- An examination of ER arrangement/policy and its effects in a broader context of the whole economy and macroeconomic policies, especially monetary policy.
- The determination of the role of the SBVN in conducting an appropriate ER policy and in directing the shift to a more flexible ER regime together with further economic and financial reforms.
- The provision of information to policy makers to help them understand ER problems in Vietnam so that they are able to decisively implement effective ER policies.

So far only a few rigorous quantitative studies of ER issues in Vietnam have been conducted. The majority has merely described the ER regime in Vietnam with some commentary (see, for example, SBVN (1995-1998), World Bank (1997), Dodsworth et al (1996), Le Van Hinh (2000), Nguyen Doan Hung (1997)). Using annual time-series data, some have limited their research to the possible impact of devaluation on the trade balance by simply checking the Marshall-Learner condition (Le Viet Duc and Tran Thu Hang 1995, Bhide 1998, Pham Chi Quang and Nguyen Viet Cuong 1999). The impact on industrial output and inflation has been analyzed by Ngo Huy Duc (1997) and Vo Tri Thanh (1996 and 1997). Recently, ER policy, together with other macroeconomic policies, was incorporated into the construction of a structural macroeconometric model (see CIEM-DIW 2000).

Though *not answering all* above-mentioned issues, this research attempts to give an overall picture of the ER arrangement/policy in Vietnam in the context of economic reform and then to examine its interrelationship with and its effects on several macroeconomic variables. The research mainly focuses on the following questions[4]:

- Whether the ER and monetary aggregates, during 1990s, contained any valuable information content on the future movements of output and prices, as expected by the SBVN. What were the significance and the magnitude of the impacts of the change

[4] Learning by doing and capacity building is also an important objective of the research. The research will give those, firstly who are involved in the research, and then those who take part in the research's workshop and who are the readers of the research, including Vietnamese policy makers, to understand about the ER in Vietnam and to utilize a more effective ER policy in a more flexible ER system for further economic liberalization.

in ER on inflation and output growth? And were the orders of magnitude stable in spite of the economic reforms and institutional changes?

- Whether the SBVN was able to maintain a relatively independent and effective monetary policy in a context of a pegged ER and capital inflows (largely in terms of FDI)?
- What options are available for the SBVN to have a smooth shift to a more flexible ER system and an effective ER policy?

Besides a description of ER arrangement/policy in Vietnam since the market-oriented reforms in 1989 and a consideration based on the simple statistics of the changes in the ER policy and the movement of the macrovariables concerned, this research will largely apply quantitative and econometric methods for analyses and evaluations. In particular, Vector Autoregressive (VAR) models will be used for the examination of information content with a focus on the marginal predictive content of the ER and monetary aggregates (currency in circulation CU, M1, and M2) on the movement of (industrial) output[5] and prices and of the possible causality between monetary aggregates, output and prices as well. Since the VAR model lacks theoretical support and has several limitations, it is important to examine more deeply the impact of ERs on price movements and to see the "behavior" of output growth in response to the fluctuations in (real) exchange rates.

Co-integration techniques and the Error Correction Model (ECM) will be used for long-run and dynamic short-run relationships between price indices and monetary aggregates, income, and ER. A simple Lucas-type production function can be used for estimating the magnitude of the impact of RER changes on output growth. The estimation of the offset coefficient for assessing the effectiveness and independence of monetary policy will be carried out[6]. In discussion of the ER arrangement and ER policy choices, along with the policy implications of our quantitative assessments, reference is made to relevant theories and historical lessons of other countries.

Following the outline of the historical background as well as the objectives of our project discussed here in Chapter I, the remainder of the study will be organized as follows. Chapter II aims to give an overview of ER arrangement since 1989 when reform towards a market-oriented economy was well under way. Chapter III attempts to explain the role of the ER among other major macroeconomic variables by using a simple statistical description. Based on the VAR models, Chapter IV examines the relationship

[5] The monthly data are only available for industrial output; for GDP, only (preliminary estimates of) quarterly data are available.

between the changes in (industrial) output, prices and money and the information content/marginal predictive content of monetary aggregates and exchange rates. Chapter V attempts to quantify the impact of changes in the ERs on output growth and inflation and to answer the question of the effect of capital inflows on the effectiveness of monetary policy during 1990s. Chapter VI analyzes the options for Vietnam (i.e. the SBVN) to shift to a more flexible ER system in an orderly manner and to implement an effective ER policy. The analysis is based on considerations in previous chapters, including arguments for and against a specific ER regime, and the rational way for changing the current ER regime. The conclusion, Chapter VII, summarizes the main findings and suggests some points for further research.

[6] Since the SBVN in fact could not intend to undertake sterilization operation, the estimation will be based on a broader 'compensation' measure, the change in the net domestic assets, for the change in the (net) foreign assets.

Chapter II

THE ECONOMIC REFORMS AND THE EXCHANGE RATE ARRANGEMENT SINCE 1989

II.1. An overview of the economic renovation and the financial reforms during the period of 1989-1999

II.1.1. The economic Renovation (Doimoi)

Prior to the 1980s, the characteristics of Vietnam's economy were essentially those of a centrally-planned economy (CPE). The economy suffered from persistent shortages with low levels of per capita consumption and inefficient investments. By the end of the 1970s, the failures of the centrally planned system had become apparent and pressures for reform increased substantially. In 1981, the Vietnamese government tried to create incentives in the agricultural sector and the state-owned enterprises (SOEs) through selected microeconomic reforms. Market forces were enhanced, resulting in an increase in voluntary and decentralized interactions between individual agents. Nevertheless, up to this point, there had been no significant changes in macroeconomic management, particularly in the triangular relationship involving the state budget, the central bank, and the SOE sector. The subsequent financial reform (the so-called 'price-salary-money reform') in 1985, proceeded without addressing the fundamental problems of resource misallocation and macro-imbalances in the economy. Although output expanded, high rates of inflation emerged, and in the mid-1980s, accelerated to several hundred percent (Leung and Vo 1996). Up to 1989 the role of the official ER was mainly that of an accounting device to enable consistent conversion between foreign and domestic prices. The official ER had been fixed by the government at a level much lower than that prevailing in the market.

The failure of the efforts to stabilize the economy until 1988 and of the last attempts to control the free market during the period 1985-88 showed that Vietnam could not return to its previous managerial system. Although the renovation program (*Doimoi*) was initiated in 1986, only in the spring of 1989 did Vietnam embark on comprehensive reform towards a market economy. The reform aimed to stabilize the economy, remove administrative controls that stifled economic performance, inducing greater autonomy and competition in production and business. An array of measures to develop markets was implemented. Price liberalization was carried out in 1989-1991. The reform also included a large devaluation and unification of the official and market ERs, raising nominal interest rates and thereby pushing real rates to positive levels, reducing subsidies to SOEs, curbing public sector expenditures, restraining increases in wages and state-run sector and state budget expenditures as well as halting the financing of state budget deficits by printing money. In the meantime, supply side-related policies such as encouragement of the development of a multi-ownership economy, restructuring of

SOEs, decollectivization and granting individuals and families long-term user rights to productive land in the agricultural sector were essential factors included in the reform package. With the legacy of a market economy before 1975, especially Southern Vietnam responded quickly to these market-oriented reforms.

As a result, Vietnam recorded remarkable achievements in terms of GDP growth, inflation control, export expansion, and attraction of foreign direct investment (FDI), especially during the period of 1989-1996 (Table II.1). From experiencing widespread food-shortages while importing approximately half a million tons of food annually in 1986-1988, in 1989 Vietnam became the third- and then in 1990s the second- largest exporter of rice behind Thailand.

Since 1997 the economy has experienced a slow-down, reflecting structural weaknesses compounded by the regional crisis. The GDP growth rate progressively slowed from 9.3% in 1996 to 8.1% in 1997, 5.8% in 1998 and 4.8% in 1999. FDI, which has played a significant role in supporting economic growth, declined dramatically in terms of both commitments and disbursements. Enterprises, mainly SOEs, have suffered from growing inventories. Imports have been kept at low levels through restrictive trade measures in a attempt to reduce pressures in financing the trade deficits. The unemployment rate has also increased, especially in urban areas, leading to growing social problems.

Table II.1. Vietnam: Some macroeconomic indicators (1989-1999)

	89	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**[d]
GDPgrowth (%)	8.0	5.1	6.0	8.6	8.1	8.8	9.5	9.3	8.1	5.8	4.8
- Agriculture	6.9	4.6	1.7	6.9	3.3	3.4	4.8	4.4	4.3	2.7	5.2
- Industry[a]	-4.0	-2.4	12.3	9.9	12.6	13.4	13.6	14.5	12.6	10.3	7.7
- Services	17.6	10.8	5.5	9.1	8.6	9.6	9.8	8.8	7.1	4.2	2.3
Unemployment rate in cities								5.88	6.01	6.85	7.40
Inflation (%)	34.7	67.5	67.6	17.5	5.2	14.4	12.7	4.5	3.6	9.2	0.1
FDI ($US bill.)[b]											
- Commitment	88-90:	1.5	1.4	2.3	2.1	4.1	5.5	9.2	5.5	4.1	1.5
- Disbursement		0.12	0.22	0.26	0.30	1.05	1.40	1.80	2.59	1.85	1.45
Export (USD bill.)	1.32	1.73	2.04	2.48	2.98	4.05	5.20	7.33	9.27	9.36	11.54
- % change	80.1	31.1	17.9	21.6	20.2	35.9	28.4	41.0	26.5	1.0	23.1
Import (USD bill.)	1.67	1.97	2.34	2.54	3.92	5.83	8.16	11.1	11.7	11.6	11.64
- % change	18.3	18.0	18.8	8.6	54.3	48.7	40.0	36.0	5.4	-0.9	0.3

Note: a. Including Construction; b. Total commitments including Vietnam's contribution; according to the World Bank, during 1998-99, the annual disbursement was just about USD 700-800 million; c. Official figures (FOB for exports and CIF for imports); d. Preliminary estimates.
Source: General Statistic Office of Vietnam (GSO) and Ministry of Planning and Investment (MPI) and our estimates

The structural weaknesses of the economy are now widely recognized by Vietnamese policy-makers. For example, according to the Government's report at the 6th session of 10th National Parliament Assembly, November 1999, this slow-down is related to the Country's "low degree of development, unsustainable economic growth, a low level of competitiveness and inefficient economic performance." The report also points out several specific reasons for the slow-down. Firstly, the commitment to multiple ownership in the economy has not been effectively realized. Many SOEs remain inefficient piling up losses, while SOE equitization and privatization have progressed slowly. In practice, a completely level playing field has not been established for all types of ownership and the private sector has still faced discrimination in some areas. Secondly, the market economy, in reality, remains rudimentary. Market mechanisms as well as pertinent institutions have not been fully established. Economic policies, falling short of effectively promoting a market economy, have been shaped by a CPE model, which is still characterized by the "asking-giving mechanism". Thirdly, while the progress towards international and regional economic integration has been significant, in practice the government has caved in protectionist demands, implementing a variety of trade barriers that have overwhelmed efforts for raising economic competitiveness and efficiency. Investment allocation has been led by import-substitution philosophies.

The above government's assessments have verified, to a certain extent, that economic reform has not kept pace with what is needed to attain sustainable economic growth[7]. Even in 1996, it was deemed that the benefits earned from reforms were nearly exhausted (Kokko and Zejan 1996) and forecasted that the growth rate at the end of the decade would be 5 %, much lower than that projected by the VIIIth Vietnamese Communist Party Congress in 1997 (Fforde 1997).

With controls on its capital account, it may be true that Vietnam was not highly vulnerable to the East Asian economic crisis as Indonesia, Malaysia, and Philippines. Nevertheless, with a close link with the Asia-Pacific countries through trade (about 60% of Vietnam's exports and nearly 75% of its imports) and FDI (about 2/3 come from East Asian countries), the contagion effects of the regional crisis on Vietnam's economy have been unavoidable. *The regional crisis together with the existing structural weaknesses and macroimbalances of Vietnam's economy* imposed significant negative socio-economic impacts on Vietnam's economy, particularly in 1998, and these impacts continued to be felt in 1999. Our estimates show that the costs in terms of foregone potential GDP growth due to delaying reforms and the impacts of the regional crisis could reach, respectively, to 1.2% and 3.5% (total = 4.7%) in 1998 and up to 2.1% and 3.2% (total = 5.3%) in 1999 (Vo Tri Thanh 1999).

In summary, the economic reform has brought a number of fundamental changes to the economy, especially during the first half of the 1990s. Nonetheless the slow-down in the economic reforms in the second half of the 1990s and in combination with the negative impacts of the regional crisis has slowed down the progress achieved with great effort by the country in the first stage of the reform and left the country with a number of issues to be addressed in order for her to move ahead to achieve sustainable economic growth rates. The serious concerns raised in Vietnam are not just that the crisis has had negative effects on its economy, but also that in light of the regional crisis and restructuring, Vietnam must rethink its reform program and longer-term development strategy.

II.1.2. Financial sector reforms and monetary instruments

In line with the economic Renovation since 1989, reforms in the financial sector have also taken place. This section examines pertinent changes in the sector in an attempt to provide a background to ER arrangement. A focus on the institutional, legal, and regulatory framework of the sector is followed by a discussion of monetary policy instruments exercised by the State Bank of Vietnam (SBVN), including its role in ER policy..

Prior to 1990, the Vietnamese banking system followed a CPE model; the primary task of the SBVN was to provide all banking services in accordance with the national plan. In mid-1988, Vietnam took the initial steps towards establishing a two-tier banking system by transferring the commercial banking functions of the SBVN to the new state-owned commercial banks (SOCBs). In practice, however, the two-tier system did not function as intended since the SBVN remained very much part of the state bureaucracy. Only in 1990 did the new laws on banking (the 'Decree on the State Bank of Vietnam' and the 'Decree on Banks, Credit Co-operative and Finance Companies') authorize the SBVN to assume traditional central bank functions such as the conduct of monetary policy and the supervision of the financial system. By the end of 1998, Vietnam's financial system consisted of four state-owned commercial banks (SOCBs)[8], accounting for more than 80 percent of total banking sector assets, 51 joint-stock banks (JSBs), accounting for 10 percent of total assets, 23 branches of foreign banks and four joint-venture banks, accounting for 8 percent of total assets (IMF 1999), and a system of people credit funds. In addition to the official system, unofficial financial operations have still existed in the community. Compared to the former mono-bank system that was

[7] See, for example, World Bank (1997 and 1998), IMF (1999), UNDP (1996)

[8] Four SOCBs are the Bank for Foreign Trade of Vietnam (Vietcombank), the Bank for Investmant and Development of Vietnam (BIDV), the Industrial and Commercial Bank (Incombank), and the Vietnam Bank for Agriculture and Rural Development (Agribank).

comprised of the SBVN, the growing number of financial institutions operating on a business basis is remarkable.

Nonetheless, some of the main characteristics of a centrally-planned system remain, such as dominance of state-run components, combination of commercial and noncommercial (so-called policy) financial activities and the government's direct controls. In the banking system, the SBVN is still defined as an organization of the government and is instructed to carry out functions assigned by the government (Article 1 and Section II of the SBVN Decree and Law, respectively) and therefore remains dependent on the government while the SOCBs still account for 82 percent of total banking sector assets (see also Box 1) and for "80 percent of loans and deposits and their lending remains subject to official intervention" (IMF 1999), especially credits to the SOE sector. The direct controls (meaning less market-based activity) over the banking system are also reflected in operating procedures employed so far in the system which will be mentioned shortly.

Box 1: The Measure of the monopoly power in Vietnam's banking system

- The Herfindahl index (H) is a measure of the monopoly power in an industry as a whole. $H=(\Sigma S_i^2)/100$ where S_i is the market share of firm i in the industry. In general, the greater the value of H is, the greater the degree of monopoly power is in the industry. In the case of a monopoly (or a single firm), H= 100. According to US Justice Department guidelines, a merger is likely to be challenged if the post-merger Herfindahl index is estimated to be greater than 18.

- Our calculation of H for the banking system in Vietnam is based on shares of deposits, credits and assets of three groups: the state-owned commercial banks (SOCBs), the joint-stock banks (JSBs), and the branches of foreign banks and joint-venture banks. The results are denoted as H_d, H_c, and H_a, respectively.

$$\mathbf{H_d = 61;\ H_c = 58} \text{ and } \mathbf{H_a = 69} \text{ (1998)}$$

- The major shortcomings in using the Herfindahl index are: (a) If imports are significant, H may overestimate the relative importance of concentration in the industry; (b) H may not be relevant for the economy as a whole when the market is local (eg. in the case of the cement industry); (c) H depends very much on how the industry is defined; and (d) H does not give any indication of potential entrants into the market.

Progress has also been made in defining the financial and banking system, its participants, and their inter-relationships, rights and obligations, including the establishment of regulatory mechanisms for mobilizing funds. Nonetheless, following the legacy of a centrally-planned model, Vietnam's financial and banking legislation

continues to fall short of having fully adequate prudential and supervisory regulations to ensure an effective, safe and transparent financial system. There continues to be a lack of cohesiveness with uncertainty over the interpretation, application, and mechanisms for the enforcement of specific provisions of the law (World Bank 1995).

Throughout the reform, a series of appropriate devices have been introduced and applied in the financial and banking system, emphasizing the SBVN's role in exercising prudential and supervisory controls on financial operations, albeit these devices remain constrained by inadequacies in the legal framework. Reserve requirements were put into practice in 1990; credit ceilings replaced credit plans, and rules over holdings of government securities were put in place in 1991; inter-bank markets for both domestic funds and foreign exchange were established in 1993 and 1994 respectively; a foreign exchange auction system allowed for intervention in determining the ER and for payment of instruments such as transfer payment checks, cash transfer checks, payment orders and payments vouchers. Nonetheless, in general, Vietnam's financial sector remains rudimentary as a result of "incomplete reforms of the financial sector and the SOEs" (IMF 1999). The incomplete reforms of financial sector and SOEs have left the financial sector in general and banking system in particular vulnerable and lacking the trust to the whole community. "Many banks are financially weak, with shoestring equity capital. Their credit performance is poor and they hold excessively high levels of overdue debt, posing financial risks to the whole banking system" (Nguyen Tan Dung 1999).

The financial system still lacks depth as indicated by low broad money/GDP ratios (29% and 33% respectively, in 1998 and 1999) compared with other ASEAN countries. These figures for Vietnam indicate that the banking system is still far from playing a key role in financial intermediation. Recently, several events have revealed the fragility of the banking system. First, the balance sheets of state banks have steadily deteriorated since 1994. At the end of 1998, non-performing loans accounted for 12.5% of total debt, compared with 6% at the end of 1994. Moreover, about ½ of these debts were overdue more than 6 months. Second, the four state-owned commercial banks (SOCBs), which account for 80% of deposits, have a very weak capital base. In early 1998, their capital/total assets and capital/total credit ratios were just 5.3% and 8.9% respectively. Third, the banking system's exposure to foreign exchange risk is high as about 40% of total credit is in foreign (USD) exchange while business enterprises in most cases used these loans for domestic operations and do not have access to foreign exchange hedging instruments. Moral hazard continues to afflict the system demonstrated by a 'mini-crisis' in early 1997 when the SBVN had to rescue the reputation of the banking system by securing the repayment of guaranteed letters of credit[9]. The SOCBs

[9] Faced with tight domestic credit and speculating on real estate price increases, in 1996 a number of Vietnamese enterprises engaged in foreign borrowings in form of deferred L/Cs. The real estate bubble

have been also allowed to rollover past-due loans without limit, especially for the SOEs (e.g. the cases of the Nam Dinh Textile Enterprise and Ha Bac Fertilizer Enterprise in 1997).

Until now monetary controls exercised by the SBVN have been mainly carried out through a system of direct instruments. Interest rates have been set by the government in conjunction with the SBVN; SBVN's credit to banks (SBVN's refinancing facilities) has been a main channel through which liquidity is provided to the economy. The credit ceilings, which have been utilized since 1994 and actively used during 1994-96, were viewed as "necessary for achieving monetary and credit targets." Setting minimum reserve requirements, as an important monetary policy instrument has not been effectively used as procedures for calculating required reserves is cumbersome (World Bank 1995). In addition to these instruments, the ER was both viewed as a monetary policy instrument and sometimes as a target for monetary policy (SBVN 1995-1998). Also it seems that monetary authorities gave formal and informal advice to banks in their lending, particularly with regard to choice of borrowers, another instrument of control on bank lending policy (World Bank 1995).

Use of these instruments has been viewed to be rudimentary in the sense that they are too direct, having "an interventionist flavour, and as such, tend to interfere with the efficiency and development of the banking system" (World Bank 1999). Recently, Deputy Prime Minister and former Governor of the SBVN, Nguyen Tan Dung, also pointed out that "reforms of key monetary instruments have also been slow, with frequent abuse of direct administrative instruments which are now irrelevant and of little effect, while indirect instruments formulating and implementing monetary policies remain rudimentary" (Nguyen Tan Dung 1999). The Law on the SBVN approved in December 1997 seems to be a step backwards, at least in terms of the central bank independence.

In sum, the slow-down in the comprehensive economic reform since 1996 has led to a downturn in economic performance, compounded by the negative impact of the regional crisis during the last three years. This slow-down includes the incomplete reforms of the financial and banking sector, in which serious measures were implemented in the first half of the 1990s. A dilemma facing the SBVN now is how to effectively control the money supply while being able to promote a financial system that facilitates the efficient financial resource allocations. The ER arrangement is one part of this general environment. Issues related to it are discussed in the remaining parts of this chapter.

II.2. Exchange rate arrangement during 1989-1999

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burst and a large proportion of loans became bad debts. As a result of this financial mini-crisis, Vietnam's banking system rating was downgraded from Ba3 to C.

Before 1989, Vietnam adopted a multiple ER system with two official exchange rates (OERs) for foreign trading and non-trading and a so-called internal ER, which was applicable to business relations between domestic banks and other domestic business entities using foreign exchange and was also used for state budgeting in regard to foreign aid mainly coming from the former CMEA and former Soviet Union. In 1988, the two OERs were devalued several times from VND225/USD to VND900/USD for trade transactions and from VND368/USD to VND3500/USD for all other transactions. In March 1989, these two OERs were unified into a single rate and raised to VND4500/USD, approaching the level in the parallel foreign exchange market. Since then, ER determination has become more market-oriented (See Box 2 for the path of ER and foreign exchange market reform). Still, some clarifications are needed concerning ER arrangements during the economic reform, issues such as how the ER has been managed, including what has helped maintain rates in the light of the recent regional crisis, and on the nature of the movements toward a flexible ER regime.

Box 2: Path of the changes in the ER arrangements and foreign exchange controls

Before 1989:

- Three-tier ER system: official ER for foreign trading, non-trading ER and internal ER used in business relations between banks and other domestic business entities. These rates were also used in state budgeting in regard to foreign aid mainly coming from the former Council for Mutual Economic Assistance (CMEA) and the former Soviet Union using the Transfer Ruble.
- ERs were set by the government at fixed levels based on economic and granting agreements between the government of Vietnam and other related countries.
- A parallel foreign exchange market with higher ERs than those set by the government.

March 1989 (after the Sixth Communist Party Congress):

- The multi-tier ER system was unified into a single official ER (OER) set by the State Bank of Vietnam (SBVN).
- The OER was adjustable in principle, based on inflation rates, interest rates, balance of payment (BOP) stance and the ER in the parallel/free foreign exchange market; based on the OER announced by SBV, commercial banks were allowed to set ERs for their own transactions within a band of (+/-)5% around the OER.

October 1989:

- Issuing Regulation on foreign exchange management, reinforced later by a series of implementation documents such as Circular 33-NH/TT (15 March 1990) giving guidance to Regulation implementation, Direction 330-CT (13 Sept. 1990) expediting control over the use of foreign exchange, and Decision 96-NH/QD to regulate NOSTRO ACCOUNT (5 Nov. 1990).

1991:

- Tighter control over use of foreign exchange (Decision 337/HDBT dated 25 Oct. 1991) following the establishment of an official fund for streamlining foreign exchange flows to enable the SBV to stabilize the ER (Apr.).
- Establishment of two foreign exchange transaction floors, in Ho Chi Minh City (Aug.) and Hanoi (Nov.) along with regulations on foreign exchange deposits (Jan.), foreign exchange deposit and lending interest rate ranges (June) and foreign exchange dealing (Dec.).
- OERs were set based on auction-based rates at the foreign exchange floors where the

SBV played a dominant role, by buying or selling large amounts of foreign exchange. At the end of 1991, commercial banks were allowed to set their own ERs within a range which was 0.5% higher or lower than the announced OERs.

From 1991 to 1993:

- Restriction of foreign exchange transfers through border entrance and exit controls (Decision 175-QD-NH7 dated 9 Sept. 1992) and borrowing from abroad and lending to domestic businesses (Decision 192-NH/QD dated 7 Sept.1992, Direction 08/CT-NH1 dated 9 Oct. 1992).

From 1994 to 1996:

- Replacement of the two foreign exchange transaction floors with an inter-bank foreign exchange market in which the SBVN still remained influential as the "last seller and buyer" of foreign exchange (Decision 203//QD-NH3 dated 20 Sep. 1994).
- Foreign exchange transactions by domestic sectors were limited (Decision 396/QD-TTg, Oct. 1994).
- OERs were stable and set by the SBV based on inter-bank ER rates. The ER band within which Commercial banks set their own ERs remained narrow at (+/-) 0.5% around the OER.
- Interest rates on VND were gradually lowered to reduce conversion of USD into VND.
- The ER band was somewhat widened, from 0.5% to 1% (Nov. 1996)

Since 1997:

- The ER band was widened continuously, from 1% to 5% (Feb. 1997), and from 5% to 10% (13 Oct. 1997).
- Devaluation of the VND under pressure of falling foreign exchange reserves and increases in BOP deficits, from VND 11,175/USD to VND 11,800/USD (16 Feb. 1998) and to VND 12,998/USD (7 Aug. 1998) together with narrowing the band, to 7%.
- Instead of declaring an OER, since 26 Feb. 1999 the SBV began announcing average inter-bank ERs of the previous working day, but the band has been tightened remarkably to 0.1% (Decision 65/1999/QD-NHNN7).
- Foreign exchange surrender requirements of up to 80% of available balances were introduced (Decree 173/QD-TTg, Sep. 1998), and then reduced to 50% (Aug. 1999). In Aug. 1999, the government issued Decision 170/1999/QD-TTg in order to (officially) encourages private foreign exchange transfers from abroad.

Up to February 1999, the ER was directly controlled by the government in an attempt to keep it stable (SBVN, Annual reports, 1995-1998), and administrative instruments, from time-to-time, primarily resorted to regulating ER levels. The SBVN set and announced levels of the OER and the ER band within which commercial banks were allowed to trade foreign exchange (SBVN Decree Law, 1990). During 1990-91, although it was announced that the OER was set based on market supply and demand, in reality the OER was often set at levels that were below those prevailing in the parallel free foreign exchange (FE) market, where a number of ER transactions were carried out, although illegally (Figures II.1 and II.2). To overcome problems when the OER did not reflect economic interactions in the economy and the existence of a 'black' market for FE, an official FE market was established in 1991 comprised of two FE transaction floors, one in Ho Chi Minh City (Aug.) and one in Hanoi (Nov.). Based on the auctioned rates at these two floors, the OER was set and announced by the SBVN. To reduce the amplitude of ER

fluctuations, however, the ER band was significantly reduced from 5% to 0.5%. The introduction of this arrangement seemed to make the ER more market-based. However, not long after its establishment, the OER remained lower than the ER in the parallel free market. In effect it was still controlled by the dominant SBVN which could buy and sell large amounts of FE to set the predetermined ER level (Nguyen Doan Hung 1997). Nevertheless, the mere shift from administrative setting of the OER to a system where the ER was determined through government intervention in FE supply and demand was a remarkable step towards market-based mechanisms.

Figure II.1. Nominal ERs: OER, Interbank Selling Rate (SER), Parallel Market Selling Rates in Hanoi and Ho Chi Minh City (HSER and SSER), 1990:1-1999:6

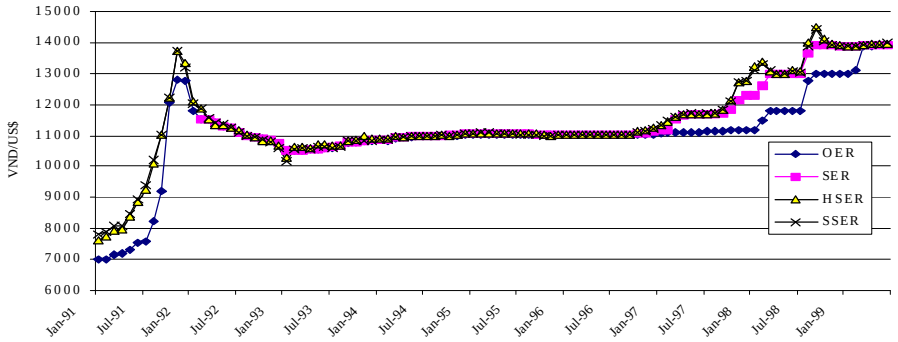
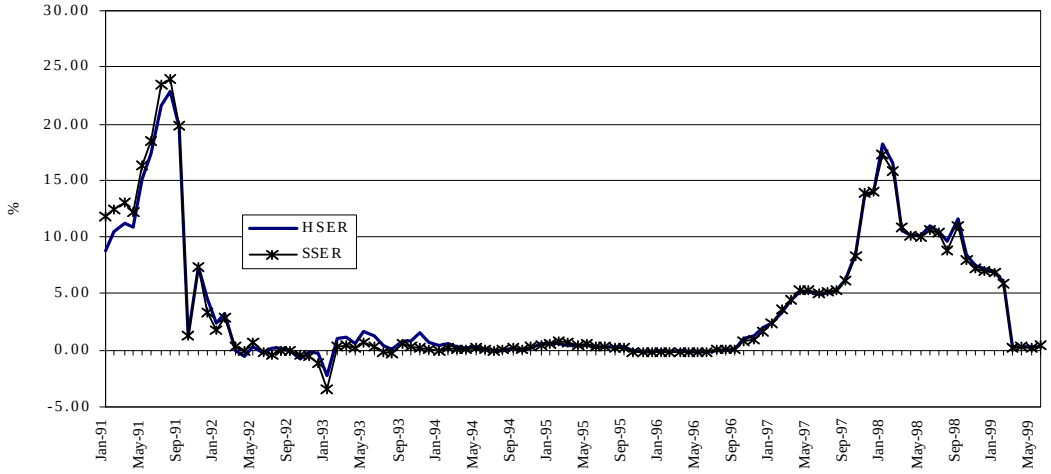


Figure II.2. Parallel market premium



Note: Premium = (Parallel Market rate-OER)*100/OER; the calculation is for HSER and SSER in Hanoi and Ho Chi Minh City

Source: Based on SBVN's data (both Figures II.1 and II.2)

In the following years, a surge in capital inflows, mainly through foreign direct investment (FDI), to a certain extent released the pressure on financing the current account deficit and therefore reversed the upward trend of ER, lessening pressure on the official FE market. On the other hand, however, this development required a more active and effective FE market, as the number of participants and transaction volumes rose. Thus, an inter-bank FE market was established in September 1994. The SBVN, while still playing a dominant role in the market as the "seller and buyer" of last resort, continued setting and announcing the OER, which was said to be based on rates in the inter-bank market. During 1993-96, the parallel market premium was less than 1%, and both the OER and the parallel free market ERs remained stable, but at levels that were believed to overvalue the VND. as the annual trade deficits were high, up to an estimated level of 16% of GDP in 1996.

Being under pressure to finance current account deficits as a result of the drop in capital inflows during the Asian financial crisis, two devaluations took place following soaring rates in the parallel free market: the OER was increased from VND 11,175/USD to VND 11,800/USD on 16 February 1998 and then to VND 12,998/USD on 7 August 1998 resulting in a total VND devaluation of 16.3%. Also, in order to increase the possibility of ER fluctuation, the ER band was adjusted, from 0.5% first to 1% in November 1996, to 5 % in February 1997 and then to 10% in October 1997; it was again narrowed to 7% in August 1998. Even though the VND was devalued by more than 16% and it was said to be set based on the rates in the inter-bank market, the OER announced by the SBVN was still depressed and did not fully reflect the aggregate FE demand and supply in the economy. The commercial banks' ERs, which were always *set at the upper bound* allowed by the SBVN demonstrate the free market upward trend of the ER, a phenomenon that the SBVN strove to change.

In an attempt to improve the ER arrangement, on 25 February 1999, a new principle for setting the ER was introduced: Effective the following day, in lieu of the OER, an average inter-bank rate of exchange between VND and USD would be determined by the SBVN but the ER band within which credit and financial institutions could trade was narrowed to 0.1%. This new ER arrangement has been viewed by Vietnamese authorities and the SBVN as a turning point in ER policy in Vietnam, moving closer to a flexible ER regime.

In order to ease pressures on the ER, Vietnam has also exercised strict controls over foreign exchange (FECs). The FECs initiated by Government Decree 161/HDBT, dated 18/10/1988, mandates that all entities, institutions and individuals place all of their FE in bank accounts. All unused FE remaining following the purchase of imports must be sold to the government and all FE transfers to abroad must have permission of the SBVN.

The later Government Decree 63/1998/ND-CP, dated 17/8/1998, maintains FECs stipulated in the Decree 161/HDBT, except legalization of some issues such as specification of terms and requirements, like residency and origin of FE. Following the recent regional crisis that affected FE reserves, all economic entities were required to deposit all FE in a single onshore account to facilitate enforcement of FECs while stricter FECs were launched by Decision 173/1998/QD-TTg, dated 12/9/1998, by the Prime Minister, imposing FE surrender requirements up to 80% of available balances. Nearly a year later in August 1999, this surrender requirement ratio was reduced to 50%.

With respect to foreign trading, in order to reduce trade deficits, FECs support the attainment of three goals, namely, mobilizing FE for the needs of enterprises (mainly SOEs), containing imports of consumer goods, and prodding foreign invested enterprises into sourcing inputs domestically while exporting outputs.

FECs have also put into place restrictions on private businesses that wish to borrow FE domestically in addition to restricting foreign-invested enterprises from freely opening accounts to borrow FE from abroad. These restrictions include a minimum borrowing requirement of US$3 million, and funds can be used only for infrastructure construction and production-specific purposes (Circular 02/TT-NH7 dated 28/6/1998 of SBVN). Whenever difficulties in financing the current account arise and/or the level of national foreign exchange reserves falls, the Government intensifies administrative controls such as banning operations of the parallel free FE market or inspecting for foreign exchange at all border checkpoints.

Except for FDI flows, capital is still not allowed to flow freely out of and into the country. A securities market newly opened in Ho Chi Minh City in July 2000, first with participation of domestic investors and then of foreign investors, had been planned for several years.

Although capital controls in Vietnam have been generally effective, this has not stopped some from finding ways to evade them, e.g. by under-invoicing exports and over-invoicing imports, taking advantage of the leads and lags in commercial settlements, or through forward exchange operations to cover trade transactions. Over the last two years, with the significant increases in USD deposits held by residents who have high expectations of further VND devaluations and the reduction in domestic interest rates coupled with greater risks in domestic lending due to the economic slow down, commercial banks have deposited substantial amounts of USD abroad in order to earn from the differential in domestic and off-shore interest rates[10]. It is evident that as the

[10] Vietnam is an economy with high degree of dollarization (Ngo Huy Duc 1997) and has allowed the banking system to hold US dollar deposits for residents. In 1999, the SBVN adjusted the ceiling of lending interest rates 5 times, from 1.2-1.5% in January to 0.85% per month in October; the interest rate on USD

process of economic integration proceeds, Vietnam will find it more difficult to control capital flows.

In closing, rather than summarizing the above, we respond to two questions on the nature of Vietnam's ER regime and the consistency of Vietnam's reforms with the conventional wisdom concerning sequencing of liberalization during the 1990s.

What type of ER regime did Vietnam actually have during the economic reform?

ER regimes are theoretically classified into fixed, floating and in between the two, referred to as managed or "dirty floating" regimes, under which "central banks intervene to buy and sell foreign currencies in attempts to influence exchange rates" (Dornbusch and Fischer 1994). Practically, ER regimes "actually span a continuum, ranging from pegs to target zones, to floats with heavy, light, or no intervention" and therefore a three-way classification is used; "pegged, intermediate (i.e. floating rates, but within a predetermined range), and floating" (IMF 1996).

For Vietnam, the ER regime is often classified as a managed-floating one. It is also often argued that after a long period of being kept stable with the help of a surge in capital inflow, since 1997, with the widening of the bands and the devaluation of 16.3%, the ER regime has shifted to be more flexible. The SBVN "took flexible and prompt measures to adjust exchange rate in order to achieve the set objectives without causing any great shock to the economy" (SBVN 1998). Actually, as the study on ER management in developing Asia carried out by Ohno (1999) points out, "the Vietnamese Dong has been *effectively pegged to the dollar with several discrete realignments in 1997-1998*" (= "adjustable peg" system).

The aforementioned description of ER arrangements is consistent with this assertion. Since 1997, Vietnam's monetary authorities in fact have adopted an adjustable peg regime, including interventions to maintain a stable ER. Initially, changes in the OER have responded rather passively. Upward adjustments were effected when difficulties in financing trade balances and shortages in foreign exchange reserves were encountered as the ER in the official market was far below that in the parallel market. Also, whenever the OER was upwardly adjusted controls over FE and imports were tightened. Moreover, the inter-bank market rates have always been *set at the upper bound* of the bands allowed by the SBVN. Recently, ER flexibility remains in question as the SBVN narrowed the trading band to 0.1% since February 1999.

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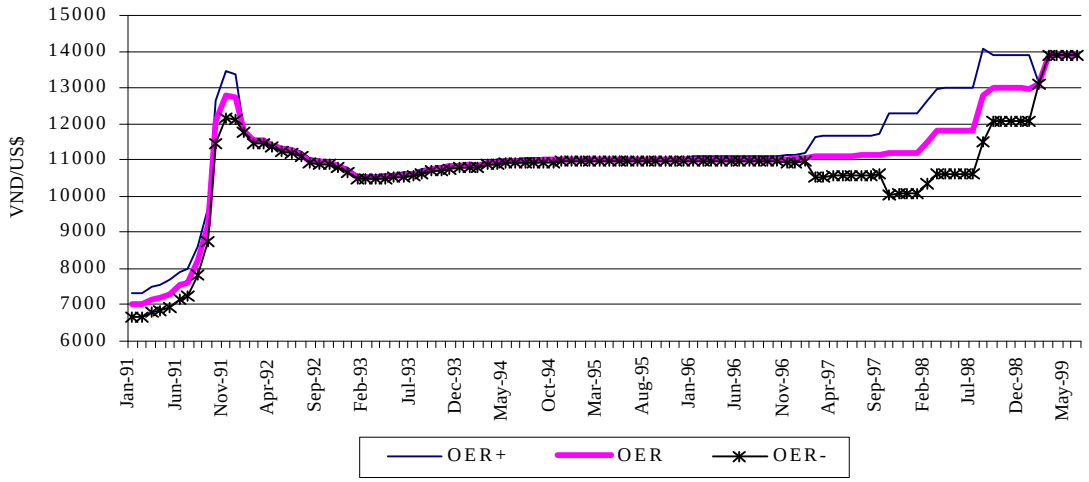
deposits of both legal entities and residents were also reduced from 3-3.5% to 2.5-3% and from 4.8-5.5% to 3.5-4.5% per year, respectively.

Under pressure from the Asian financial crisis, it is rational for Vietnam to adjust the ER in order to soften the impact of the crisis. Adjustment, however, needs to be examined in the broader context of the role of the ER in economic policy and its relationship to other key macroeconomic variables such as output, prices, and monetary aggregates.

Figure II.3. Official exchange rates (VND/USD) and exchange rate bands



Source: Based on SBVN's data and Box 1

Has economic reform in Vietnam during the 1990s meant liberalization?

There is a consensus that the 'nuts and bolts' of transition encompass three sets of reforms: (price) liberalization and stabilization; institutional changes that support market exchanges and property rights; and the establishment of social programs to ease the pain of transition (World Bank 1996). Although there exist substantial arguments on the advantages and the risks for capital account liberalization, it is now believed that economic liberalization should be conducted in an orderly, well-sequenced way in order to avoid currency and financial crises. The conventional view of liberalization here is to achieve macroeconomic stability first and to give high priority to strengthening the domestic financial sector before liberalizing the current account and then the capital account (see, for example, Eichengreen *et al*. 1999, Johnston 1998, and Shirai 2000).

During the period of 1990s, Vietnam has been successful in reducing inflation and keeping it at low levels (Table II.1). Also (especially in the first half of 1999s), Vietnam has instituted a number of economic reforms in pricing, in the external sector, in agriculture, in SOEs, and in the financial sector, that established fundamental prerequisites for a market economy. At the same time, the reforms of the financial sector (and SOE sector) and monetary instruments have been incomplete and not kept pace with economic development. The weaknesses of the banking system are a major obstacle to the process of liberalizing the current account and the BOPs.

During 1993-96, Vietnam's current account deficits reached high levels and import restrictions seemed necessary. But as a study by Nguyen Thi Hong (1999) shows, in 1997-98 restrictions were *overdone*, i.e. imports were restrained too heavily in comparison with domestic needs and ability to pay. Since 1997, although Vietnam's authorities have adopted an adjustable peg ER regime and controls over both FE and imports have become more stringent, depreciation pressures remain high. Vietnam has implemented rather effective controls over capital flows, but the effectiveness of control measures should not be used as an excuse for delaying desirable financial reforms and trade liberalization. During the 1990s, inconsistencies between the exchange rate arrangement, the interest rates for both VND and USD, and the international interest rates caused serious problems. Obviously, Vietnam needs to have a reform strategy consistent with its liberalization process to solve the trinity of the relationship between the ER, capital mobility and monetary independence. Together with improvements in banking system supervision, increased flexibility in the ER regime with fewer controls over the current account and FE seems to be the best option for Vietnam.

Chapter III

EXCHANGE RATE AS A POLICY TOOL DURING THE ECONOMIC REFORM, 1989-99

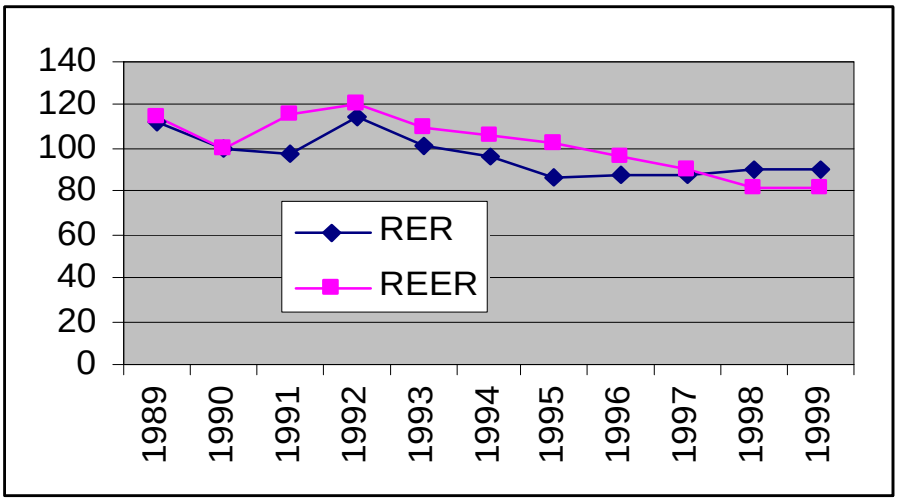
Most governments that oversee open economies implement policies designed to influence exchange rates, effectively making this one policy instrument to promote growth rates of GDP by manipulating the relations ER has to aggregate demand (consumption, investment, export and import), aggregate supply (via production costs and capital flows) and to macro-stability (inflation and the BOPs). In Vietnam, the ER has been stipulated as a policy instrument for "stabilizing the Vietnamese Dong, promotion of exports, control of imports, further accumulation of international reserves, sustaining a viable balance of payments and a stable macro-economic environment" (SBVN 1996). Below we examine the role the ER has played as an economic policy instrument, considering its effects on macro-economic variables, using simple statistics and charts. In particular, the relationships between ER and three major macro-economic variables - inflation, output and money supply, are examined.

III.1. Exchange rate and inflation

As mentioned above, the government of Vietnam has been obsessed with avoiding the reoccurrence of hyperinflation experienced in the 1980s and is resolved to give priority to combating inflation. One of the best ways to stall hyperinflation has been to keep the ER, or more exactly, the nominal ER, as stable as possible. This is why the ER, as a nominal anchor, has appeared prominently in annual national economic plans since 1989 as a foremost target of economic policies and an important criterion to assess economic performance.

Nonetheless, the close relationship between the ER and inflation has not always been realized on a basis of broad interactions between macro-variables through which changes in the ER normally impact on other economic variables. The Government has intuitively observed the real direct impact of the ER on inflation through two channels: countrywide dollarization in the late 1980s and the 1990s and costs of imports of intermediate goods and foreign debt payments. The mere partial tie of the ER to inflation through these two channels has led a number of economists to wonder whether the ER is paralyzed in the national economic system. Still, obsessed with fears of hyperinflation, the Government has nonetheless set the OER at levels below those in the parallel free market with concomitant adjustments in the ER band in addition to tightening FE and import controls as described above.

Figure III.1. Real exchange rate (RER) and real effective exchange rate (REER) (index 1990=100)



Note: RER = ER*P_{US} /P, where ER is the nominal (interbank selling) rate (VND/USD), P_{US} and P are the pertinent price indexes of United State and Vietnam respectively. The calculation of REER is based on the RERs and the trade-based weights by trading partner. REER = ΣRER_i*W, where RER_i = ER*P_i /P (Pi is price index of partner i) and Wi is the trade-based weight, which is defined here as the ratio of the total trade value of Vietnam with trading partner i to the total value of Vietnam's trade. Thirteen major trading partners are included in our calculation. They are Japan, Singapore, South Korea, Thailand, China, Indonesia, Malaysia, Germany, France, United States, Australia, United Kingdom, and Netherlands, which together accounted for 58.2% (1996), 67.2% (1997), and 72.5% (1999) respectively of the value of Vietnam's total trade. The REER can be seen as inflation-adjusted and trade-weighted rate. In our calculation, an upward trend means the real depreciation.
Source: The estimates are based on SBVN data as well as IFS data issued by the IMF

Since 1995-96, when difficulties in financing current account deficits arose and the VND was considered to be overvalued (Figure III.1 for RER and REER), the Government has faced great pressure for devaluation. With a limited understanding on how changes in the ER can impact on economic performance, the “fear” of the effect a sharp devaluation would have was foremost in the minds of policy makers. The SBVN has thus adopted an ER policy in which the ER has been adjusted "cautiously", while applying strict controls over imports and FE. Between July 1997, when the East Asian crisis began, and February 2000, the VND *depreciated* by at least 20% with respect to the USD, Chinese Renminbi, and the Japanese Yen, but *appreciated* by at least 19% or more relative to currencies of the crisis-affected ASEAN countries (Table III.1). Real appreciation was somewhat less due to low inflation in 1997 and in 1999 (Table II.1, Chapter II).

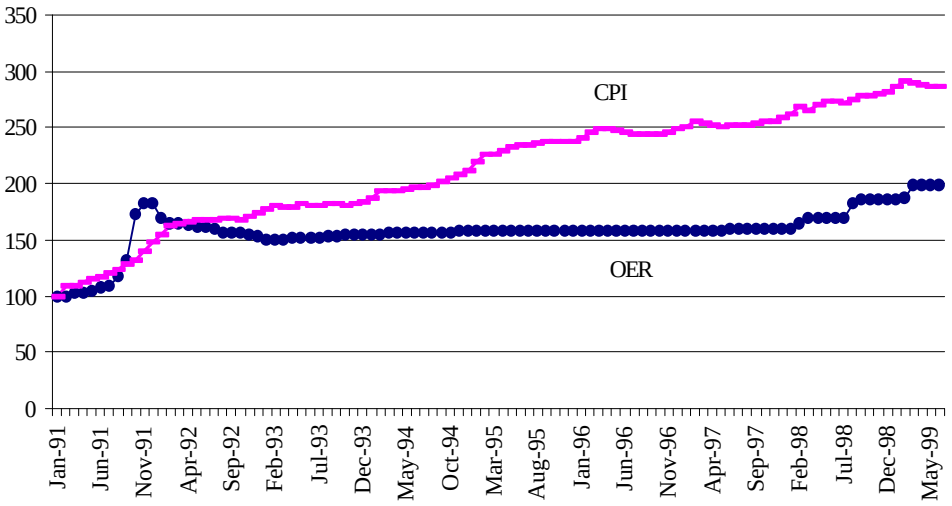
Table III.1. Nominal appreciation (+)/depreciation (-) of the VND relative to other currencies, July 1997 – February 2000

Indonesian Rupiah	+60
Philippines Peso	+22
Malaysian Ringgit	+20
Thai Bath	+19
South Korean Won	+5
Singapore Dollar	-1
Taiwan Dollar	-9
Hong Kong Dollar	-20
US Dollar	-20
Chinese Renminbi	-21
Japanese Yen	-26

Source: UNDP (according to EIU 2000)

Figure III.2 below shows the relationship between the movement of the OERs and price levels during the 1990s. During the period of 1989-91, the two exhibited a high degree of correlation. It seems that the pegged and stable ER was a significant determinant in bringing down inflation to rather low rates during 1992-1993, after the long period of hyperinflation in the 1980s and the early 1990s. It is not easy to demonstrate, however, just how important its effect has been on prices since 1994.

Figure III.2. Nominal exchange rates and price level (Index, January 1991 = 100)



Source: Based on SBVN's data.

It has also been widely argued that the relatively stable ER has significantly contributed to containing inflation during the 1990s and reversing the inflation trend in 1989, and this should all be attributed to the presence of the interest rate policy pursued by the Government of Vietnam (GVN)[11]. Moving away from the practice of "buying like steeling, selling like giving", since 1989, the GVN has insisted on maintaining positive real interest rates, resulting in positive opportunity costs of holding VND. At the same time, portfolio choices were increased, notably giving the public access to term deposit accounts in FE. The opportunity cost of holding VND, in terms of real interest rates on VND equals ($i_d - \pi$), where i_d is domestic currency deposit rate and π is inflation rate. The rates of return in terms of USD equals ($i_d - \varepsilon^e$), where ε^e is the expected nominal depreciation rate. Annual values for these two rates of return are presented in Table III.2 for the years 1989 to 2000 (see also Box 3 for the calculation).

Table III.2. The yearly rates of return on VND in real terms and in terms of USD (%, 1989-99)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
$\mathbf{i_d - \pi}$	118.8	-0.0	-12.1	22.8	17.2	8.0	9.7	9.9	8.4	1.6	8.3	0.8
$\mathbf{i_d - \varepsilon^e}$	169.9	8.8	-38.4	56.2	22.4	20.7	22.8	12.8	1.8	-2.32	7.3	1.8
$\mathbf{i_{fc}}$ -6-month				7 – 8				5.2	5.2	5.2	5.0↓4.0	4.0↑5.0
-12-month								6.0	6.0	5.75	5.5↓4.5	4.5↑5.5

Source: Based on SBVN's data

Box 3: The calculation of the real rate of return on USD

The calculations here are based on a so-called parity condition: $E_0/E_1(1+i_d) = 1+i_{fc}$, where E_0 and E_1 are exchange rates at initial and end periods of depositing money, i_d and i_{fc} are interest rates on domestic and foreign (USD) currency deposits, and $\varepsilon^e = (i_d - i_{fc})/(1+i_{fc}) \approx i_d - i_{fc}$, or $\mathbf{i_{fc} = i_d - \varepsilon^e}$. If the right hand side of this last equation is greater than the left hand side, people will shift their portfolio toward domestic currency and vice versa.

For the calculations in Table III.2, the annual interest rates are calculated by using nominal rates for 6-month term deposit. The expected depreciation rate for the respective year is set equal to the actual (ex-post) depreciation (assumption of perfect foresight). Figures for the year of 2000 are estimated, assuming π = 4% and ε^e = 3%; $\mathbf{i_{fc}}$ are all based on first-half year rates.

It has been argued that this positive real interest rate policy has contributed greatly in fighting inflation especially during the first half of 1990s, when there still existed unofficial ways for the GVN to "exploit the SBVN's capacity to create 'easy

[11] See, for example, Vo Tri Thanh (1996), Phan Van Tiem (1991), and Ngo Tuan Kiet (1997).

money' through seigniorage". The apparent relaxation in this positive real interest rate policy in 1990-1991 coincided with an attempt to rescue SOEs and a negative rate of return in terms of USD in 1991, following its strong effect on inflation in 1989 may be explained by the reoccurrence of inflation shown in Figure III.2. During 1992-95, the much higher levels of real rates of return in terms of USD compared to the annual deposit rate for USD deposits of 7-8% during the period, shifted the preferred portfolio by the public in favour of VND to defend its purchasing power, which had plummeted in the previous years. Since 1997, however, this has been not the case (Table III.2) and the public has shifted back again to USD holdings and deposits.

The above analysis shows that the role of the ER in fighting inflation should not be over emphasized. Given the stable ER, monetary policies as the positive real interest rate policy have greatly contributed to the fight as well. Since 1997, depreciation rates and interest rates have become statistically less significant in explaining the low level of inflation. Moreover, as mentioned in Chapter II, the lack of a *comprehensive and flexible approach* in dealing with the ER and interest rates for both domestic and foreign currencies has created problems of policy inconsistency. This problem can be seen through an examination of the period 1992-2000.

III.2. Exchange rate and economic growth

Theory suggests that the ER regime can influence economic growth through the factors of production (capital and labour) and investment in addition to increases in productivity, reflected by the growth in external trade. An empirical study carried out by the IMF (1996) asserts that "investment rates were highest under a pegged exchange rate" while "fixing the nominal exchange rate can prevent relative prices (including, perhaps, real wages) from adjusting. This lowers economic efficiency". In the end, however, a portion of this lower productivity growth is offset by increased investment. A pegged ER regime, on the other hand, can result in greater volatility of GDP growth and employment.

As mentioned in Chapter II, the market-oriented reforms, in which the opening of the economy has played a key role, have had a positive impact on trade and economic growth. Table III.3 confirms this assessment; excluding the year of 1993, exports formed an essential component of aggregate demand, contributing to economic growth. A study by TG (1999) supports the fact that the changes in export values have had a significant, though small impact on economic growth[12] and this economic growth is largely explained not by efficiency, but by the expansion of markets for exports and investment (a large proportion of which is FDI). However, as Table III.3 shows, *net* exports in fact have had

[12] On average, in the long run a percentage point increase in the export growth rate, other things being equal, will lead to approximately a 0.04 percentage point increase in the GDP growth rate.

a very small or even negative contribution to economic growth. This may indicate that Vietnamese exports come not from high value-added manufacturing sectors, which is consistent with the fact that in 1998 the share of manufacturing was only 17.7% of GDP.

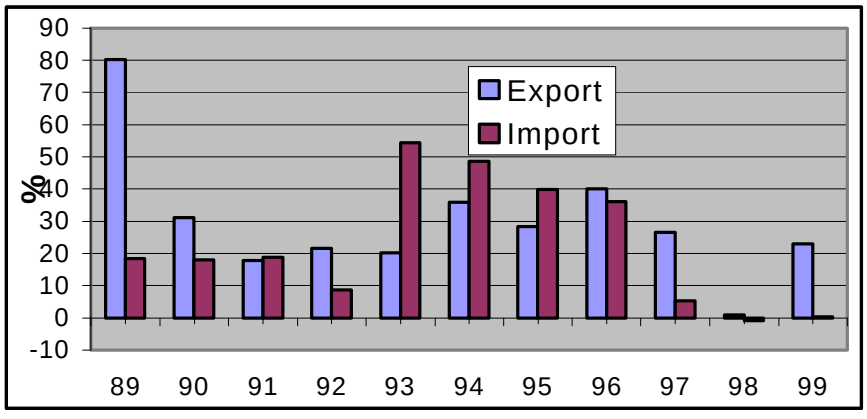
Table III.3. The Contribution of Demand Components to Growth, 1991-99
(Percentage points of GDP growth rate)

	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
***GDP** (% increase)*	***5.96***	***8.65***	***8.07***	***8.84***	***9.54***	***9.34***	***8.15***	***5.83***	***4.77***
- Final consumption	3.40	3.88	3.82	5.43	6.08	7.25	4.63	3.21	1.40
- Gross capital formation	1.00	3.38	8.42	3.43	4.35	3.87	2.67	2.24	-0.92
- Exports	***6.10***	***5.31***	***1.23***	***7.39***	***5.95***	***10.50***	***4.88***	***3.45***	***4.70***
- Imports	-3.20	-3.20	-6.53	-9.12	-6.52	-11.68	-3.74	-3.20	-0.08
- (Net exports)	2.90	2.11	-5.30	-1.73	-0.57	-1.18	1.14	0.25	4.62
Errors and omissions	1.34	0.73	-1.13	-1.70	0.32	0.61	0.28	-0.13	0.33

Source: Estimates based on data of Standard National Account provided by GSO

However, by matching the figures in the BOPs to the ER movement mentioned earlier, it can been seen that during 1993-1996 when stable ERs were in place, FDI increased dramatically from USD 0.3 billion in 1993 to its peak of USD 2.6 billion in 1997, turning the capital account from a deficit of USD 0.2 billion in 1993 to a surplus of more than USD 2.4 billion in 1997. Accordingly, Vietnam's total BOP position reversed from having a large deficit of about USD 1.1 billion in 1993 to a surplus of USD 0.4 billion in 1994 and one of USD 0.2 billion in 1997. By the same token, devaluations in the nominal ER during 1998 took place when FDI disbursements and the capital account surplus dropped considerably to USD 1.7 billion. This BOP position would have been worse had imports not been held back during 1997-1998 by the government in an attempt to reduce pressure in financing current account deficits (Figure III.3).

Figure III.3. Annual export and import growth rates (%- change; 1989-99)



Source: Based on Table II.1 (not on Table III.4 of BOPs)

Table III.4: Vietnam's balance of payments (USD million; 1990-99)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TRADE BALANCE	**-41**	**-63**	**-60**	**-547**	**-1190**	**-2345**	**-3150**	**-1300**	**-981**	**-96**
Exports (FOB)	1731	2042	2475	2985	4054	5198	7330	9269	9365	11540
Imports (FOB)	1772	2105	2535	3532	5244	7543	10480	10569	10346	11636
NON-FACTOR SERVICES (NET)	**55**	**179**	**311**	**76**	**19**	**159**	**-61**	**-623**	**-539**	**-597**
Receipts	55	450	724	772	1283	2074	2243	2530	2604	2668
Payments	0	271	413	696	1264	1915	2304	3153	3143	3265
TRANSFERS (NET)	**138**	**90**	**123**	**264**	**302**	**290**	**1200**	**885**	**1122**	**1181**
Private transfers (Net)	0	35	59	70	170	140	1050	710	950	1050
Official transfers (Net)	138	55	64	194	132	150	150	175	172	131
INVESTMENT INCOME (NET)	**-411**	**-339**	**-382**	**-560**	**-297**	**-236**	**-384**	**-543**	**-605**	**-325**
Receipts	28	42	43	30	27	96	140	136	133	160
Payments	439	381	425	590	324	332	524	679	738	485
Of which:										
Scheduled interest (Net)	237	248	282	330	198	262	340	379	303	371
(Actual Payment)	*53*	*24*	*155*	*113*	*100*	*128*	*281*	*348*	*246*	*276*
CURRENT ACCOUNT	**-259**	**-133**	**-8**	**-767**	**-1166**	**-2132**	**-2395**	**-1581**	**-1003**	**163**
CAPITAL ACCOUNT	**121**	**-59**	**271**	**-180**	**897**	**2184**	**2064**	**2423**	**1740**	**1368**
FOREIGN DIRECT INVESTMENT	**120**	**220**	**260**	**300**	**1048**	**1780**	**1803**	**2587**	**1745**	**1484**
MEDIUM & LONG TERM LOAN	**-47**	**-191**	**52**	**-597**	**-275**	**93**	**37**	**356**	**228**	**2**
Disbursements	233	65	487	54	272	433	772	1145	952	1036
Scheduled Amortization	280	256	435	651	547	340	735	789	724	1034
(Actual Payments)	*166*	*198*	*206*	*290*	*119*	*272*	*508*	*639*	*544*	*582*
SHORT TERM LOANS	**48**	**-88**	**-41**	**117**	**124**	**311**	**224**	**-520**	**-233**	**-118**
Disbursements	338	180	159	367	353	1381	1747	1006	478	239
Scheduled Amortization	290	268	200	250	229	1070	1523	1526	711	357
(Actual Payments)	*290*	*218*	*158*	*202*	*-140*	*1092*	*1523*	*1526*	*711*	*357*
ERRORS & OMISSIONS	**-4**	**142**	**-197**	**-109**	**-409**	**125**	**334**	**-614**	**-419**	**-1108**
OVERALL BALANCE	**-142**	**-50**	**66**	**-1056**	**409**	**177**	**3**	**228**	**318**	**423**
FINANCING	**142**	**50**	**-66**	**1056**	**409**	**-177**	**-3**	**-228**	**-318**	**423**
CHANGE IN NFA (-: INCR)	**-156**	**-282**	**-464**	**1056**	**-117**	**-357**	**-289**	**-409**	**-555**	**...**
Change in NIR (-: incr)				430	-292	-448	-467	-329	-512	...
Use of IMF credit				430	175	91	178	-80	-43	-32
Purchases				-39	0		-467	0	0	0
Repurchases					0		178	80	43	32
CHANGE IN ARREARS	***298***	***332***	***398***	***626***	***526***	***180***	***286***	***181***	***237***	***548***

RESCHEDULING										

Source: SBVN

This seems to confirm assertions that following several successful years of stabilizing the nominal ER with help from a surge in foreign investment, Vietnam experienced difficulties financing her external deficits as a result of her weak economy, which was compounded by the regional economic crisis.

Moreover, the relative stability of the nominal ER during the period of 1993-96 was associated with the highest growth rates of exports, and the devaluations of the ER in 1998 did not improve the export performance. After years of having a positive and significant impact on trade, ER policy seemed to lose its effectiveness. Export expansion could largely be explained by increasing demand in trading partner- countries; the high export growth rate experienced in 1999 mainly followed economic recovery in East Asia and rising demand from the EU. At the same time, since 1992, movements in the ER can be seen to be more or less consistent with the changes in imports (of course imports have also been affected by FDI flows and the changes in domestic output). Nevertheless, the ER has remained rather rigid and has not been used effectively as an instrument for restraining imports; instead, these outcomes have largely come from Vietnam's active administrative measures to control the current account and FE.

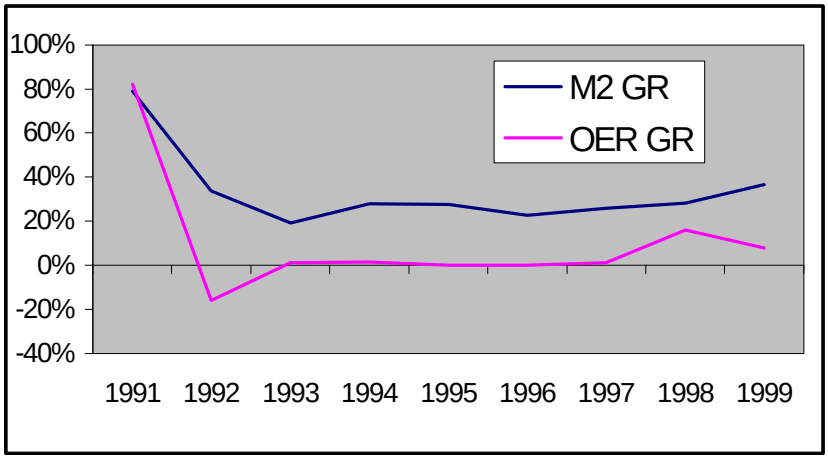
Thus, in the context of high external trade values and current account deficits, together with the real appreciation of VND during 1993-96, Vietnam could easily have put into place a more flexible ER regime. Still, strong export performance with a low parallel market premium might not give policy-makers the correct signals to go in that direction. Even the IMF mission in Vietnam at the time argued that " It would not seem... that there is a need for a significant realignment of the VND at this time. The parallel market has been stable and export growth continued to be robust in the early part of 1995, indicating that external competitiveness remains sound" (see Dodsworth *et al*. 1996).

III.3. Exchange rate and money supply

In theory, the money supply impacts upon the ER through price levels, interest rates and capital flows in the context of open economies. The effects of the ER on money supply, however, occurs mainly in fixed and pegged ER regimes, when central banks intervene in FE markets, purchasing or selling FE to cancel out potential ER fluctuations, thereby changing the money supply.

Figure III.4 plots changes in M2 and the OER in Vietnam from 1991 to 1999. While suggesting a close association between the ER and money supply during the period, the direction of causality between the two variables is not consistent.

Figure III.4. The changes in the OER and M2 (%-change from Dec. to Dec)



Source: Based on SBVN's data

Under the pegged ER regime with increasing capital inflows in the 1990s as mentioned earlier, the SBVN had a strong case to carry out purchases and sales of FE in a attempt to keep the ER stable. In fact, because of the real appreciation of the VND due to a surge in capital inflows stemming from foreign investment and aid, and private remittances, the SBVN intervened in the foreign exchange market in 1992, 1994 and 1995 by purchasing US dollars.

How then did ERs influence monetary policy? An answer to this question requires to take into account sterilization operations, where central banks attempt to change levels of money base components in order to neutralize the effects on the monetary base from their FE market interventions, keeping the money supply unaffected. If sterilization is not practiced in a pegged ER regime, then authorities effectively lack an independent monetary policy. This was the case in Vietnam, where the ER arrangement undermined monetary policy.

A simple way to check whether sterilization operations have been in place is to examine the association between net foreign assets (NFA) and M2 (broad money). A close positive association between them would indicate an absence of sterilization. Without sterilization operations, changes in NFA would induce changes, in the same direction, in M2, and vice versa. It turns out that the correlation coefficient between NFA and M2 during the years from 1990 to 1998 is positive at a high level of +0.951. This

result corroborates the fact that the SBVN did not effectively sterilize FE interventions during this period. Indeed, open market operations (OMO) through which to carry out sterilization operations are new to Vietnam.[13]

An examination of the relation between the ER and the money supply supports the assertion that Vietnamese monetary authorities, while interested in stabilizing ERs and raising international reserves, paid little to the control of the money supply. It appears that the stable ER has, to a certain extent, undermined monetary policy.

In conclusion, the above examination of ER movements in relation to inflation, economic growth and monetary policies has described the role of the ER in the macroeconomic system during Vietnam's economic reform in the 1990s. This general overview of ER arrangements helps to show how ER policy in Vietnam has evolved during this period.

This should not, however, form the basis for determining an ER regime for the future. Only by using more advanced statistical models that consider interactions among macroeconomic variables, including the accounting for lagged impacts among them, can one have a firm basis to assert whether changes in the ER give any useful information for making policy and a basis for understanding how changes in ERs impact on other macroeconomic variables. The following chapters develop these models to provide this basis.

[13] The SBVN *officially* introduced the OMOs in July 2000. Before July 2000, the SBVN organized its own auctions for government bonds with no secondary market. In recent years, the bond market has lacked activity; on many occasions the market was almost 'frozen'.

Chapter IV

CHANGES IN OUTPUT, PRICES, AND MONEY AND INFORMATION CONTENT OF MONETARY AGGREGATES AND EXCHANGE RATES

IV.1. Information content and model specifications

Monetary policy is often used to achieve far-reaching goals as economic growth and price stability. During periods of economic and financial reform, however, the framework and effectiveness of monetary policy can be altered due to three factors: (i) the instability in the demand for real balances; (ii) changes in the behaviour of the public and commercial banks; and (iii) changes in transmission mechanisms of monetary effects (Khan and Sundararajan 1991). As the IMF (1996) points out, the ER regime can matter for inflation and growth. Together with reform measures, ERs can play an increasingly important role in transmission mechanisms.

Therefore, it is important for monetary authorities to reassess the usefulness of financial variables such as monetary aggregates and ERs used in the monetary process and the information they provide. The use of a vector-auto regressive (VAR) model in order to study the relationship between money, output, and prices is one way to assess the information content of money and ERs (Hamann 1993). This approach is used in our research. An unrestricted VAR model can be expressed as follows:

(Equations (IV.1), (IV.2), and (IV.3))

$$DLCPI_t = Const_1 + [ERR_{1,t-1}] + \sum_{i=1}^{12} a_i^{cpi} DLCPI_{t-i} + \sum_{i=1}^{12} b_i^{cpi} DLIND_{t-i} + \sum_{i=1}^{12} g_i^{cpi} DLM_{t-i} + \left[\sum_{i=1}^{12} h_i^{er1} DLER_{t-i}\right] + e_t^{cpi}$$

$$DLIND_t = Const_2 + [ERR_{2,t-1}] + \sum_{i=1}^{12} a_i^{lind} DLCPI_{t-i} + \sum_{i=1}^{12} b_i^{lind} DLIND_{t-i} + \sum_{i=1}^{12} g_i^{lind} DLM_{t-i} + \left[\sum_{i=1}^{12} h_i^{er2} DLER_{t-i}\right] + e_t^{lind}$$

$$DLM_t = Const_3 + [ERR_{3,t-1}] + \sum_{i=1}^{12} a_i^{lm} DLCPI_{t-i} + \sum_{i=1}^{12} b_i^{lm} DLIND_{t-i} + \sum_{i=1}^{12} g_i^{lm} DLM_{t-i} + \left[\sum_{i=1}^{12} h_i^{er3} DLER_{t-i}\right] + e_t^{lm}$$

Where M is the monetary aggregate, CPI the consumer price index, IND is real industrial output, ER is the exchange rate, ERR is an error term from co-integration between money, prices, and output, and DLX = $\Delta\log(X)$ = Growth rate of variable X, e.g. DLCPI = Growth in the CPI (rate of inflation).

The model will be estimated for three monetary aggregates: currency in circulation *CU*, *M1* defined as *CU* plus demand deposits, and *M2* as *M1* plus time deposits and foreign currency deposits, and four ERs: OER (official ER), SER (selling ER on the interbank market), SSER (parallel selling ER in HCM city), HSER (parallel selling ER in Hanoi). The choice of CU, M1 and M2 for analysis is not arbitrary. M2 is a

policy variable targeted by the SBVN; CU and M1 are important as Vietnam remains a "cash economy" (Table IV.1). Due to the lack of a better measure, real industrial output is used as a proxy for output. The data on monetary aggregates and exchange rates have been provided by the SBVN. Real industrial output and CPI data have been obtained from the GSO. All data are in monthly frequency, covering the period from January 1991 to June 1999[14]. Due to problems of 'non-normal behaviour' in 1991 of some variables (Chapters II and III), estimations cover only the period of January 1992- June 1999.

Table IV.1. The ratios of M2 to GDP, of CU to M1, and of CU to M2, 1990-99

	M2/GDP	**CU/M1**	**CU/M2**
1990	0.27	0.70	0.33
1991	0.26	0.70	0.32
1992	0.25	0.71	0.39
1993	0.23	0.74	0.44
1994	0.23	0.79	0.45
1995	0.23	0.72	0.36
1996	0.24	0.73	0.35
1997	0.26	0.63	0.31
1998	0.29	0.59	0.26
1999	0.33	0.62	0.29

Source: Estimates based on data provided by GSO and SBVN.

Before presenting our estimation results, it is important to provide the following three explanations:

First, the information content of money and ER is assessed by testing whether the coefficients γ and η in equations (IV.1), (IV.2), and (IV.3) are jointly equal to zero (Hypotheses *Ho*). A rejection of Ho implies that money and/or the ER contain valuable advance information on the dependent variables, i.e. they can be seen as the leading indicators for the movement of the dependent variables. Since the variables in these equations are in "the form of variable log differences", what is actually being tested is *the marginal predictive content of money and ERs*. The choice of model specification is not ambiguous: we would like to see the information value of the concerned variables in predicting the *part of the variation* in prices and output *not already predictable from their*

[14] In fact, our data sets of inflation, ER, and interest rates cover a longer period, but our estimation is limited by the availability of the original time series of money supply and industrial output. Time-series of OERs cover only the period of 1991:1-1998:12 and of SER only 1991:6 -1999:6

observed own past movements. This information could be used in policy formulation, especially in the short-run. Moreover, because most economic variables are non-stationary, VAR models generally are estimated in the first-difference form. However, for the illustrative purposes, the relationship among *level* money, prices, and output will be also briefly examined.

Second, tests of *Ho* for all variables can also indicate causality (in the Granger sense) among the three variables: money, prices, and output. It is argued that if there exists a two-way *Granger-causality*, say between money and prices, the evidence on the value of the information content of money would be weakened since this means money is not exogenous to price movement. But, as indicated in Friedman and Kuttner (1992), if *lagged* values of money (and ERs) help predict movements in prices and output, independent of results of Granger-causality tests, then these variables still contain *valuable information* that can be used to guide policy decisions.

Third, use of 'conventional' VAR models, i.e. where models do not include error correction terms for co-integration regressions, would be problematic because they cannot take into account the long-term effects from short-term adjustments. It is therefore important to include the long-term relationship between money, prices, and output via error correction terms with one lag in our VAR models. Also, in order to avoid the problem of "spurious regressions", we carry out unit root tests for the time series of money, prices, output, and ERs. Note that Hamann (1993) has interpreted the results based only on the "conventional" VAR models and believed that the costs for testing a very large set of co-integrations outweigh the possible benefits. In fact, by using the Eview program (see Appendix A), we can easily show the results for the VAR models with both conventional and co-integration approaches.

The unit root tests are performed using an Augmented Dickey-Fuller (ADF) test. In order to implement an ADF test for a series x_t, the following regression is estimated using the ordinary least squared method (**Equation IV.4**):

$$\Delta x_t = c_0 + [b_0 T] + b_1 x_{t-1} + \sum_{i=1}^{s} c_i \Delta x_{t-i} + m_t$$

Where T is time-trend and s should be chosen to induce the error term m_t into white noise. Note that a Dickey-Fuller (DF) test can be regarded as a special case of the ADF test with $s = 0$ (no lags of Dx_t in the right hand side (RHS) of Equation IV.4). The null hypothesis in the ADF test is the existence of a unit root (b_1=0). The series x_t is stationary or integrated of order zero, $x_t \in$ I(0), i.e. the null hypothesis is rejected, when the test

statistic for b_1 (ADF statistic, calculated as a t-statistic) is significantly negative in comparison with the Dickey-Fuller critical value. If $x_t \notin$ I(0), but $\Delta x_t \in$ I(0), then x_t is said to be co-integrated of order one, $x_t \in$ I(1).

Table IV.2 presents the results of the ADF tests with trend, intercept and s = 12 lags for LIND, LCPI, and LM (M = CU, M1, M2), and with only intercept and s = 6 lag for LER (ER = OER, SER, HSER, SSER). It is apparent that all time-series belong to I(1), except the case of LM2 $\in$ I(0). Thus, the co-integration regressions can be run for the variables under consideration and the error correction terms can be used for the VAR models.

Table IV.2. The unit root tests for the time series of output, prices, money, and ERs

Variables	**Test for one unit root**	**Test for two unit roots**
LIND	-2.2922(a)	-4.9715(d)
LCPI	-1.5107(a)	-2.9037(d)
LCU	-1.5950(a)	-3.0160(d)
LM1	-1.9371(a)	-3.5334(d)
LM2	-3.7171(a)	-3.9537(d)
LOER	-0.3146(b)	-3.3605(e)
LSER	-1.2746(c)	-2.4240(f)
LSSER	-2.2243(a)	-4.1470(d)
LHSER	-2.002(a)	-4.0402(d)

Critical Value	*Number of Observations*					
	94(d)	**89(a)**	**83(b)**	**76(c)**	**88(e)**	**81(f)**
1% Critical Value	-3.5007	-4.0636	-4.0713	-4.0819	-3.5055	-3.5121
5% Critical Value	-2.8922	-3.4602	-3.4639	-3.4688	-2.8943	-2.8972
10% Critical Value	-2.5829	-3.1560	-3.1581	-3.1610	-2.5840	-2.5855

Note: (a) 89 observations; (b) 83 observations; (c) 76 observations; (d) 88 observations; (e) 82 observations; (f) 75 observations.

IV.2. ESTIMATION RESULTS AND INTERPRETATION

More detailed estimation results are presented in Appendix B. As mentioned above, because of the problem of spurious regressions, conventional VAR models will be estimated only for illustrative and comparison purposes. The focus of our examination is on cases of VAR models including error correction terms from corresponding co-integration estimations.

IV.2.1. Conventional VAR models

- **For variables at levels**

  Granger Causality Test on LM (M = CU, M1, M2), LIND, LCPI

  Sample: 1992:01 1999:06; lag = 12

  Table IV.3. Granger–causality tests (LM, LIND, LCPI) and information content of LM

Variable Causing:	**Variable Caused:**			
		LCPI	LIND	LM (CU, M1, M2)
	LCPI (CU) (M1) (M2)		 Yes** Yes** yes**	 yes*** yes*** no
	LIND (CU) (M1) (M2)	 yes*** yes*** yes***		 yes** no no
	LCU LM1 LM2	yes*** yes*** no	No No Yes**	

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypotheses where the coefficients of the corresponding variables are jointly equal to zero.

Interpretation and comments:

- There is a two-way Granger-causality between LCPI and LIND regardless which monetary aggregate is used. The two-way causality between LCPI and LM only occurs in cases using narrow money (CU and M1). There is only a one-way causality from LIND to LCU and from LM2 to LIND, but not vice-versa.

- Thus, money in a narrow sense (CU and M1) carries valuable advance information on the price levels only; but the value of the information content of money is somewhat weakened since money is not exogenous to the movements in prices. This seems

consistent with Vietnam's cash-based economy. Regarding the broad money (M2), it can only help predict future output fluctuation.

- The existence of several two-way causalities suggests that, prices, money, and real output *at levels* may be modeled as a long-term relationship. However, we are much more interested in models where changes in variables and estimation results need to be interpreted with caution.

♦ **For variables in differences**

Granger Causality Test on DLM (M=CU, M1, M2), DLIND, and DLCPI
Sample: 1992:01 1999:06; lag = 12

Table IV.4. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM (using a conventional approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI			
	(CU)		No	Yes***
	(M1)		No	Yes***
	(M2)		No	Yes**
	DLIND			
	(CU)	Yes**		No
	(M1)	Yes**		No
	(M2)	Yes**		No
	DLCU	No	No	
	DLM1	No	No	
	DLM2	No	No	

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

Interpretation and comments:

- In terms of Granger-Causality, the results have changed considerably in comparison with those in Table IV.3. The DLCPI Granger-causes the DLM (M=CU, M1, M2) but not vice-versa. There exists only one-way causality from DLIND to DLCPI. That means that money lacks information content or in other words, it lacks marginal predictive content on the future movements in inflation and (industrial) output growth. Money rather just follows past inflation signals and does not even respond to past movement in (industrial) output.

- The stability (Cusum-SQ) test for the structural changes in parameters (see Appendix B) shows that equations with DLIND on the left-hand side (Equation IV.2) are not stable, while all other equations (Equations IV.1 and IV.3) are.
- Once again we remain tentative with these estimation results and interpretation because of the problem of spurious regressions.

IV.2.2.The VAR models with the error correction terms from co-integrations

♦ **Co-integration tests by Johansen and Juselius Method**

The Johansen method for co-integration testing is presented in Appendix D. The results of the test are shown in Appendix B. It is worth noting that in the cases of the test with an intercept and a trend in the co-integrating equation for the variables LIND, LCPI, LM (M = M1, M2), there exists only one integrating vector. There is, however, a problem for the case when M = CU; the test indicates that there exist two integrating vectors. The problem of having more than one integrating vector can be found in the cases of the test with an intercept and a trend in the co-integrating equation together with DLER (ER=OER, SER, SSER, HSER) as exogenous variables for LIND, LCPI, LM (M = CU, M1, M2). In these cases, the first integrating vector shown by the Eview program is chosen for taking the error correction term[15].

♦ **The VAR models with only the error correction terms from co-integrations**

Granger Causality Test on DLM (M=CU, M1, M2), DLIND, and DLCPI
Sample: 1992:01 1999:06; lag = 12

Table IV.5. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM (using a co-integration approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI			
	(CU)	Yes***	No	Yes***
	(M1)	Yes***	No	Yes***
	(M2)	Yes***	No	Yes***
	DLIND			
	(CU)	Yes***	Yes***	No
	(M1)	Yes**	Yes***	No
	(M2)	Yes***	Yes***	Yes*
	DLCU	No	No	No
	DLM1	Yes*	No	No
	DLM2	No	No	Yes***

[15] Since our focus is on the causality between variables, the existence of more than one integrating vectors is not a problem.

Note: *,** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

Interpretation and comments:

- In terms of Granger-causality, the results are the same for the direction of causality from DLCPI to DLM (M=CU, M1, M2) and from DLIND to DLCPI as was the case using a conventional model (Table IV.4). The differences are that there is only *weak support* for the existence of causality from DLM1 to DLCPI and from DLIND to DLM2 (since the significance is at only 10% level and the change in M1 is not exogenous to the fluctuation in inflation). The results are summarized as follows:

DLCPI $\Rightarrow$ DLM (M=CU and M2)
DLIND $\Rightarrow$ DLCPI (whatever M=CU, M1, M2)
DLCPI $\Leftrightarrow$ DLM1
DLIND $\Rightarrow$ DLM2

- Thus, *in general,* money, especially when using currency in circulation (CU) and a broad monetary aggregate (M2), lacks information content or the marginal predictive content on the future movements in inflation and (real industrial) output growth. The *main direction* of changes in the money supply follow inflationary signals and it seems to not respond actively to the past movement in (industrial) output. The exception is only in the cases where inflation weakly responds to the changes in M1 and when changes in M2 weakly respond to output growth.
- Again, the result of the stability (Cusum-SQ) test for the structural changes in parameters is the same as in the case without error correction terms (i.e. all equations with DLIND on the LHS are not stable, whereas all others are stable (see Appendix B).

It is worth noting that the results shown in Table IV.5 are nearly the same as the ones in Table IV.4, supporting Hamann's (1993) claim that the use of co-integration approaches is not essential. Also, the results show that current inflation and output growth are largely predicted by their past movements.

- **The VAR models with error correction terms from co-integration and DLER as exogenous variables**

The case of DLER=DLOER

Table IV.6. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM and DLOER (co-integration approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI (CU) (M1) (M2)		No Yes** Yes*	Yes* Yes*** Yes***
	DLIND (CU) (M1) (M2)	No Yes*** Yes***		No Yes*** Yes**
	DLCU DLM1 DLM2	No No No	No No No	No Yes** Yes**
DLOER	(CU)	No	No	No
	(M1)	No	Yes*	Yes***
	(M2)	No	No	No

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

The case of DLER=DLSER

Table IV.7. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM and DLSER (cointegration approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI (CU) (M1) (M2)		Yes*** Yes*** Yes***	Yes** No Yes**
	DLIND (CU) (M1) (M2)	No No No		Yes*** Yes* No
	DLCU DLM1 DLM2	No No No	No No No	Yes** Yes* Yes**
DLSER	(CU)	No	Yes***	No
	(M1)	No	Yes***	Yes*
	(M2)	No	Yes***	No

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

The case of DLER=DLHSER

Table IV.8. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM and DLHSER (co-integration approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI			
	(CU)	Yes**	No	No
	(M1)	Yes*	No	No
	(M2)	Yes**	Yes**	Yes**
	DLIND			
	(CU)	No	Yes***	No
	(M1)	No	Yes***	No
	(M2)	Yes**	Yes***	Yes*
	DLCU	No	No	No
	DLM1	No	No	No
	DLM2	No	No	Yes*
DLHSER	(CU)	No	No	No
	(M1)	No	No	No
	(M2)	No	No	No

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

The case of DLER=DLSSER

Table IV.9. Granger–causality tests (DLM, DLIND, DLCPI) and information content of DLM and DLSSER (co-integration approach)

Variable Causing:	**Variable Caused:**			
		DLCPI	DLIND	DLM (CU, M1, M2)
	DLCPI			
	(CU)	Yes**	No	No
	(M1)	Yes*	No	No
	(M2)	Yes**	Yes**	Yes***
	DLIND			
	(CU)	No	Yes***	No
	(M1)	No	Yes***	No
	(M2)	Yes*	Yes***	Yes*
	DLCU	No	No	No
	DLM1	No	No	No
	DLM2	No	No	Yes*
DLSSER	(CU)	No	No	No
	(M1)	No	No	No
	(M2)	No	No	No

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level for the tests of the hypothesis that the coefficients of the corresponding variables are jointly equal to zero, respectively.

Interpretation and comments for Tables IV.6 - IV.9:

Table IV.10. A summary of Granger-causalities between the variables

The case of OER	The case of SER	The case of HSER	The case of SSER
DLCPI ⇒ DLM (M = CU, M1, M2) DLCPI ⇒ DLIND (M = M1, M2) DLIND ⇒ DLCPI (M = M1, M2) DLIND ⇒ DLM (M = M1, M2) **DLM ⇒ DLCPI (no)** (M = CU, M1, M2) **DLM ⇒ DLIND (no)** (M = CU, M1, M2)	DLCPI ⇒ DLM (M = CU, M2) DLCPI ⇒ DLIND (M = CU, M1, M2) DLIND⇒DLCPI **(no)** (M = CU, M1, M2) DLIND ⇒ DLM (M = CU, M1) **DLM ⇒DLCPI** (**no)** (M = CU, M1, M2) **DLM ⇒DLIND (no)** (M = CU, M1, M2)	DLCPI ⇒ DLM (M = M2) DLCPI ⇒ DLIND (M = M2) DLIND ⇒ DLCPI (M = M2) DLIND ⇒ DLM (M = M2 but weak) **DLM ⇒ DLCPI (no)** (M = CU, M1, M2) **DLM ⇒ DLIND (no)** (M = CU, M1, M2)	DLCPI ⇒ DLM (M = M2) DLCPI ⇒ DLIND (M = M2, but weak) DLIND ⇒ DLCPI (M = M2 but weak) DLIND ⇒ DLM (M = M2 but weak) **DLM ⇒ DLCPI** (**no)** (M = CU, M1, M2) **DLM ⇒ DLIND (no)** (M = CU, M1, M2)
DLOER⇒DLCPI(no) (M = CU, M1, M2) **DLOER ⇒ DLIND** (M = M1, but weak) **DLOER ⇒ DLM** (M = M1)	**DLSER⇒DLCPI** (**no**) (M = CU, M1, M2) **DLSER ⇒ DLIND** (M = CU, M1, M2) **DLSER ⇒ DLM** (M=M1, but weak)	**DLHSER⇒DLCPI (no)** (M = CU, M1, M2) **DLHSER⇒DLIND(no)** (M=CU, M1, M2) **DLHSER ⇒ DLM (no)** (M=CU, M1, M2)	**DLSSER⇒DLCPI (no)** (M = CU, M1, M2) **DLSSER⇒DLIND (no)** (M = CU, M1, M2) **DLOER ⇒ DLM (no)** (M= CU, M1, M2)

- The Granger-causality between the concerned variables are summarized in Table IV.10. In comparison with the cases without the inclusion of the exogenous ERs, the introduction of lags in nominal depreciation of ERs has significantly altered the Granger- causality from DLCPI to DLM and from DLIND to DLCPI. Except the case of OER, these relationships become weaker. The results continue to show that in general current inflation and output growth are largely predicted by their past movements. But it cannot be said that the supply side plays a role in predicting inflation (except the case of OER). At the same time, in the cases where official and interbank ERs are used, output growth responded to changes in prices.

- Again, however, the changes in monetary aggregates do not contain any advance information or the marginal predictive content on the future movements in inflation and (real industrial) output growth. The inclusion of the ER into the VAR model has weakened the changes in money supply that follow inflation signals (especially in the case of parallel markets), but money seems to respond more actively to past movements in output (particularly for the cases of official and interbank ERs).

- In all circumstances (Tables IV.6 – IV.9 or Table IV.10), depreciation rates do not help to predict future

movements of inflation. The role of the changes in nominal ERs as a leading indicator for either output growth or money supply varies depending on which ER is used: OER, SER, HSER, or SSER. The parallel market ERs (proxied by the rates in Hanoi and Ho Chi Minh City) fail in this role, supporting arguments that this market is too small (some estimates suggest that it accounts for only about 10% of total foreign exchange transactions) and is influenced much by its link with official markets (the interbank market and transactions between commercial banks and enterprises). Interbank rates were found to contain very significant advance information on output development. In general, it can be said that the changes in the money supply, especially in M2 as an important policy target, have no significant connection to lags of depreciation rates.

- Once again, the results of the stability (Cusum-SQ) test for the structural changes in parameters is the same as in the cases when no error correction terms are included (i.e. all equations with DLIND in the LHS are not stable, whereas all others are stable or nearly stable (see Appendix B)).

- The patterns of adjustment of the macroeconomic variables on the LHS of Equations IV.1-IV.3 to shocks are shown through the impulse response functions (see Appendix B) which trace the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables. In general, the results are similar. In the case of a supply shock, output growth, inflation, and money converge quickly to initial values (equilibrium) and do not fluctuate much. But in the cases of price and money shocks, the effects are relatively large within one year. This means an effective monetary policy is essential.

During 1992-99, the changes in monetary aggregates (CU, M1, M2) did not seem to contain any advance information on the changes in inflation and (real industrial) output fluctuations. In other words, money did not serve as a leading indicator for either inflation or output growth. This seems to support the view that increased financial liberalization should lead to a decreased role for the monetary aggregates and a greater role for the financial prices in determining economic activities due to the increased role of expectations and the relaxation of liquidity constraints as the choice of assets available

to agents widens[16]. The policy implication is that one cannot point to the growth rates of CU, M1, or M2 as indicating building inflationary pressures or higher expected rates of (real industrial) output growth. Instead, money growth responds to the past movement in inflation and output, i.e. it is demand determined, though evidence for this is weak. This, unfortunately, leaves little room for policy instruments.

At the same time, the movement of the ERs has significantly altered the Granger-causality between output growth, inflation, and the changes in money supply. Surprisingly, however, the rates of change in nominal ERs do not help to predict future movements of inflation. This is consistent with the considerations in Chapter III that when analyzing inflation in Vietnam, it is important to look at both the depreciation rates and the interest rates for VND and USD. The changes in ERs (OER or especially SER) show signs of playing a leading indicator role for output growth.

These conclusions, together with the relative structural stability of the price and monetary equations (Equations IV.1 and IV.3), seem to be consistent with the fact that financial reforms in the 1990s, though considerable, still did not keep pace with economic development. The formulation and implementation of effective monetary instruments remain rudimentary. The examination of the role played by money supply also suggests a need to study domestic credit[17] and to look at the attempt by the SBVN, if any, to implement sterilization operations. A well-known shortcoming of the VAR model is its lack of theoretical foundations. It is important that the models are based on rigorous foundations in order to probe at the impact ERs have on price movements and to see the "behaviour" of output growth in response to the fluctuations in (real) exchange rates[18]. The next chapter is an attempt to do just this.

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[16] Study by Hamann (1993) for Indonesia, Korea, and Philippines warns against the use of *generalizations*. The study has shown that the information content of money was not enhanced by the introduction of lagged values of ERs (and interest rates) which did not have much of an effect on the output equations. But the ERs were found to contain valuable information about future developments in prices in Korea and Philippines.

[17] Unfortunately, we do not have monthly data for domestic credit.

[18] Moreover, there is also a danger of relying too heavily on Granger-causality tests - all they say is whether lagged values of the "explanatory" variable are correlated with contemporaneous values of the dependent variable. They say nothing about the theoretical plausibility of the relationship.

Chapter V

IMPACTS OF CHANGES IN THE EXCHANGE RATE ON OUTPUT GROWTH AND INFLATION, AND MONETARY STERILIZATION IN RESPONSE TO CAPITAL FLOWS

V.1. Industrial output and the real exchange rates

As mentioned in Chapter I, some studies have tried to examine the impact devaluations of the VND have had on exports, imports and the trade balance. There are, however, doubts about the relevance of this enterprise: most are based on a small number of *annual* time-series data points, and yet more importantly, sharp increases in trade can largely be explained by the opening of the economy and expansion of external markets over the reform period. There is also the problem related to the structure of trade: the low level of exports of manufactured goods and the large share of import of capital and intermediary goods, which have been associated with FDI and import substitution policies. As a result, most studies have found no significance of price elasticities for exports and imports at aggregate levels. But the significance of impacts of the changes in the (real) ERs on output *may be* different since, as theory suggests, the ER can influence economic growth through many other channels, e.g. factors of production (capital and labour), investment in particular, and productivity growth.

In an open economy, thus, the change in the expected real exchange rate may be an important factor in changing output. Taking this fact into account, a supply function can be presented in the following form

$$y = y_o \exp(nt)\left(\frac{ER^e P^*}{P}\right)^V \qquad \text{(V.1)}$$

where t is time variable, ER^e is the expected nominal exchange rate, P and P^* are domestic and foreign price levels respectively, and ζ is a positive parameter. By taking the natural log and differentiating by t, we obtain

$$\frac{\dot{y}}{y} = n + V e^e \qquad \text{(V.2)}$$

In other words, the growth rate of output can be seen as an increasing function of the rate of change in the (expected) real ERs, e^e. For practical purpose, we will use the following regression for estimating the impact of the rate of changes in the (current) real ERs, ε, on industrial output growth:

$$DLIND_t = const + de + \sum_{i=1}^{k} d_i DLIND_{t-i} + m_t \qquad \text{(V.3)}$$

The idea of putting a lagged output change term into the RHS in equation (V.3) is motivated by fact that these changes were found to have very good predictive content for explaining current output growth (see Chapter IV, Section IV.2.2).

We now estimate Equation (V.3) for the period of 1992:1 - 1999:6 using four ERs with ER = OER (official ER), SER (selling inter-bank ER), HSER (parallel selling ER in Hanoi), and SSER (parallel selling ER in Ho Chi Minh City). Tables of V.1 to V.4 present the results of the OLS estimation of Equation (IV.3) with lags of t-12, t-9, t-6, and t-3, which are based on a simplification search. DR_ERs (ER=OER, SER, HSER, and SSER) are the rates of change in real ERs (VND/USD).

Results from diagnostic tests (not shown here) for serial correlation and normality of the error term were acceptable. We also conducted *Wu-Hausman tests for exogeneity* of variable *e* since output may have an effect on the real depreciation rate and hence there is potential for *e* to be endogenous and the estimates would be not consistent[19]. Wu-Hausman test results were also satisfactory. Thus the estimation results given below are admissible.

Table V.1. Effect of the Changes in the Real Exchange Rate on Output Growth (**Equation OUTPUT_OER;** Case of using OER)

Dependent Variable: DLIND
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.184068	0.192678	0.955312	0.3422
DR_OER	0.245106	0.133938	1.829990	0.0708
DLIND(-3)	-0.002906	0.077602	-0.037449	0.9702
DLIND(-6)	0.107117	0.083738	1.279194	0.2044
DLIND(-9)	-0.041258	0.085829	-0.480697	0.6320
DLIND(-12)	0.766630	0.088988	8.615003	0.0000
R-squared	0.509357	Mean dependent var		0.482899
Adjusted R-squared	0.479801	S.D. dependent var		2.174862
S.E. of regression	1.568616	Akaike info criterion		3.803300
Sum squared residual	204.2262	Schwarz criterion		3.971074
Log likelihood	-163.2469	F-statistic		17.23318
Durbin-Watson statistic	3.008967	Prob(F-statistic)		0.000000

[19] The Wu-Hauseman test involves augmenting the regression (V.3) with the residuals from the regression of each of the regressors suspected of endogeneity (in our case, variable *e*) upon the set of available instruments (Here we will use e_{-1} and $DLIND_{-1}$) and then testing the joint significance of these added residuals by using an F-test.

Table V.2. Effect of the Changes in the Real Exchange Rate on Output Growth (**Equation OUTPUT_SER;** Case of using SER)

Dependent Variable: DLIND
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.164683	0.193900	0.849317	0.3981
DR_SER	0.211857	0.141934	1.492643	0.1393
DLIND(-3)	-0.001425	0.078562	-0.018140	0.9856
DLIND(-6)	0.111323	0.084386	1.319199	0.1907
DLIND(-9)	-0.034806	0.086263	-0.403483	0.6876
DLIND(-12)	0.765690	0.090115	8.496776	0.0000
R-squared	0.502905	Mean dependent var		0.482899
Adjusted R-squared	0.472959	S.D. dependent var		2.174862
S.E. of regression	1.578897	Akaike info criterion		3.816366
Sum squared residual	206.9121	Schwarz criterion		3.984140
Log likelihood	-163.8283	F-statistic		16.79399
Durbin-Watson statistic	2.997962	Prob(F-statistic)		0.000000

Table V.3. Effect of the Changes in the Real Exchange Rate on Output Growth **(Equation OUTPUT_HSER**; Case of using HSER)

Dependent Variable: DLIND
Sample: 1993:01 1999:06
Included observations: 78

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.194010	0.211913	0.915517	0.3630
DR_HSER	0.342270	0.178031	1.922537	0.0585
DLIND(-3)	5.72E-05	0.083477	0.000686	0.9995
DLIND(-6)	0.117099	0.090623	1.292155	0.2004
DLIND(-9)	-0.043086	0.092821	-0.464186	0.6439
DLIND(-12)	0.765835	0.095842	7.990602	0.0000
R-squared	0.515600	Mean dependent var		0.453752
Adjusted R-squared	0.481961	S.D. dependent var		2.321092
S.E. of regression	1.670604	Akaike info criterion		3.938051
Sum squared residual	200.9462	Schwarz criterion		4.119337
Log likelihood	-147.5840	F-statistic		15.32749
Durbin-Watson statistic	3.038577	Prob(F-statistic)		0.000000

Table V.4. Effect of the Changes in the Real Exchange Rate on Output Growth (**Equation OUTPUT_SSER**; Case of using SSER)

Dependent Variable: DLIND
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.185743	0.192510	0.964846	0.3374
DR_SSER	0.260066	0.139583	1.863171	0.0660
DLIND(-3)	-0.003410	0.077494	-0.044006	0.9650
DLIND(-6)	0.114192	0.083817	1.362393	0.1768
DLIND(-9)	-0.037224	0.085666	-0.434528	0.6650
DLIND(-12)	0.768080	0.088789	8.650580	0.0000
R-squared	0.510053	Mean dependent var		0.482899
Adjusted R-squared	0.480538	S.D. dependent var		2.174862
S.E. of regression	1.567504	Akaike info criterion		3.801882
Sum squared residual	203.9368	Schwarz criterion		3.969656
Log likelihood	-163.1838	F-statistic		17.28119
Durbin-Watson statistic	3.003074	Prob(F-statistic)		0.000000

The real depreciation rate has a significant and positive impact on output growth, though only at 10% level. Table V.5 below indicates the short-run and long-run impacts of the rate of changes in real ERs on (real industrial) output growth. The short-run impact is just coefficient d and the long-run impact is calculated as $d/(1-\Sigma d_i)$ where d and d_i are taken from Equation V.3.

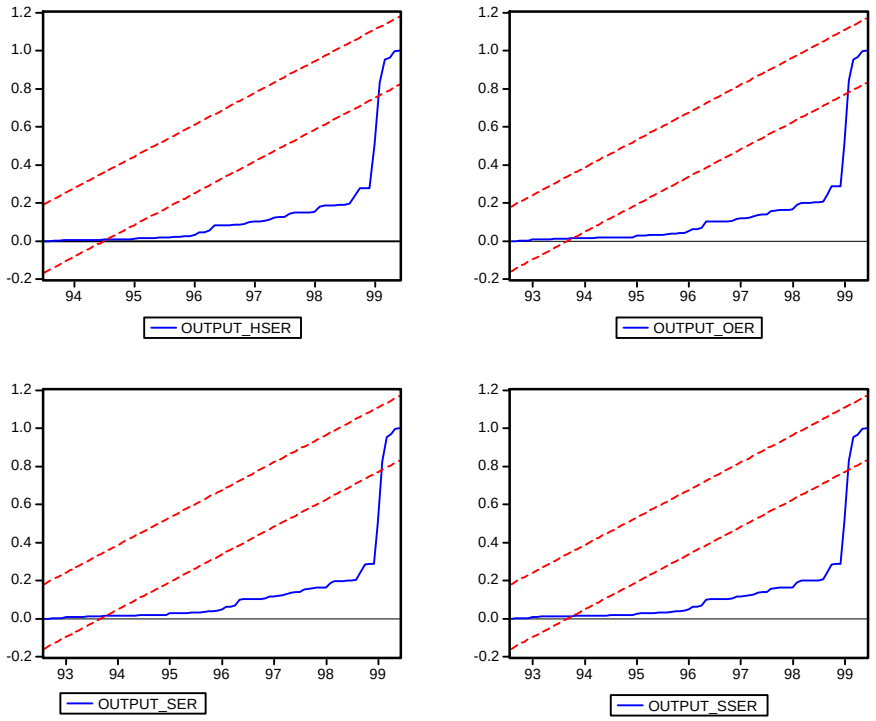
Table V.5. The short-run and long-run impacts of DR_ERs on output growth

	OUTPUT_OER	**OUTPUT_SER**	**OUTPUT_HSER**	**OUTPUT_SSER**
SR impacts	0.245	0.212	0.342	0.260
LR impacts	1.438	1.331	2.138	1.642

However, little can be said about the impact magnitudes since the estimated parameters seem to be *very unstable*. The Cusum-SQ test for structural stability of regressions V.3 failed (see Figure V.1). Thus, during the period of 1992-99, while the real industrial output responded rather significantly to the changes in real ERs, the impact magnitudes of the latter were very unstable. This may reflect two phenomena. On the one hand, the institutional environment has changed considerably and firm's behavior has

become more market-oriented. On the other hand, SOEs still account for about 45% total industrial output and in reality, a level playing field has not been well established.

Figure V.1. Cusum-SQ test for the Equations Output_ERs



V.2. Inflation and the movements in exchange rates

In developing countries, inflation is usually attributed to three factors:

1. Growth in the money supply, which in many cases is linked directly to the degree of fiscal restraint and the budget constraint on the public/SOE sector;
2. Income or output, a strong growth of which may significantly increase the demand for real balances and the process of monetization; and
3. The portfolio shift between foreign (USD) currency and domestic currency, for example, due to the changes in ERs and interest rates on domestic money.

The issue, of which factors have a significant effect on inflation, deserves to be investigated more rigorously. The econometric results obtained in several studies of the recent inflationary experiences of developing countries imply that the causes of inflation vary across countries, and that there is no basis for generalization. More interestingly, in

some countries experiencing moderate/low inflation, the money supply has been found to fail to contain valuable advanced information on the change in prices *over a certain span of data* (see also Chapter IV).

For Vietnam, there have been only few econometric analyses of the determinants of inflation since the market-oriented reform in 1989. Dodsworth *et al.* (1996) has estimated a polynomial lag model to examine the influence of broad money supply (*M2*) on inflation in the first half of the 1990s. They also used an error-correction model (ECM) to consider the effect of rice prices on inflation. The main findings in this study are that an increase in growth of *M2* leads to higher inflation, and money growth with a one- to two-month lag having the largest impact. It also found that changes in the price of rice have a positive and significant impact on inflation in the short run. Relying on a simple monetarist model, Vo Tri Thanh (1996) has used a distributed-lag model in order to investigate the determinants of inflation in Vietnam during the period of 1991-1994. The econometric analysis confirms the key role of money (CU, M1, M2) growth and that factors (such as ERs and deposit interest rates) reflecting the attractiveness of VND, have an affect on the inflation rate. A study by Ngo Huy Duc (1997) has focused on the problem of dolarization and inflation in Vietnam. It has estimated that between 1990 and 1994, for every one percentage increase in expected depreciation of the VND, 0.3 percent of the domestic money supply is substituted by USD on average. A fall in the holdings of VND, ceteris paribus, implies a shrinkage of the inflation tax, and therefore higher inflation. This relationship has been found to be empirically significant in Vietnam during 1990-94.

In our research we adopt a traditional two-step approach. First, the existence of a long run relationship between prices, money, income (proxied here by industrial output due to the lack of *monthly* income data), and nominal ERs are determined based on co-integration techniques, i.e. by using OLS running Equation V.4 with the variables belonging to I(1) and then checking whether the error term is stationary, belonging to I(0). Second, the information in the error term of the long run relationship is used to create a short-run dynamic error correction model (ECM). In Equation V.5, ERR is the error term from the integration of equation IV.4[20].

$$LCPI_t = const + aLM_t + bLIND_t + gLER_t + m_t$$

$$DLCPI_t = const + \sum_{i=0}^{k_1} a_i DLM_{t-i} + \sum_{i=0}^{k_2} b_i DLIND_{t-i} + \sum_{i=0}^{k_3} g_i DLER_{t-i} + \sum_{i=1}^{k_4} h_i DLCPI_{t-i} + ERR_{t-1} + d_t$$

[20] This two-step approach used for examining the determinants of inflation can be seen, for example, in Moser (1995)

(Equations V.4 and V.5)

Equations (V.4) and (V.5) will be estimated for M = CU, M1, and M2, and ER = OER, SER, HSER, and SSER (i.e. we need to run a total of 12 regressions for equation (V.4) and a number of regressions for equation (V.5) with $k \leq 12$ (Here we chose k1= 3, k2=3, k3=3, k4=12). Table V.6 and Tables of V.7 to V.10 present the results of the estimation of 12 co-integration equations and the corresponding ECMs for the cases of OER (Other ECMs are similar and can be seen in Appendix C).

Table V.6. The estimation results of **c**o-integration equations

1. LCPI = 0.1038 + 0.3372*LIND + 0.1999*LCU + 0.0796*LHSER
2. LCPI = -1.3423 + 0.3208*LIND + 0.2085*LCU + 0.2396*LOER
3. LCPI = -0.2886 + 0.3159*LIND + 0.2063*LCU + 0.1326*LSER
4. LCPI = -0.0529 + 0.3264*LIND + 0.2041*LCU + 0.1010*LSSER
5. LCPI = 1.4225 + 0.2686*LIND + 0.2275*LM1 - 0.0417*LHSER
6. LCPI = -0.0146 + 0.2254*LIND + 0.2422*LM1 + 0.1322*LOER
7. LCPI = 1.1269 + 0.2500*LIND + 0.23187*LM1 + 0.0007*LSER
8. LCPI = 1.2942 + 0.2596*LIND + 0.2305*LM1 - 0.0238*LSSER
9. LCPI = 3.7464 - 0.0411*LIND + 0.4069*LM2 - 0.2586*LHSER
10. LCPI = 2.9408 - 0.0509*LIND + 0.3929*LM2 - 0.1486*LOER
11. LCPI = 3.7410 - 0.0433*LIND + 0.4058*LM2 - 0.2552*LSER
12. LCPI = 3.6715 - 0.0424*LIND + 0.4066*LM2 - 0.2493*LSSER

Table V.7. ECM: the case of CU and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRCULOER	-0.1013	0.0268	-3.7796	0.0004
C	0.0037	0.0018	2.0119	0.0490
DLIND	-0.0146	0.0217	-0.6713	0.5048
DLIND(-1)	-0.0674	0.0218	-3.0884	0.0031
DLIND(-2)	0.0356	0.0233	1.5280	0.1320
DLIND(-3)	0.0090	0.0228	0.3947	0.6945
DLCPI(-1)	0.3417	0.1172	2.9152	0.0051
DLCPI(-2)	0.1004	0.1029	0.9766	0.3329
DLCPI(-3)	0.0595	0.0841	0.7083	0.4817
DLCPI(-4)	0.0969	0.0836	1.1589	0.2513
DLCPI(-5)	-0.0898	0.0870	-1.0328	0.3061
DLCPI(-6)	-0.0938	0.0856	-1.0966	0.2774
DLCPI(-7)	0.0347	0.0822	0.4226	0.6742
DLCPI(-8)	0.0128	0.0803	0.1597	0.8737

DLCPI(-9)	0.0831	0.0805	1.0314	0.3067
DLCPI(-10)	-0.1520	0.0915	-1.6607	0.1023
DLCPI(-11)	0.0061	0.1113	0.0545	0.9568
DLCPI(-12)	0.3288	0.0924	3.5587	0.0008
DLCU	0.0009	0.0359	0.0258	0.9795
DLCU(-1)	-0.0163	0.0368	-0.4414	0.6606
DLCU(-2)	-0.0607	0.0324	-1.8731	0.0662
DLCU(-3)	-0.0699	0.0317	-2.2089	0.0312
DLOER	-0.0049	0.0838	-0.0590	0.9531
DLOER(-1)	-0.0325	0.0838	-0.3881	0.6994
DLOER(-2)	0.1357	0.0738	1.8375	0.0714
DLOER(-3)	-0.0337	0.0662	-0.5088	0.6129
R-squared	0.7526	Mean dependent var		0.0072
Adjusted R-squared	0.6441	S.D. dependent var		0.0107
S.E. of regression	0.0064	Akaike info criterion		-7.0134
Sum squared residual	0.0023	Schwarz criterion		-6.2557
Log likelihood	317.0578	F-statistic		6.9355
Durbin-Watson statistic	1.9090	Prob(F-statistic)		0.0000

Table V.8. ECM: the case of M1 and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM1LOER	-0.0739	0.0253	-2.9256	0.0049
C	0.0035	0.0022	1.6261	0.1094
DLIND	-0.0170	0.0238	-0.7165	0.4766
DLIND(-1)	-0.0493	0.0231	-2.1365	0.0369
DLIND(-2)	0.0596	0.0233	2.5555	0.0133
DLIND(-3)	0.0227	0.0229	0.9881	0.3273
DLCPI(-1)	0.3675	0.1238	2.9685	0.0044
DLCPI(-2)	0.0875	0.1058	0.8270	0.4117
DLCPI(-3)	0.0566	0.0906	0.6251	0.5344
DLCPI(-4)	0.0707	0.0881	0.8019	0.4259
DLCPI(-5)	-0.1032	0.0915	-1.1282	0.2639
DLCPI(-6)	-0.0767	0.0891	-0.8607	0.3930
DLCPI(-7)	0.0397	0.0878	0.4522	0.6528
DLCPI(-8)	0.0085	0.0850	0.0998	0.9209
DLCPI(-9)	0.0736	0.0861	0.8552	0.3960
DLCPI(-10)	-0.1378	0.0995	-1.3851	0.1714
DLCPI(-11)	0.0185	0.1182	0.1566	0.8761
DLCPI(-12)	0.3101	0.1017	3.0498	0.0035

DLM1	-0.0255	0.0365	-0.6978	0.4882
DLM1(-1)	-0.0226	0.0411	-0.5508	0.5839
DLM1(-2)	-0.0352	0.0377	-0.9327	0.3549
DLM1(-3)	-0.0630	0.0329	-1.9169	0.0603
DLOER	-0.0023	0.0889	-0.0260	0.9794
DLOER(-1)	-0.0234	0.0893	-0.2618	0.7944
DLOER(-2)	0.1563	0.0789	1.9827	0.0522
DLOER(-3)	-0.0285	0.0702	-0.4066	0.6859
R-squared	0.7210	Mean dependent var		0.0072
Adjusted R-squared	0.5986	S.D. dependent var		0.0107
S.E. of regression	0.0068	Akaike info criterion		-6.8933
Sum squared residual	0.0026	Schwarz criterion		-6.1356
Log likelihood	312.0706	F-statistic		5.8920
Durbin-Watson statistic	1.8787	Prob(F-statistic)		0.0000

Table V.9. ECM: the case of M2 and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM2LOER	-0.0454	0.0280	-1.6211	0.1105
C	0.0003	0.0023	0.1468	0.8838
DLIND	-0.0280	0.0235	-1.1941	0.2374
DLIND(-1)	-0.0486	0.0230	-2.1121	0.0391
DLIND(-2)	0.0674	0.0239	2.8192	0.0066
DLIND(-3)	0.0411	0.0242	1.6965	0.0953
DLCPI(-1)	0.3198	0.1322	2.4184	0.0188
DLCPI(-2)	0.1292	0.1149	1.1241	0.2657
DLCPI(-3)	0.1145	0.0943	1.2138	0.2298
DLCPI(-4)	0.0939	0.0932	1.0074	0.3180
DLCPI(-5)	-0.1230	0.0967	-1.2724	0.2084
DLCPI(-6)	-0.0352	0.0974	-0.3617	0.7189
DLCPI(-7)	0.0366	0.0960	0.3814	0.7043
DLCPI(-8)	0.0120	0.0957	0.1255	0.9005
DLCPI(-9)	0.0760	0.0933	0.8146	0.4187
DLCPI(-10)	-0.1629	0.1005	-1.6214	0.1105
DLCPI(-11)	-0.0171	0.1152	-0.1486	0.8824
DLCPI(-12)	0.2301	0.0936	2.4578	0.0170
DLM2	0.0533	0.0411	1.2972	0.1998
DLM2(-1)	-0.0116	0.0414	-0.2794	0.7810
DLM2(-2)	0.0096	0.0411	0.2332	0.8164
DLM2(-3)	-0.0136	0.0398	-0.3407	0.7346
DLOER	-0.0520	0.0974	-0.5344	0.5951
DLOER(-1)	0.0270	0.0949	0.2849	0.7767

DLOER(-2)	0.2050	0.0817	2.5099	0.0149
DLOER(-3)	-0.0059	0.0748	-0.0788	0.9375
R-squared	0.6953	Mean dependent var		0.0072
Adjusted R-squared	0.5617	S.D. dependent var		0.0107
S.E. of regression	0.0071	Akaike info criterion		-6.8053
Sum squared residual	0.0029	Schwarz criterion		-6.0476
Log likelihood	308.4200	F-statistic		5.2038
Durbin-Watson statistic	1.8654	Prob(F-statistic)		0.0000

As all error terms from the co-integration equations are stationary, they belong to I(0), and there exists a long-term relationship among prices, money, income (real industrial output), and nominal ERs. While monetary aggregates have significant and positive impact on prices with long run elasticities, increasing from 0.2 for CU to 0.4 for M2, the signs of LIND are not quite satisfactory and their elasticities are much less than 1. The reason is not just because industrial output is not a good proxy of real income in this case, but also because the increase in industrial output is often associated with an increase in credit supply, especially for SOEs which dominate the industrial sector in Vietnam. The signs of ERs are also not right for several equations (Equations 5 and from 8 to 12 in Table V.6), and they all fail to meet any significance test, even at the 10% level. Thus, not only the rate of change in ERs does not help to predict future movements of inflation as concluded in Chapter IV, but at all levels, the ERs have at most very weak, if any, impact on the movements of prices.

In general, the short-run dynamic equations, the ECMs, seem to be acceptable in terms of their explanatory power and the significance of the included error terms taken from corresponding co-integrations (only in the case of M2 with OER, the significance of the error term is 11%). In order to see the explanatory role of each variable in the ECMs, the F-statistics of the hypothesis that its coefficients are all jointly equal to zero have been calculated (Table V.10). The F-tests once again confirm that current inflation is significantly explained by its past movement. But the impact of lagged output variables seems to be stronger in statistical sense than the results obtained from estimation of the VAR models in Chapter IV. From 12 ECMs, only the case of M2 with OER has an F-statistic with significance at the 10% level for the test of coefficients of variable DLER being jointly equal to zero. This result is consistent with that in Chapter IV. It is interesting, however, that the ECMs all are not stable in terms of Cusum-SQ tests.

Table V.10. F-tests for the jointly equal to zero coefficients of each variable in ECMs

(ER = OER)	Coeffs. Of DLIND	Coeffs. of DLCPI	Coeffs. of DLM	Coeffs. of DLOER
Eq. with CU	F = 4.393 (0.004)	F = 4.114 (0.000)	F=2.254 (0.075)	F = 0.869 (0.488)
Eq. with M1	F = 4.545 (0.003)	F = 3.451 (0.001)	F=1.015 (0.408)	F = 1.029 (0.401)
Eq. with M2	F = 5.866 (0.001)	F = 3.260 (0.001)	F=0.603 (0.662)	F = 2.112 (0.091)

Note: The results of other cases are quite similar

Thus, if one takes into account conclusions from studies of the determinants of inflation in Vietnam during the first half of 1990s, then the long-run impact of nominal ERs on price levels or the short-run impact of the rates of change in nominal ERs (i.e. depreciation rates) on inflation seems to have become much weaker and insignificant/much less significant during the second half of 1990s. In other words, other things being equal, there could be room for Vietnam to manipulate the ER regime with more flexibility without a considerable increase in the inflation rate.

V.3. The monetary sterilization in response to capital inflows

Sterilization refers to operations undertaken by the central bank in order to *neutralize* the effects that its intervention in foreign exchange markets has on the monetary base (monetary supply, if it assumed that the money multiplier is quite stable). Under a fixed/pegged ER regime, sterilization operations are linked to whether the balance of payments (BOPs) is in surplus or deficit. Both indirect (open market operations and reserve requirements) and more direct (the shift of government deposits from commercial banks to the central bank and direct lending controls) instruments are used to sterilize net capital inflows. Therefore, to capture the impact of the sterilization operations through these various instruments, a broad measure such as changes in net domestic assets of the whole banking system is usually adopted. Here we also adopt this measure.

For countries that maintain pegged exchange rate regimes, whether capital was ‘pulled’ or ‘pushed”, it often poses problems for macroeconomic management, especially in *an environment of a substantially deregulated domestic financial sector*. In examining the possible responses to a surge in capital inflows, the standard arguments are often in favor of the option of greater ER flexibility together with the 'right' implementation of other macro-policies and the liberalization of the real sector of the economy. First, is the incompatibility between the three simultaneous goals to be attained: monetary policy independence, ER stability, and capital mobility (the so-called "unatainable trinity"). Second, sterilization conducted to stabilize the ER is often ineffective and very costly. Third, ER inflexibility distorts risk-taking transactions and may give the wrong signals to

both domestic and foreign investors. Moreover, imposition of direct controls over the domestic financial sector and capital flows has become increasingly ineffective, as there are many technical innovations for evading capital controls, as well as costly.

Nevertheless, in practice, many countries have maintained pegged ER regimes and tried to use various instruments in order to sterilize surges in capital inflows. Here it is important to determine the extent to which sterilization was offset by capital inflows. In other words, what can we say about the effectiveness of sterilization operations in affecting the money supply under fixed/pegged ERs? To answer this question, the equation taking into account the following variables is often estimated:

$$K\text{-}flows = f\{NDA, CA, realGDP, domestic\ inflation, world\ i, DLER^{(e)}\} \quad (V.6)$$

where K-flows are capital flows, NDA is net domestic assets, CA is current account balance, GDP is gross domestic products, *i* is interest rate, $DLER^{(e)}$ is expected depreciation rate of ER.

In Equation (V.6), the coefficient on the NDA variable is expected to lie in the interval [-1,0]. Since the change in the NDA is a measure of sterilization via monetary policy, its coefficient is interpreted as the degree to which a monetary policy change (either contraction or expansion) becomes offset by international capital flows. This is known as the "offset" coefficient. When the estimated "offset" coefficient is statistically insignificant or relatively small in absolute terms, this would imply that, during the sample period, despite pegged exchange rates and increasing capital flows, the central bank was able to maintain a relatively independent monetary policy. In the case of the estimated 'offset' coefficient being statistically significant and relatively large in absolute terms, the central bank was facing difficult trade-off between maintaining pegged exchange rate and pursuing independent monetary policy.

Although during the 1990s the SBVN could not intend to undertake sterilization (there has been no or a very nascent open market), it is interesting to examine the problem of whether the SBVN was able to maintain an independent and effective monetary policy in a context of a pegged ER and capital inflows. Instead of capital flows, we use the change in the net foreign assets (NFA). We think the choice of this variable is better in the context of Vietnam's rather high degree of dolarization and since the errors in the BOPs (Table III.4 in Chapter III) are quite high. We also estimate different, but *acceptable* regressions in order to see whether there are differences in the estimated "offset" coefficients. The explanatory variables we are most interested in are NDA, GDP, domestic interest rates, LIBOR, and CA. The two-stage least squares (2SLS) method is applied since the changes in NDA is also a measure of sterilization which is, in turn, a reaction to capital flows, it is endogenous to the system. The estimation uses the quarterly

data and the results are presented in the Tables of (V.11) to (V.15). The Wald test for hypothesis of the "offset" coefficient being equal to –1 was also conducted.

Table V.11. "Offset" Equation: f{DNDA, GDP(-1)}

Dependent Variable: DNFA Sample(adjusted): 1993:Q3 1999:Q2 Instrument list: C DNDA(-1) GDP(-2)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8901.938	3508.150	-2.537502	0.0192
DNDA	-0.608955	0.305667	-1.992221	0.0595
GDP(-1)	0.224496	0.067346	3.333451	0.0032
R-squared	0.583176	Mean dependent var		1424.484
Adjusted R-squared	0.543479	S.D. dependent var		2665.039
S.E. of regression	1800.670	Sum squared residual		68090673
F-statistic	6.875118	Durbin-Watson statistic		2.533917
Prob(F-statistic)	0.005049			
Chow Breakpoint Test: 1998:Q1		F-statistic: 6.1854	Probability: 0.0044	
Wald Test: Ho: Coeff. of DNDA = -1		F-statistic: 1.6367	Probability: 0.2147	

Note: DNDA=NDA-NDA(-1); DNFA=NFA-NFA(-1); data of quarterly GDP are our estimates (see also CIEM-DIW (2000)). All these data are measured in VND billion.

Table V.12. "Offset" Equation: f{DNDA, SDOM_LIBOR)

Dependent Variable: DNFA Sample(adjusted): 1993:Q3 1999:Q2 Instrument list: C DNDA(-1) SDOM_LIBOR(-1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5960.327	1123.055	5.307242	0.0000
DNDA	-0.785972	0.298760	-2.630782	0.0156
SDOM_LIBOR	-2667.691	678.9122	-3.929361	0.0008
R-squared	0.634845	Mean dependent var		1424.484
Adjusted R-squared	0.600069	S.D. dependent var		2665.039
S.E. of regression	1685.374	Sum squared residual		59650212

F-statistic	9.404840	Durbin-Watson statistic	2.320794
Prob(F-statistic)	0.001212		
Chow Breakpoint Test: 1998:Q1		F-statistic: 6.5601	Probability: 0.0034
Wald Test: Ho: Coeff. of DNDA= -1		F-statistic: 0.5132	Probability: 0.4816

Note: SDOM_LIBOR=Short-term (domestic) lending interest rate *minus* LIBOR

Table V.13. "Offset" Equation: f{DNDA, CAVN, SDOM_LIBOR)

Dependent Variable: DNFA Sample(adjusted): 1993:Q3 1999:Q2 Instrument list: C DNDA(-1) CAVN(-1) SDOM_LIBOR(-1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5308.854	1597.380	3.323476	0.0034
DNDA	-0.714991	0.340348	-2.100764	0.0485
CAVN	-0.172887	0.354155	-0.488167	0.6307
SDOM_LIBOR	-2829.343	968.2988	-2.921973	0.0084
R-squared	0.416568	Mean dependent var		1424.484
Adjusted R-squared	0.329053	S.D. dependent var		2665.039
S.E. of regression	2182.970	Sum squared residual		95307128
F-statistic	3.837112	Durbin-Watson statistic		2.149236
Prob(F-statistic)	0.025483			
Chow Breakpoint Test: 1998:Q1		F-statistic: 9.3613	Probability: 0.0004	
Wald Test: Ho: Coeff. of DNDA = -1		F-statistic: 0.7012	Probability: 0.4123	

Note: CAVN = Current Account balance measured in bill.VND

Some important points can be made on the basis of our estimations. Firstly, all "offset" coefficients in Tables of V.11 to V.13 have the correct sign, i.e. are negative. They are significant at about the 5% levels and relatively large in absolute terms (from –0.61 to –0.79). Moreover, all offset coefficients are not significantly different from –1.

Secondly, although during the 1990s the SBVN might not have intended to undertake sterilization (in narrow sense of using open market operations to neutralize the impacts of capital inflows), it did, however, pay attention to the balance between the NFA and NDA to achieve its target growth rate of broad money (M2). But, in general the SBVN has been facing difficulty in pursuing independent monetary policy while maintaining a pegged exchange rate.

Thirdly, the Chow test with the breakpoint at 1998:Q1 shows that the structural parameters of the "offset" equations changed significantly during the Asian financial crisis, when the SBVN implemented nominal devaluations of the VND and tried to widen the ER intervention band enough in order to allow for greater ER flexibility in the context of introducing more stringent controls over imports and foreign exchanges. But as mentioned in Chapter II, the actual ERs used for transactions by commercial banks were always *set at the upper bound of the bands* allowed by the SBVN. This means that in fact the ER regime during that period was an adjustable peg and therefore it can be hardly said that the pressure on keeping an independent monetary policy came down.

Fourthly, it is interesting to compare our offset coefficients with the estimates for other countries: Vietnam's offset coefficients are among the highest (Table V.14). In an environment where the central bank uses direct controls over, for example, domestic interest rates and credits, it can exercise monetary policy relative independently of the changes in net foreign assets. This becomes more difficult with 2the process of financial deregulation (as shown in Table V.14 for the cases of other countries). But in the case of Vietnam, the difficulty can be seen even in an environment of a highly regulated banking system.

Table V.14. Offset coefficients for selected Asian countries

	Fry (1960-91)	Frankel & Okongwu (1977:Q3-91:Q4)	Leung (1984:Q4-93:Q4/95:Q4)	Our estimate (1993:Q3-99:Q2)
Thailand	0.18	na	-0.68***	na
Indonesia	-0.30**	na	-0.40*	na
Korea	-0.48**	-0.16***	-0.74***	na
Philippines	0.46	-0.64***	na	na
Malaysia	-1.30	na	na	na
Vietnam	na	na	na	(-0.79, -0.61)**

Note: *, ** and *** indicate the significance at 10%, 5% and 1% level.
Source: from Leung (1996) and our estimates for Vietnam

Chapter VI

POLICY OPTIONS FOR SHIFTING TO A MORE FLEXIBLE & RATIONAL EXCHANGE RATE SYSTEM

It is not always easy theoretically and practically to choose the appropriate ER regime. Traditional theory holds that there are essentially two ER regimes, a fixed regime where central banks undertake intervention in an attempt to keep rates constant, and floating ER regime, where rates are freely determined, without central bank intervention, in foreign exchange markets. In the literature one can find substantial arguments *for and against* fixed and freely floating ER arrangements. The implication is that there is *a rationale for some degree of ER management between the two extreme regimes*, which can combine the advantages of both regimes while limiting their respective disadvantages (Pilbeam 1998). Therefore, a country can have a wide range of 'de facto' choices of the different types of ER arrangements, which depend on its structural characteristics, possible external shocks, and macroeconomic environment.

It makes sense to assume that as an economy changes over time, especially as reforms are put into place, the ER regime also needs to be changed. When, then should this change be done (e.g. for greater ER flexibility)? As we have seen from the experiences of developing and transitional economies and the recent crises, the exits/returns in many cases have been forced to be undertaken in 'bad' times, if not in the 'worst' of times.

In an attempt to work out an optimal ER regime for Vietnam, we consider the following issues in logical order:

1. Was the pegged exchange rate regime pursued by the SBVN during the 1990s appropriate for and consistent with the reforms and policy targets of this period? Likewise, is the ER regime that has been implemented since February 1999 appropriate?
2. Which ER regimes 'fit' Vietnam's economic characteristics, taking into consideration both its static and dynamic situation?
3. What is the most appropriate choice of a new ER arrangement?
4. How can Vietnam make a smooth exit toward this regime tied to an appropriate sequencing of reforms?

VI.1.The appropriateness of the exchange rate regime pursued by the SBVN during the 1990s

Based on the results from Chapters of II to V, it is possible to comment on the usefulness and relevance of the pegged ER regime in the 1990s and the consistency of the process of reforms.

In 1989 when Vietnam started embarking on a radical reform toward a market-oriented economy, the ER was unified by a sharp devaluation of the official ER. During the 1990s, the VND has been effectively pegged to the USD with several discrete realignments, especially during 1990-91 and 1997-99.

In 1989, the devaluation had a very positive impact on exports and economic activities. Since then, the SBVN has considered the ER as an important macroeconomic instrument for promoting exports, controlling imports, improving economic performance, and ensuring low inflation and stability of the financial system.

The main findings from our econometric evidence over the period of 1992-99 in Chapters IV and V can be summarized as follows:

First, the changes in monetary aggregates (CU, M1, M2) do not contain any advance information on inflation and (real industrial) output fluctuations. In other words, money is not a leading indicator for either inflation or output growth. Instead, there is weak evidence that money growth has responded to past movements in inflation and output, i.e. it has been demand determined.

Second, as financial reforms led to a decreased role for monetary aggregates, a greater role for financial prices could be expected in determining economic activities. In fact, the rate of changes in ERs has significantly altered the Granger-causality between output growth, inflation, and money growth; however, it did not help to predict future movements of inflation. Moreover, at certain levels, the ERs have only very weak impact on the movements of prices. Also, in general, the changes in money supply, especially in M2 as a most important policy target, have had no significant responses to the lags of depreciation rates. The changes in ERs (in the case of OERs and SERs) began taking on the role as a leading indicator for output growth, but this causality was found to be unstable.

Third, current inflation is mostly explained by its past movements[21]. The same is true for (real industrial) output growth. However, real depreciation rates have had positive and rather significant impact on the output growth, though the impact magnitudes were

[21] This phenomenon of inflation inertia is common in most countries.

very unstable. Thus, in a changing institutional environment in Vietnam, firms' behaviours have become more market-oriented.

Fourth, as the estimated 'offset' coefficients are statistically significant and negatively large, the SBVN has faced a difficult trade-off between pursuing independent monetary policy and maintaining a pegged exchange rate regime. During the Asian financial crisis, the SBVN sanctioned several nominal devaluations of the VND and widened the ER intervention bands to allow for greater ER flexibility, while concurrently introducing stringent controls over imports and foreign exchange. Nevertheless, the actual ERs used for transactions by commercial banks were always *set at the upper bound of the bands* allowed by the SBVN.

Thus, in general, both monetary and ER policies have proven to be limited in affecting the main macroeconomic variables such as output and prices, while microeconomic behaviour has become more market-oriented. Our main findings seem to be consistent with the facts described in Chapters II and III that during 1990s the financial reforms in Vietnam, though considerable, did not keep pace with economic development, and the formulation and implementation of effective monetary instruments remain rudimentary. The weaknesses of the financial system are a major obstacle to the process of further economic liberalization.

Also, in the context of high trade and current account deficits together with the real appreciation of the VND during 1993-96, perhaps Vietnam needs to move to a more flexible ER policy. This was also supported by the fact that the impact of the changes in ERs on inflation likely becomes less significant during the second half of the 1990s. In other words, other things being equal, there should be room for Vietnam to allow for a more flexible ER regime without a considerable increase in the inflation rate.

Moreover, the lack of a comprehensive and flexible approach in dealing with ER and interest rates for both domestic and foreign currencies has created a problem of policy inconsistency, which was exposed in the two periods of 1993-96 and 1997-2000. In the context of high current account deficits during 1993-96 and the impact of the Asian financial crisis, import restrictions and FE controls seemed necessary. But the actual measures were *over adjustments and too 'heavy'* and in fact, they were utilized as an excuse for delaying needed financial reforms.

Since our econometric evidence, in general, does not indicate any significance of the ER regime implemented since February 1999[22], this is important to have a meaningful judgement of this regime. As mentioned in Chapter II (see Box 2), since February 1999, the SBVN has changed its ER management mechanism. Instead of announcing an official (VND/USD) rate with a trading band of 7%, the SBVN announces the average interbank ERs of the previous working day and prescribes the interbank market to make FE transactions within a band not exceeding 0.1%. This ER arrangement is considered by Vietnamese authorities as more market-oriented and flexible.

In fact the ER regime implemented since February 1999 does not allow for significant direction by the market. First, at the time Vietnam moved to this regime, the average rate was determined at the upper bound of the band allowed by the SBVN in the previous arrangement. As the ER was under heavy upward pressure, this rate can not be seen as an equilibrium/market one. Second, the interbank market has been very thin, although the number of participants increased from 23 in 1994 to 58 in 1999. While the ratio of daily turnover to total volume of exports and imports ranged anywhere from 8 to 93% in countries which have well-developed FE markets, the corresponding figure in Vietnam was only in the range of 0.15-0.65% (Table VI.2; in the mid-1990s, South Korea can also be considered as not having a well developed FE market). Moreover, the FE interbank market has been dominated by Vietcombank, which is a SOCB and hence, much under 'guidance' of the SBVN. The share of Vietcombank in all transactions accounts for 90%, and this figure has not changed since the establishment of the FE interbank market in 1994 (Table VI.1). Third, the regime is still very rigid since the prescribed band is just 0.1%. In 1999 the nominal depreciation rate was only 1.1%. The thinness of the market and inflexibility of ER regime has allowed the SBVN to have effective control over the interbank market, but the problem of policy inconsistency remains as before (see Chapters II and III).

Table VI.1. Volumes of the FE transactions in interbank market (USD mill.)

	1994	1995	1996	1997	1998	1999	Q1/2000
	All transactions in interbank market						
-Buying	3131	12363	17392	9047	4533	6282	1158
-Selling	3097	12363	17312	9002	4590	6307	1049
	Transactions with Vietcombank						
-Buying	2818	11127	15653	8142	4080	5654	1042
% total	90.0	90.0	90.0	90.0	90.0	90.0	90.0
-Selling	2787	11127	15581	8102	4131	5676	944

[22] Note that our data set covers only the period from January 1991 to June 1999.

% total	90.0	90.0	90.0	90.0	90.0	90.0	90.0

Source: SBVN

Table VI.2. Volume of daily turnover in FE markets (in USD billion)

	Daily turnover (A)	**Total trade (B)**	**(A/B)*100**
UK	463.8	500.0	92.8
USA	244.4	1326.0	18.4
Japan	161.3	726.6	22.2
Singapore	105.4	235.5	44.8
Hong Kong	90.2	366.0	25.1
South Korea	2.0	251.0	0.8
Vietnam, for years			
-1994	0.021	9.298	0.22
-1995	0.082	12.741	0.65
-1996	0.116	17.810	0.65
-1997	0.060	19.838	0.30
-1998	0.030	19.711	0.15
-1999	0.042	23.176	0.18

Note: Data for all other countries are for 1995. The calculation for Vietnam is based on the figure of 300 working days for the interbank market.
Source: Rhee and Song (1999) and our estimates for Vietnam

Obviously, Vietnam needs to have a reform strategy consistent with the sequencing of economic liberalization and finding a suitable compromise of the relationship between ER stability, capital mobility and monetary policy independence. Together with the strengthening of the financial system and the improvement of monetary instruments, greater flexibility of the ER regime and fewer controls over the current account and related FE transactions seem to be an appropriate option for Vietnam.

VI.2. Vietnam's static and dynamic economic characteristics and exchange rate regimes

Basically, the advantages of a fixed ER regime is that it promotes international trade and investment, provides discipline for macroeconomic policies, promotes international cooperation and helps avoid destabilizing speculation. Meanwhile, a floating ER regime can ensure a balance of payments equilibrium, monetary autonomy, and can insulate an economy and promote economic stability while private speculations tend to move the ER towards its fundamental equilibrium value allowing it to function as a stabilizing rather than destabilizing force. This approach suggests, for example, that

small open economies are "better served by a fixed ER and that the less diversified is a country's production and export structure and the more geographically concentrated its trade, the stronger also is the case for a fixed ER" (IMF 1997). Nonetheless it is extremely difficult, if not impossible to prove the arguments for and against the two regimes (Pilbeam 1998). Accordingly this approach leaves plenty of scope for disagreement, stimulating alternative methods of evaluating optimal regimes.

Another approach in determination of the optimal ER regime is to evaluate which regime best stabilizes the domestic economy in the face of various shocks to the economy. In particular, according to this approach, the optimal ER regime is the one that stabilizes macroeconomic performance, that is, minimizes fluctuations in output, real consumption, and domestic price levels or other macroeconomic variables. Actually this approach focuses on three crucial factors which determine the choice of the ER regime: policy-makers' preferences (objectives); type of shocks impinging on the economy (nature and sources of shocks) and the structure of the economy. In addition to these three factors, a host of other factors such as relationships between various shocks make the choice of the ER regime more complicated. Also, in practice, it is quite difficult to realize if an economy is being hit by a supply or demand shock or a shock to money demand. And even if nature of the shocks is known already, whether they are permanent or transitory is still a tough question. This approach, although considered as a modern one, still does not provide an unambiguous solution as to which ER regime is the best.

Table VI.3 presents an IMF checklist for determining the most appropriate ER regime for an economy with our own assessment for the individual case of Vietnam with its current economic situation[23].

Table VI.3: Considerations in the Choice of Exchange Rate Regime

Characteristics of Economy	**Implication for the desired Degree of Exchange Rate Flexibility**	**Vietnam**	
		Economic Characteristics	**Implied ER regime**
Size of economy	The larger the economy, the stronger is the case for a flexible rate.	Small	Less Flexible
(Trade) Openness	The more open the economy, the less attractive is a flexible exchange rate.	Medium	More flexible
Diversified production/export structure	The more diversified the economy, the more feasible is a flexible exchange rate.	Still low diversity	Less flexible
Geographic concentration of trade	The larger the proportion of an economy's trade with one large country, the greater is the incentive to peg to the currency of that country.	Concentration of trade on East Asia	Basket pegged ER
Divergence of domestic inflation from the world	The more divergent a country's inflation rate from that of its main trading partners, the greater is the need for frequent exchange rate	Less divergent	Less frequent ER adjustments

[23] We have a more detailed assessment which can be provided by request

inflation	adjustments. But for a country with extremely high inflation, a fixed exchange rate may provide greater policy discipline and credibility to a stabilization program.		
Degree of economic/financial development	The greater the degree of economic and financial development, the more feasible is a flexible exchange rate regime.	Low degree of economic and financial development.	Flexible ER is less feasible.
Labour mobility	The greater the degree of labour mobility, when wages and prices are downwardly sticky, the less difficult (and costly) is the adjustment to external shocks with a fixed exchange rate.	Low degree of labour mobility and less sticky wages	Less fixed ER.
Capital mobility	The higher the degree of capital mobility, the more difficult it is to sustain a pegged-but-adjustable exchange rate regime	Low degree of capital mobility, but rather high degree of dollarization	Fixed/ pegged ER is possible but not sustainable
Foreign nominal shocks	The more prevalent are foreign nominal shocks, the more desirable is a flexible exchange rate.	More disturbances are expected	More flexible ER
Domestic nominal shocks	The more prevalent are domestic nominal shocks, the more attractive is a fixed exchange rate.	Domestic shocks are expected	More rigid ER
Real shocks	The greater an economy's susceptibility to real shocks, whether foreign or domestic, the more advantageous is a flexible exchange rate.	More unanticipated real shocks	More flexible ER
Credibility of policymakers	The lower the anti-inflation credibility of policymakers, the greater is the attractiveness of an exchange rate as a nominal anchor.	Moderate credibility	Room for a more flexible ER

Source: Our assessment based on the "criteria" given in IMF (1997)

Obviously, given the current conditions in Vietnam, neither freely floating nor rigid ER regimes are the most suitable options. Indeed, these kinds of considerations of alternative ER systems are not very useful and relevant in practice and "... no single currency regime is right for all countries or at all times" (Frankel 1999).

Based on the dynamic situation of Vietnam's economy, the ER arrangement can be more associated with the degree of domestic financial sophistication and the extent of involvement with the world economy, especially modern, global financial markets. Greater global involvement can be seen in several aspects such as capital mobility, portfolio diversification, and openness to international trade, shift of exports toward high value-added products, and diversification in trading partners. For economies with substantially liberalized capital accounts and well-developed financial markets, floating ER regimes are increasingly the best choice (Mussa *et al* 2000). The

experiences of the recent Asian financial crises have shown that pegged ER regimes are inherently crisis-prone for the emerging economies. A floating ER regime allows for large adverse shocks to be more easily deflected/absorbed and avoids the large costs that often accompany a breakdown of the ER regime.

For a large number of developing and transition countries that do not yet have a high degree of involvement with the global financial markets and a well-developed financial infrastructure, the choice can be a broad range of regimes with a varying degree of permissible ER flexibility, from hard, single-currency pegs, to basket pegs, to bands to adjustable pegs and bands, to crawling pegs and bands, to managed floats. With increased capital mobility, as countries approach the status of emerging economies, they will need to consider regimes of greater ER flexibility (Mussa *et al* 2000). At the same time, the exit strategy from the pegged regime to the more flexible ER regime should be designed to avoid speculative currency attacks (APF 2000).

The recognition of the important role of the ‘open-door’ policy in general and trade policy in particular has led Vietnam to more actively participate in regional and international organizations. Vietnam signed a trade agreement with the European Economic Community (now the European Union, EU) in 1992. In July 1995, Vietnam became a member of ASEAN and subsequently committed itself to implement the Common Effective Preferential Tariff Scheme (CEPT) for the realization of the ASEAN Free Trade Area (AFTA). In November 1998 Vietnam was admitted to membership of APEC. The diplomatic relationship between Vietnam and the United States was normalized in 1995, and the two countries signed a bilateral trade agreement in July 2000. In January 1995 Vietnam also applied for World Trade Organization (WTO) membership and since has been actively preparing for accession.

Although there has been inconsistency and discretion in the process of reforms in general and trade liberalization in particular, it can be said that Vietnam has made significant steps toward integrating itself into the regional and world economy. For Vietnam, several aspects of involvement into global market just mentioned above are being deepened, implying that an ER regime with greater flexibility has become more

appropriate. This kind of ER regime is also more suitable in the context of rather high degree of dollarization in Vietnam.

VI.3. The choice of a new ER arrangement

According to the study by Ohno (1999), ER management can be improved operationally and the choice of the ER system is not important so long as the two 'extreme' (fixed and freely floating) regimes are ruled out. Recently more economies, especially those in the East Asian region that suffered from the crisis, have shifted towards flexible ER regimes. Nonetheless it remains controversial whether this is the right direction for other countries, including Vietnam, to follow. Rana (1999) argues that countries in a post-crisis period as well as the other vulnerable developing countries can adopt a crawling peg system in combination with appropriate macroeconomic policies.

From the experience of several countries (and also our considerations), it can be expected that a good choice of 'intermediate' ER regimes needs to satisfy two requirements:

- *It must be consistent with sustainable international competitiveness of ER;*
- *There is room for ER fluctuations to free up, within limits, domestic monetary policy and for there to be a market-based signaling role for ERs*

In practice, there are two common ER arrangements that could be adopted. The first is the so-called Williamson-style crawling band or 'band-basket-crawl' (BBC) scheme, which consists of three elements:

- First, the central parity should be allowed to crawl over time;
- Second, the parity should be expressed in terms of a basket, not a single foreign currency;
- Third, there should be a broad enough band around the parity in which the market-determined ER may move.

The second ER arrangement is the so-called market average ER system (MARS), i.e. each business day the inter-bank market rate (of the domestic currency against the US dollar) is allowed to fluctuate within a specified band centered on yesterday's average rate. Two examples are the mechanism used in Vietnam since February 1999 and the system applied in South Korea in the early of 1990s (see Box 4).

The BBC system has several advantages. The central bank can ensure international competitiveness by determining the parity based on an appropriate trade-weighted currency basket, adjusted for domestic-foreign inflation differences. Together with the parity crawl, this

adjustment can prevent expectation of discrete realignment and avoid serious misalignment of ERs. With the use of a broad enough band, the system also provides the central bank with some flexibility and a scope to implement an independent monetary policy. By allowing some uncertainty about the ER, the band would also reduce incentives for heavy speculative currency borrowing. Moreover, the movements of the ER can provide the central bank with information about the direction of market forces, which can serve to guide policy. Finally, the BBC approach allows authorities to more easily concentrate on strengthening macroeconomic fundamentals and at the same time, it is also flexible enough to respond to shifts in more market based monetary instruments and to the gradual process of integration into the world financial market. In particular, at present this is very important for Vietnam as Vietnam needs to have a more flexible interest rate policy which is consistent with the interest rate parity condition, taking account of both interest rates for USD circulated within the economy and international interest rates.

Israel, Chile, and Colombia have had favourable experiences with the BBC system. Their experience has shown that a country practicing this kind of arrangement can enjoy smooth and substantial integration in world capital markets, gradual disinflation, stable REERs, and a strongly performing real economy (Dornbusch and Park 1999 and Williamson 1996).

The key decisions of the BBC system consists of how to adjust the central parity and how wide to set the band. The consensus view is that the parity should be determined so as to track the long–run equilibrium REER reflecting the relative importance of trading partners and differences in international inflation rates. The crawl should be adjusted in accordance not only with the inflation differences but also with changes in fundamental factors such as terms of

trade, productivity, and saving rates[24]. A problem here is that an ER regime compatible with international competitiveness requires the right information and right adjustments that involve difficult calculations and careful evaluation.

As mentioned by Dornbusch and Park (1999), there is no theoretical foundation for determining a good band. Williamson (1996) recommends to select a band width in the range of (+/-) 7-10%. The idea for these numbers is that less is too little and the more is too much. A problem is that the degree of flexibility should also accommodate extraordinary shocks, such as massive capital inflows, international price shocks and relative productivity advances related to technological innovation.

The BBC system, of course, is not a panacea and a magical solution to credibility problems. Indonesia adopted the system in 1978 and widened the band several times – most recently in 1997 from 8% to 12%; nonetheless, it was still subject to speculative attacks, most notably in early 1998. This means that an appropriate mix of monetary policy and fiscal policy is required to go along with the BBC system (Rana 1999). There are also some problems in implementing this system. For example, under what conditions should the rate of crawl be adjusted? This is an issue of rules versus discretion. There is also the problem of the central bank's interventions to defend the band when the ER tends to stick to the edge of the band. In this situation, any shock to confidence makes it easy for a speculative run to develop.

The MARS seems to be more flexible than the BBC system in the sense that the central bank gives up its ability to directly set the ER at some arbitrary level and it allows market forces to play a more important role in determining ERs, thereby laying the basis for the market to become more efficient (the central bank is only one participant in FE market). However, the MARS gives little assurance that the rate would not get pushed to miss-aligned levels by market forces, especially when the inter-bank market is not well-

[24] Williamson (1996) suggests that the rate of crawl can be estimated by the formula: the target for domestic inflation – expected foreign inflation – estimated productivity bias = next year's increase of the parity.

developed. In this case, if the band's margin is wide enough, speculators could make profits at the expense of the central bank: The central bank, especially one with low international reserves, could not easily effectively intervene in the FE market, and the rate would be easily driven to the edge of the band.

To gain effectiveness in intervention, say, in order to make sure that today's average rate is never far from yesterday's rate, the market should be thin, or the central bank should have power in 'guiding' the major participants in the market, or the band should be very narrow (as in the case of Vietnam). In turn, however, this would discourage a sound development of the foreign exchange market. Moreover, the lack of short-run flexibility could impose absurd constraints on monetary policy.

In the case of South Korea, although the central bank did have the capability to influence the ER to move in the desired direction and the REER had apparently been more stable in the 1990s under the MARS than in the 1980s, it would have been better if the development of the FE market had been encouraged (e.g. by allowing commercial brokerage firms to engage in FE transactions and to relax the restrictions on their net FE position) and intervention had been accompanied by corrective macroeconomic policies (Rhee and Song 1999; also see Box 4).

Although the above two systems allow for flexibility within bands and share some problems of implementation, on balance, the BBC scheme seems to be more appropriate for use during intermediate stages toward a floating regime[25]. The MARS is hard to be adopted unless there exist necessary conditions for it to function well, such as the existence of an efficient interbank market with rather sophisticated financial instruments and relatively large central bank's international reserves. And as the decision on which option to take for the ER arrangement is made, there still are problems related to the exit strategy to make a smooth transition to the new regime with minimum disruption to economic performance and consistency in sequencing of reforms.

Box 4. South Korea and ER arrangement during early 1990s

In March 1990, South Korea shifted its ER regime from a multiple currency basket peg system to the MARS, in which the exchange rate of the won vis-a-vis the US dollar is primarily determined in an inter-bank foreign exchange market. Up to 1998, *participants of*

[25] In reality, no country has actually practiced a completely freely floating regime.

the market comprise 110 banking institutions including the Bank of Korea: twenty-five domestic commercial banks, five specialized banks, three development banks, twenty-seven merchant banks, and forty-nine branches of foreign banks.

The market average rate, which is used as a daily basic rate for inter-bank transactions of the US dollar, is a *weighted average* of the market exchange rates related to all transactions of the previous day with the weight being the volume of each transaction. Each business day the inter-bank market rate of the won against the US dollar is allowed to fluctuate within a specified band around the basic rate, which is revised daily.

When the MARS was first introduced, the market exchange rate was allowed to vary within ± *0.4 per cent of the basic rate*. Since then, the band has been gradually widened. At present the *band is ± 2.25 per cent* of the basic rare. The South Korean government *plans to widen the band further and to remove it entirely in the near future*.

It should be noted that there are no commercial foreign exchange brokerage firms in South Korea. As a result, most of the inter-bank transactions are intermediated by a public brokerage house, the Fund Trading Center of Korea, Financial Telecommunication and Clearing. The public foreign exchange brokerage system may help the Bank of Korea to monitor developments in the foreign exchange market closely and to maintain stability of the market through effective supervision. However, the supervision of the market is likely to create distortions because banks as market makers may be discouraged from active price quotations, and the Fund Trading Center, as a public institution, has *little incentive to develop new products or in general to serve the market*. Furthermore, the total volume of direct inter-bank foreign exchange transactions is trivial compared to the volume cleared through the Fund Trading Center. Even in the case of direct inter-bank foreign exchange transactions, detailed information on each transaction must be reported to the Fund Trading Center after it is completed.

The exchange rates of *the Korean won against currencies other then the US dollar are determined by the cross-rate*. Assuming an arbitrage relation, they are calculated by multiplying the won/dollar exchange rate by the exchange rates of other currencies vis-à-vis the US dollar determined in the international foreign exchange market. The exchange rates quoted in the Tokyo foreign exchange market in the morning (8.00 a.m. of each business day) are used to calculate the official exchange rates of the won against the Japanese yen, British pound, German Mark, Swiss franc and Australian dollar. They are announced in the morning of each business day along the basic won/dollar exchange rate.

The net foreign exchange position of market participants is subject to limits. For example, a spot ever-sold position of each bank at the end of each business day should not exceed 2 per cent of its capital or $ 3 million, whichever is larger. Also, an overall ever-sold position at the end of each business day is permitted up to $20 million or 30 per cent of its daily average of the amount of foreign exchange purchase in the previous month. An overall ever-bought position is allowed up to $20 million or two times its daily average foreign exchange purchase in the previous month, whichever is larger. The position restriction is imposed in order to maintain stability of the foreign exchange market and to prevent excessive speculative foreign exchange trading.

The bank of Korea often intervenes in the inter-bank market through the sale or purchase of US dollars. It is conjectured that the main purpose of the intervention in the foreign exchange market is to stabilize the real effective exchange rate of the won in order to maintain the price competitiveness of South Korean exports. The central bank intervention has been effective due to the thinness of the domestic foreign exchange market, where the average volume of

daily turnover in 1995 was only $2 billion.

Source: Dornbusch and Park (1999) and Rhee and Song (1999)

VI.4. A smooth exit to the new regime with an appropriate sequencing of economic reforms in Vietnam

The smooth exit to and the implementation of the new (BBC) ER regime is very much dependent on the determination of the (new) central parity, the coordination with other macropolicies and structural reforms, and the establishment of policy credibility.

As suggested by Williamson (1996), the initial parity can be based on the calculation of the REER, taking into account the current account balance on average in the medium term, the sustainable capital flows consistent with the debt-GDP ratio at a prudent level (say, no more than 40%). For Vietnam, the initial parity can be derived from the REER index using 1993 as a base year. Note that the REER index in Figure III.1 (Chapter III) is calculated by the yearly average, not the December-December data. And in 1992, the current account was nearly in balance. Moreover, for economies in transition, there may be a problem of over devaluation in the initial period, and hence a base year at 3-4 years after the reforms in 1989 would be a better choice.[26]

The coordination between the ER policy with other macroeconomic policies and structural reforms is an essential element for the success of implementing a BBC system, especially for transition economies (see Chapters II and III for the case of Vietnam and Box 5 for the case of Poland). The central bank, preoccupied with price stability, and the government, more concerned with growth and employment, could clash over the conduct of ER policy. Williamson (1996) suggests that while keeping responsibility to the ER policy, the central bank's primary duty of controlling inflation *may* need to be tempered by the aim of stabilizing the economy (in a broader sense) and maintaining competitiveness. There is also the relation between the band width and the usefulness of monetary policy in reducing volatility in the case of shocks. In the case of no availability of fiscal policy as a stabilization tool, if real shocks predominate then a fairly wide band should be adopted and if domestic nominal shocks predominate, then keeping the ER close to central parity is a more favorable choice. But with a flexible fiscal policy, the

[26] Note also that the basket feature of parity does not mean that there is a need to intervene in all reference currencies. In practice, the FE market is run in terms of one of the reference currencies, say the USD. The central USD rate is then adjusted in terms of the corrections deriving from external rate movements among the basket currencies.

role of monetary policy as a stabilization tool is diminishing, and hence, the adoption of a fairly narrow band seems to be better. Regarding intervention within the band, active intervention should accompany nominal shocks, whereas real shocks instead call for some combination of ER and fiscal adjustment (Rana 1999).

The establishment of policy credibility is also vitally important. Credibility can only be expected to increase with the acceleration of the process of consistent reforms (commitments and implementation in reality). The management of a new ER arrangement should be transparent with accurate and timely information for all participants in the market, essential for market participants to accept it and to learn to expect changes in the equilibrium REER with changes in macroeconomic variables. Here the government can play a role in instituting disclosure requirements as the "free rider" problem would discourage individuals to produce private information on financial markets (including FE markets) and corporate sectors.

In general, during the 1990s Vietnam's policymakers have been successful in containing and bringing down the country's inflation rate. Although being potentially fragile, the *recent* macroeconomic environment has been rather stable. Inflation has been reined in and remained stable with rather low rates of one digit for several years, compared with two and three digits before. State budget deficits have been kept under control by the Government, and the external balance has improved. According to Eichengreen and Masson (1998), this tranquil environment is an opportune moment for the ER regime to be moved toward a greater flexibility.

At the same time, the banking system and ER policy still lack credibility in the eyes of the public. One of the most striking proofs is that the public continues to keep massive amount of savings in the form of foreign currencies and gold and continues to trade large volumes of foreign currency outside the financial and banking system[27]. The economy still suffers from fundamental structural weaknesses. The banking system is still fragile and monetary instruments remain rudimentary. The inefficient state-run sector together with serious economic distortions created by policy mismanagement (e.g. trade regime and import-substitution policies) is also a major problem that needs solving. All

[27] It is estimated by authorities that there exist many billions of USD held in cash in the public. It was reported on Vietnam Television, VTV1, on 6 March 2000 that in 1999, about US$ 1.2 billion, equivalent to two thirds of the total amount, from overseas Vietnamese had been transferred into Vietnam via the banking and financial system and one-third was transferred outside the banking and financial system.

these problems should be addressed in the process of further economic reforms and liberalization.

Box 5. The experience of Poland on the way toward a flexible ER regime

Poland has been an economy in transition from a CPE to a market economy. In this regard, Polish experience with exchange rates is worth referring to for considering a voluntary, timely and flexible exit.

In 1990 Poland embarked on a comprehensive reform program aimed at stabilizing the economy and putting it on a transition path to a market economy. As a result, inflation was reduced substantially with remarkable growth performance, imbalances in the external account were eliminated, and the external debt was reduced markedly. The success of Poland's overall macroeconomic policy has been attributed to a comprehensive set of reforms including the ER policy, interest rates, fiscal and income policies, and structural reforms. Within the reform strategy, the ER policy has played a dual role as an inflation anchor and a factor ensuring international competitiveness.

The zloty was initially fixed against the USD, but at a level that would restore and maintain competitiveness. In May 1991, the zloty was pegged to a basket of currencies. Further flexibility was introduced in October 1991, when the regime was modified to a pre-announced crawling peg as deterioration in competitiveness persisted in view of the Country's persistently high inflation relative to trading partners. During 1991-93 three devaluations were implemented and the ER policy was complemented with additional measures, including tight fiscal and (tax-based) incomes policies, which helped alleviate pressures on both inflation and competitiveness. In May 1995, the authorities extended the band width to (+/-) 7% around a central parity in order to provide scope to deal with various shocks and capital flows, while at the same time maintaining partially the anchor role for the ER.

Three important things can be inferred from the experience of Poland. First, ER policy cannot, and should not, be viewed in isolation, and should be accompanied by financial and structural policies that are consistent with it. Second, sterilization of capital inflows became increasingly difficult and costly. Third, Poland's banking system was not free of troubles because of the insufficient preparation for liberalization which had resulted in a sharp increase in bank lending and a subsequent deterioration in loan quality. A comprehensive program of restructuring the banking system and strengthening prudential regulation and supervisory capacity had stabilized the banking sector and reduced the ratio of non-performing loans (NPLs).

Source: Eichengreen and Masson (1998)

As mentioned in Chapter II, it is now believed that economic liberalization should be carried out in an orderly, well-sequenced way in order to avoid currency and financial crises. According to the McKinnon sequence (McKinnon 1982 and 1991), in order to have a smooth transition, the following steps should be followed consecutively:

- Firstly, economic distortions in the economy should be removed before opening economic links externally.

- Secondly, international trade will be liberalized, in particular, tariff and non-tariff barriers should be removed. In this stage, controls over ER, however, should not be removed yet.
- Lastly, the external capital account should be liberalized and then the fixed ER regime should be abandoned moving toward a flexible ER regime.

The conventional view is to give high priority to build a strong domestic financial sector before liberalizing the current account and then the capital account. And of course, it is necessary to strive for strong macroeconomic fundamentals, such as low inflation, a balanced budget, and high domestic saving. Note, however, that the choices of and the changes in the ER regime are not limited as suggested. In reality and usually, some individual components (FDI and/or commercial bank borrowing) can be liberalized selectively.

We have argued that the BBC system is more suitable as an 'intermediate' regime for Vietnam at present. Moreover, it is clear that financial sector and SOE reforms in Vietnam need to be conducted simultaneously and in conjunction with trade reform, similar to the World Bank's suggested three-year agenda for accelerating the "Doi Moi" renovation program outlined in Box 6 below. Our concerns here focus on the issue of strengthening financial institutions.

As stressed in Box 6, in order to have a healthy banking system, Vietnam needs to restructure JSBs and SOCBs, strengthen its legal, regulatory and supervisory framework, and establish a level playing field for all banks. One lesson drawn from the recent Asian crisis is that it is also important to give high priority to developing a sound long-term, domestic-currency-denominated capital market (APF 2000). A healthy banking system and this kind of capital markets, together with a more flexible ER regime will make the economy much less vulnerable to the volatility of capital flows, especially when diversified capital markets are eventually opened.

Not only monetary policy should be exercised by the 'real' authority of the SBVN, but also monetary instruments should evolve toward more market-based arrangements since they will be constrained by increased capital flows (Johnston 1998). This development can help the SBVN to continue to have effective control over the money supply, while gradually eliminating the obstacles to the development of an efficient financial system in Vietnam.

Box 6: An accelerated "Doi Moi" program: a three-year agenda, drawn up by individual Vietnamese ministries in consultation with international financial institutions

1) Opening Up to International Trade

a) Adopt, announce and implement the phase-out of all quantitative import restrictions, and replace them with transitional tariffs.
b) Continue to expand auctioning of garment export quotas and improve the terms of auction, including transferability of quotas among firms.
c) Increase the share of rice export quotas allocated to private firms.
d) Cease granting of new discretionary exemptions on import-tariffs and of new import restrictions.
e) Eliminate remaining restrictions on firms' importing rights, so that they can import directly all non-restricted products, including those not listed in firm's business license.
f) Remove the foreign exchange surrender requirement.
g) Approve and implement provisions of the Vietnam-US bilateral trade agreement to expand export markets, and move towards WTO accession.

2) *Developing a Healthy Banking System*

a) *Restructuring JSBs and SOCBs*:

i) Create a sound and transparent mechanism for resolution of failed/troubled financial institutions.
ii) Implement and enforce a regulatory framework for all 51 JSBs and complete implementation of action plans for all JSBs in phases.
iii) Establish an Asset Management Company (AMC).
iv) Agree on key elements of the restructuring action plans between Government and SOCB that involve strengthening management, resolving non-perfoming loans (NPLs), and developing phased recapitalization.
v) Complete a detailed restructuring plan for each SOCB and develop an implementation timetable.
vi) Equitize one of the four large SOCBs by the end of 2002.
vii) Remove non-commercial lending by SOCBs except in special circumstances where there is an explicit government guarantee.

b) Strengthening Legal, Regulatory & Supervisory Framework

i) Adopt the international definition for classifying NPLs, where if any installment of a loan is overdue, the total value of that loan is classified as NPL.
ii) Adopt regulations that prohibit banks and financial institutions from lending to shareholders and directors, including persons or entities related to them.

iii) Move towards a risk-based approach to bank-supervision
iv) Develop a detailed plan to upgrade accounting standards and systems for banks and borrowers to international standards.
v) Initiate training programs for banking staff in credit risk management.

c) *Leveling the Playing Field for All Banks*

i) Relax restrictions on dong deposit mobilization by foreign banks.
ii) Ensure that SOCBs have no preferential treatment relative to JSBs.

3) *Improving Efficiency of the State Enterprise Sector*

a) Adopt, announce and implement a three-year comprehensive SOE reform program with annual targets for equitizations, divestitures, liquidations, mergers and other forms of restructuring to cover a significant fraction of SOEs.
b) Amend Decree 44 to remove caps on shareholding of individuals and legal entities in equitized enterprises, to enhance transparency by announcing sale of SOEs in newspapers 30 days before bids are invited, and to improve effectiveness of sale by moving sale of shares of an SOE to an agency, outside the SOE.
c) Implement a system to monitor quarterly changes in bank credit and budgetary support for 200 large highly indebted SOEs.
d) Conduct operational reviews (i.e. diagnostic audits) for 50 large troubled SOEs.
e) Develop and implement restructuring plans of the three selected general corporations (i.e. Seaprodex, Vinatex and Vinacafe) to enhance efficiency and competitiveness.
f) Enforce ceilings on bank credit to the SOE-sector, including a sub-ceiling on the 200 large highly-indebted SOEs.

Source: World Bank (1999)

Chapter VII
CONCLUSION

Prior to the 1980s, Vietnam closely followed the model of a centrally planned economy (CPE). The failure of this system led to partial microeconomic reforms, yet within the framework of a CPE. During the following period of 1980-88, the Vietnamese economy can be regarded as a kind of 'modified' planned economy (MPE). In the spring of 1989, Vietnam adopted a comprehensive reform package and the reforms implemented since then have fundamentally changed the economic management system in Vietnam toward a market-oriented economy. Some important steps have been undertaken on the road to a more market-oriented financial system. The role of the ER policy has been also reassessed significantly since 1989 when the ER was unified by a sharp devaluation of the official ER. During the 1990s the VND has been in fact effectively pegged to the USD with several discrete realignments, especially during 1990-91 and 1997-1999. The SBVN has considered controlling the ER as an important macroeconomic instrument for ensuring low inflation and stability of the financial system, promoting exports, controlling imports, and enhancing economic growth.

The research above attempts to give an overall picture of the ER arrangement in Vietnam and associated policies as well as to examine the ER's interrelationship with and its impacts on the main macroeconomic variables in the context of economic reforms in Vietnam during the 1990s. The focus of the research is as follows:

- To find out the information content (marginal predictive content) of the ERs and monetary aggregates (CU, M1, M2) together with the changes in output and prices;
- To identify the significance and the magnitude of the impacts of the change in ER on inflation and output growth;
- To examine the capability of the SBVN in maintaining an independent and effective monetary policy in a context of pegged ER and capital inflows;
- To search for an appropriate option for the SBVN to have a smooth shift to a more flexible and rational ER arrangement.

Based on the above quantitative assessments, we found that the usefulness of both monetary and ER policies, in general, has been very limited as a guide setting for affecting the main macroeconomic variables such as output and prices, while microeconomic behaviour has become more market-oriented. The changes in monetary aggregates (CU, M1, M2) do not contain any advance information on inflation and (real industrial) output fluctuations; instead, it has been largely demand determined. The rate of changes in ERs has altered significantly the Granger-causality between output growth,

inflation, and money growth; however, this did not help to predict future movements of inflation.

Moreover, in general, the lagged changes in money supply, especially in M2 as the most important policy target, have not been significant determinants of depreciation in exchange rates. The changes in nominal ERs (in the cases of OERs and SERs) served, albeit inconsistently, as a leading indicator for output growth, but this causality was not stable. Current inflation and (real industrial) output growth have been mostly explained by their past movements. *Real* depreciation rates have had a positive and rather significant impact on output growth, though the magnitude was very unstable. Thus, in a changing institutional environment in Vietnam, firm's behaviour has become more market-oriented. At the same time, as the estimated 'offset' coefficients were statistically significant and not different from -1, the SBVN has been faced with the difficulty in maintaining an independent and effective monetary policy while holding to a pegged exchange rate regime.

These findings are also consistent with our descriptive analysis that during the 1990s, financial reforms in Vietnam, though considerable, still did not keep pace with economic development and the financial sector remains fragile; the formulation and implementation of effective monetary instruments remain rudimentary. Also, in the context of high trade and current account deficits together with the real appreciation of the VND during 1993-96, perhaps Vietnam needs to move its ER policy toward a more flexible one. This is also supported by the fact that the impact of the changes in ERs on inflation become much weaker and insignificant, or much less significant, during the second half of 1990s.

In other words, other things being equal, there could be room for Vietnam to move to a more flexible ER regime without a considerable increase in the inflation rate. Moreover, the lack of a comprehensive and flexible approach in dealing with ERs and interest rates for both domestic and foreign currencies has created the problem of policy inconsistency, which was exposed in the periods of 1993-96 and 1997-2000. The excessive application of import restrictions and FE controls were utilized as an excuse for delaying desirable financial reforms.

Since February 1999, the SBVN has moved to the MARS. The appropriateness of this arrangement is questioned by a number of problems related to the equilibrium rate, the thinness of the interbank market where 90% of all transactions are carried out by a SOCB, the rigidity in movement of the ER (the prescribed band width is only 0.1%), and the tension in having policy consistency.

The current conditions in Vietnam have shown that both freely floating and rigid ER regimes are not suitable options. Considering the dynamic quality of Vietnam's economy, ER arrangement should become much more associated with the degree of domestic financial sophistication and the extent of involvement with the world economy, especially modern, global financial markets. As Vietnam has committed to further structural reforms and has more actively participated in the regional and world market, an ER regime with greater flexibility becomes more appropriate.

A good choice of the 'intermediate' ER regimes needs to be consistent with sustainable international competitiveness of the ER and to have a room for ER fluctuations to free up, within limits, domestic monetary policy. In practice, there are two common ER arrangements that could be adopted: the 'band-basket-crawl' (BBC) scheme and the market average ER system (MARS). Evaluating the advantages and disadvantages of these two systems, the BBC system seems to be more appropriate for Vietnam.

But a smooth exit to a new BBC regime would be very much dependent on the determination of a (new) central parity, the coordination with other macropolicies and structural reforms, and the establishment of policy credibility. The latter can only be expected to increase with the acceleration of the process of consistent reforms and transparent management with the accuracy of information for all participants in the market. As macroeconomic situation has been rather stable with low inflation rates and the Government's budget deficit being kept under control, Vietnam seems to now have a favourable environment to move the ER regime towards one with greater flexibility.

At the same time, the economy has still revealed many structural weaknesses. The banking system is still fragile and monetary instruments remain rudimentary. The inefficient state-run sector together with the serious economic distortions created by policy mismanagement (e.g. trade regime and import-substitution policies) is also a major problem that needs to be solved. All these problems should be addressed in the process of further economic reforms and financial liberalization with an orderly, well-sequenced way, designed to maintain macroeconomic stability and to give high priority to build a strong domestic financial sector before liberalizing the capital account.

In order to have a healthy banking system, Vietnam needs to restructure its JSBs and SOCBs, strengthen its legal, regulatory and supervisory framework, and establish a level playing field for all banks. It is also important to give high priority to developing a sound long-term, domestic-currency-denominated capital market. The financial sector and SOE reforms in Vietnam need to be conducted simultaneously and in conjunction with trade reform. The SBVN should be given more responsibility and independence in exercising monetary policy together with shifting monetary instruments towards more market-based arrangements. This development can help the SBVN to continue to have effective control over the money supply, while eliminating the obstacles to the development of an efficient financial system in Vietnam.

There are, of course, some limitations in our analyses pointing to areas, which need further research. As mentioned in Chapter IV, the case of domestic credits was not included in our VAR model because of a lack of data. Since we used (real) industrial output, it would have been more appropriate to run VAR models with changes in prices of non-food stuffs, as in Vietnam fluctuating rice and food prices have considerable impact on the general price index. Although the focus of our research was on the ER and ER policy, the problem of consistency between the choice of a new ER regime and interest rate policy is worth examining in greater detail.

In sum, our analysis has shows that the ER arrangement during the 1990s was inappropriate for Vietnam and a BBC scheme seems to be the most rational option for Vietnam's current process of further reforms and financial liberalization. Nevertheless, it would be enlightening to have a quantitative assessment of the dynamic paths for the most important macroeconomic variables under different liberalization scenarios and varied ER arrangements (floating vs. not floating regimes)[28]. This would likely provide more confidence for adopting, for example, the BBC system.

[28] See the methodology used in Cho and Koh (1999).

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Appendix A: EVIEW PROGRAM FOR RUNNING VAR MODELS

```
smpl 91:01 99:06
'Transforming series to log and dlog
For %1 ind cpi m2 cu m1 oer ser hser sser
    genr lg=log(%1)
    genr l{%1} = lg
    genr lg=dlog(%1)
    genr dl{%1}=lg
Next
'The lag length
!lag=12
!lag1=6
'Creating Tables for Unit Root Test celled unitlind, unitlcpi, unitlm2, unitlcu, unitlm1, and so on
For %1 lind lcpi lm2 lcu lm1 loer lser lhser lsser
    Freeze(unit{%1}) %1.uroot(!lag, t)
    Freeze(unitd{%1}) d{%1}.uroot(!lag1, c)
Next
Smpl 92:01 99:06
For %1 Cu m2 m1
    Group endov{%1} lind lcpi l{%1}
    'Tables for Granger Causality between lind, lcpi, and lcu (or lm2 or lm1), called Gcvarcu,
Gcvarm2, Gcvarm1
    Freeze(Gcvar{%1}) endov{%1}.cause(!lag)
'Tables for ordinary var between lind, lcpi, and lcu (or lm2 or lm1),  called varcu, varm2, varm1
    var var{%1}.ls 1 !lag lind lcpi l{%1}
    Freeze(tvar{%1}) var{%1}
    %m="dl%1"
    Group endovd{%1} dlind dlcpi %m
'Tables for Granger Causality between dlind, dlcpi, and dlcu (or dlm2 or dlm1), called Gcvardcu,
Gcvardm2, Gcvardm1
    Freeze(Gcvard{%1}) endovd{%1}.cause(!lag)
'Tables for ordinary var between dlind, dlcpi, and dlcu (or dlm2 or dlm1),  called vardcu,
vardm2, vardm1
    var vard{%1}.ls 1 !lag dlind dlcpi %m
    Freeze(tvard{%1}) var{%1}
'Tables Cusum-square Test for the regression dlind on dlind(-1 to -!lag)  dlcpi(-1 to -!lag) and
dlcu(-1 to -!lag) and so on
'These Tables are called cuslindcu, cuslindm2, and cuslindm1
    equation eqlind{%1}.ls dlind c dlind(-1 to -!lag) dlcpi(-1 to -!lag) %m(-1 to -!lag)
    Freeze(cuslind{%1})    eqlind{%1}.rls(v)
'Tables Cusum-square Test for the regression dlcpi on dlind(-1 to -!lag)  dlcpi(-1 to -!lag) and
dlcu(-1 to -!lag) and so on
'These Tables are called cuslcpicu, cuslcpidm2, and cuslcpidm1
    equation eqlcpi{%1}.ls dlcpi c dlind(-1 to -!lag) dlcpi(-1 to -!lag) %m(-1 to -!lag)
    Freeze(cuslcpi{%1})    eqlcpi{%1}.rls(v)
'Tables Cusum-square Test for the regression dlcu (or dlm2 or dlm1)  on dlind(-1 to -!lag)
dlcpi(-1 to -!lag) and dlcu(-1 to -!lag)
'These Tables are called cuscu, cusm2, and cusm1
    equation eq{%1}.ls %m c dlind(-1 to -!lag) dlcpi(-1 to -!lag) %m(-1 to -!lag)
    Freeze(cus{%1}) eq{%1}.rls(v)
```

```
Next
For %1 Cu m2 m1
'Tables for Cointegration Test (Johansen Method) with intercept and trend, named as Cointcu, Cointm2, and Cointm1
    Group cot lind lcpi l{%1}
    Freeze(Coint{%1}) cot.coint(d, 1)
'Tables for VEC between lind lcpi lcu (or lm2 or lm1), named as vvareccu, vvarecm2, and vvarecm1
    Var varec{%1}.ec(d, 1) 1 !lag lind lcpi l{%1}
    Freeze(vvarec{%1}) varec{%1}
Next
D cot
Smpl 91:01 99:06
For %1 Cu m2 m1
genr err{%1}=varec{%1}.b(1,1)*lind(-1)+varec{%1}.b(1,2)*lcpi(-1)
+varec{%1}.b(1,3)*l{%1}(-1)+varec{%1}.b(1,4)*@trend(91:01)+varec{%1}.b(1,5)
Next
'Wald Test
smpl 92:01 99:06
For %2 Cu m2 m1
%m= "dl%2"
For %1 dlind dlcpi %m
   equation eq{%1}_{%2}.ls %1 err{%2} c dlind(-1 to -!lag) dlcpi(-1 to -!lag) %m(-1 to -!lag)
    Freeze(Cus1{%1}{%2}) eq{%1}_{%2}.rls(v)
    For !i = 0 to 2
    %w=""
    %t="c_%1_%2" +@str(!i+1)+"="
    For !tr= 1 to !lag
        scalar k=!tr
        If k <!lag then
            %w=%w+"c(" + @str(2+!tr+!i*!lag)+ ")" + "= 0 ,"
            %t=%t+"c(" + @str(2+!tr+!i*!lag)+ ")" + "+"
        Else
           %w=%w+"c(" +@str(2+!tr+!i*!lag)+ ")" + " = 0"
            %t=%t+"c(" + @str(2+!tr+!i*!lag)+ ")"
        Endif
    Next
    Freeze(Wteq{%1}_{%2}{!i}) eq{%1}_{%2}.wald %w
Genr %t
Next
Group c_{%1}_{%2} c_{%1}_{%2}1  c_{%1}_{%2}2  c_{%1}_{%2}3
'D  c_{%1}_{%2}1  c_{%1}_{%2}2  c_{%1}_{%2}3
Next
Next
D k
For %1 loer lser lhser lsser
For %2 cu m2 m1
    %m= "l%2"
    %n="d%1"
    %v="dl%2"
    Group cot
```

```
'Tables for Cointegration Test (Johansen Method) with intercept and trend, named as
Cointcu_dlsoe, Cointcu_dlser, etc.
    %ex=""
    For !tr=1 to !lag
        %ex=%ex + %n +"(-" + @str(!tr) + ") "
    Next
    var vart.ec(d, 1) 1 !lag lind lcpi l{%2} @ %ex
    Freeze(Coint{%2}_{%1}) vart.coint(d, 1)
'Tables for VEC between lind lcpi lcu (or lm2 or lm1), names as varcu_dloer, varcu_dlser, and so
on
    var var{%2}_{%1}.ec(d,1) 1 !lag lind lcpi %m @ %ex
    smpl 91:01 99:06
    genr er{%2}{%1}=var{%2}_{%1}.b(1,1)*lind(-1)+var{%2}_{%1}.b(1,2)*lcpi(-1)
    +var{%2}_{%1}.b(1,3)*%m(-1)
    +var{%2}_{%1}.b(1,4)*@trend(91:01)+var{%2}_{%1}.b(1,5)
    smpl 92:01 99:06
    For %3 dlind dlcpi %v
        equation eq{%3}{%2}{%1}.ls %3 er{%2}{%1} c dlind(-1 to -!lag) dlcpi(-1 to -!lag) %v(-
        1 to -!lag)  %n(-1 to -!lag)
         Freeze(Cus2{%3}{%2}{%1}) eq{%3}{%2}{%1}.rls(v)
    Next
'Test for coefficients of exogenous variables
    ' !tot=2+3*!lag
    !tot =2
    For !e = 1 to 4
    %w = ""
    %t="cc_%3%2%1" +@str(!e)+"="
    For !tr =  ((!e-1)*!lag+!tot+1) to (!e*!lag+!tot)
        scalar k = !tr
        If k < (!e*!lag+!tot) then
            %w = %w + "c(" +  @str(!tr) +") = 0, "
            %t = %t + "c(" +  @str(!tr) +") + "
        Else
            %w = %w + "c(" +  @str(!tr) +") = 0 "
            %t = %t + "c(" +  @str(!tr) +") "
        Endif
    Next
    Genr %t
    Freeze(Wtex{%2}{%1}_!e) eq{%3}{%2}{%1}.wald %w
    Next
    Group cc_{%3}{%2}{%1} cc_{%3}{%2}{%1}1 cc_{%3}{%2}{%1}2
     cc_{%3}{%2}{%1}3 cc_{%3}{%2}{%1}4
    'D cc_{%3}{%2}{%1}1 cc_{%3}{%2}{%1}2 cc_{%3}{%2}{%1}3 cc_{%3}{%2}{%1}4
'Tables for Impulse responses, named Imcu_lsoer, Imcu_lser, etc.
    Freeze(im{%2}_{%1}) var{%2}_{%1}.impulse(12, m)
    d vart
Next
Next
D cot
```

APPENDIX B: THE ESTIMATION RESULTS FOR CHAPTER IV

Note: M = CU, M1, M2 and ER = OER, SER, SSER, HSER

I. Granger Causality Test

(Sample: 1992:01 1999:06, lag = 12)

1. Granger Causality Test on LIND, LCPI, LM

a. for LIND, LCPI, LCU

Null Hypothesis:	Obs	F-Statistic	Probability
LCPI does not Granger Cause LIND	90	2.05702	0.03264
LIND does not Granger Cause LCPI		3.29646	0.00092
LCU does not Granger Cause LIND	90	0.97580	0.48084
LIND does not Granger Cause LCU		1.89780	0.05092
LCU does not Granger Cause LCPI	90	2.92906	0.00266
LCPI does not Granger Cause LCU		3.46966	0.00056

b. for LIND, LCPI, LM1

Null Hypothesis:	Obs	F-Statistic	Probability
LCPI does not Granger Cause LIND	90	2.05702	0.03264
LIND does not Granger Cause LCPI		3.29646	0.00092
LM1 does not Granger Cause LIND	90	1.19268	0.30732
LIND does not Granger Cause LM1		1.56268	0.12526
LM1 does not Granger Cause LCPI	90	2.66531	0.00570
LCPI does not Granger Cause LM1		3.32334	0.00085

c. for LIND, LCPI, LM2

Null Hypothesis:	Obs	F-Statistic	Probability
LCPI does not Granger Cause LIND	90	2.05702	0.03264
LIND does not Granger Cause LCPI		3.29646	0.00092
LM2 does not Granger Cause LIND	90	2.01755	0.03647
LIND does not Granger Cause LM2		1.39427	0.19158
LM2 does not Granger Cause LCPI	90	1.03675	0.42726
LCPI does not Granger Cause LM2		1.35337	0.21161

2. Granger Causality Test on DLIND, DLCPI, DLM

a. for DLIND, DLCPI, DLCU

Null Hypothesis:	Obs	F-Statistic	Probability
DLCPI does not Granger Cause DLIND	89	1.45106	0.16690
DLIND does not Granger Cause DLCPI		2.43414	0.01127
DLCU does not Granger Cause DLIND	89	0.33372	0.97994
DLIND does not Granger Cause DLCU		1.51070	0.14362
DLCU does not Granger Cause DLCPI	89	1.53985	0.13331
DLCPI does not Granger Cause DLCU		2.65632	0.00595

b. for DLIND, DLCPI, DLM1

Null Hypothesis:	Obs	F-Statistic	Probability
DLCPI does not Granger Cause DLIND	89	1.45106	0.16690
DLIND does not Granger Cause DLCPI		2.43414	0.01127
DLM1 does not Granger Cause DLIND	89	0.41452	0.95257
DLIND does not Granger Cause DLM1		0.92420	0.52869
DLM1 does not Granger Cause DLCPI	89	0.81435	0.63487
DLCPI does not Granger Cause DLM1		2.88112	0.00311

c. for DLIND, DLCPI, DLM2

Null Hypothesis:	Obs	F-Statistic	Probability
DLCPI does not Granger Cause DLIND	89	1.45106	0.16690
DLIND does not Granger Cause DLCPI		2.43414	0.01127
DLM2 does not Granger Cause DLIND	89	1.50037	0.14743
DLIND does not Granger Cause DLM2		0.61893	0.81839
DLM2 does not Granger Cause DLCPI	89	0.33633	0.97928
DLCPI does not Granger Cause DLM2		2.29538	0.01676

II. Cointegration Test

1. Cointegration Test for LIND, LCPI, LM

(Linear trend in the data, and both an intercept and a trend in the cointegrating equation, Included observations: 89, Lags interval: 1 to 12.)

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

a. for LIND, LCPI, LCU

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.366445	76.97555	42.44	48.45	None **
0.298779	36.35527	25.32	30.45	At most 1 **
0.052146	4.766352	12.25	16.26	At most 2

b. for LIND, LCPI, LM1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.316362	52.16474	42.44	48.45	None **
0.146978	18.31561	25.32	30.45	At most 1
0.045744	4.167257	12.25	16.26	At most 2

c. for for LIND, LCPI, LM2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.278467	44.59700	42.44	48.45	None *
0.107001	15.54945	25.32	30.45	At most 1

0.059687	5.477326	12.25	16.26	At most 2

2. Cointegration Test for LIND, LCPI, LM with LER as exogenous variables
(linear trend in the data, and both an intercept and a trend in the cointegrating equation, the number of cointegrating equations n = 1, Lags interval: 1 to 12)
2.1. Cointegration Test for LIND, LCPI, LM with LOER as exogenous variables
a. for LIND, LCPI, LCU

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.496254	122.0879	42.44	48.45	None **
0.381432	64.49062	25.32	30.45	At most 1 **
0.249787	24.14140	12.25	16.26	At most 2 **

b. for LIND, LCPI, LM1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.607106	125.8795	42.44	48.45	None **
0.287932	47.40543	25.32	30.45	At most 1 **
0.201299	18.88057	12.25	16.26	At most 2 **

c. for LIND, LCPI, LM2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.497134	86.61626	42.44	48.45	None **
0.200521	28.87203	25.32	30.45	At most 1 *
0.113009	10.07328	12.25	16.26	At most 2

2.2. Cointegration Test for LIND, LCPI, LM with LSER as exogenous variables
a. for LIND, LCPI, LCU

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.618454	119.1341	42.44	48.45	None **
0.357155	44.94271	25.32	30.45	At most 1 **
0.132223	10.92014	12.25	16.26	At most 2

b. for LIND, LCPI, LM1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.475966	102.7379	42.44	48.45	None **
0.367560	52.98049	25.32	30.45	At most 1 **

0.205378	17.70142	12.25	16.26	At most 2 **

c. for LIND, LCPI, LM2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.368095	71.10842	42.44	48.45	None **
0.232110	35.76421	25.32	30.45	At most 1 **
0.181565	15.42780	12.25	16.26	At most 2 *

2.3. Cointegration Test for LIND, LCPI, LM with LSSER as exogenous variables

a. for LIND, LCPI, LCU

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.516140	107.8025	42.44	48.45	None **
0.382915	43.19205	25.32	30.45	At most 1 **
0.002552	0.227376	12.25	16.26	At most 2

b. for LIND, LCPI, LM1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.491123	87.88640	42.44	48.45	None **
0.261212	27.76252	25.32	30.45	At most 1 *
0.009152	0.818235	12.25	16.26	At most 2

c. for LIND, LCPI, LM2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.491947	86.00985	42.44	48.45	None **
0.246755	25.74172	25.32	30.45	At most 1 *
0.005851	0.522272	12.25	16.26	At most 2

2.4 Cointegration Test for LIND, LCPI, LM with LHSER as exogenous variables

a. for LIND, LCPI, LCU

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.527762	109.0448	42.44	48.45	None **
0.376592	42.27049	25.32	30.45	At most 1 **
0.002392	0.213174	12.25	16.26	At most 2

b. for LIND, LCPI, LM1

	Likelihood	5 Percent	1 Percent	Hypothesized

Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.499709	90.23059	42.44	48.45	None **
0.266674	28.59230	25.32	30.45	At most 1 *
0.011036	0.987657	12.25	16.26	At most 2

c. for LIND, LCPI, LM2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.464701	81.96321	42.44	48.45	None **
0.252456	26.34448	25.32	30.45	At most 1 *
0.005031	0.448880	12.25	16.26	At most 2

III. VAR models of DLIND, DLCPI, and DLM

(Note: lag = 12, and Error terms are calculated from VI.1)

1. Wald Test for Joint Coefficients of Each explanatory variable (Including Error term and intercept, no exogenous variable)

LHS	RHS Variables				
	DLIND	*DLCPI*	*DLCU*	*DLM1*	*DLM2*
1. DLIND on ERRCU C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12)					
F-statistic	4.4430	1.2386	0.3992		
Prbability	0.0001	0.2839	0.9575		
Sum of Coefficients	-5.9344	0.6580	-0.2647		
2. DLIND on ERRM1 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12)					
F-statistic	5.2135	1.3741		0.6515	
Probability	0.0000	0.2090		0.7879	
Sum of Coefficients	-8.5759	0.6757		-0.3244	
3. DLIND on ERRM2 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12)					
F-statistic	5.9669	1.4714			1.4647
Probability	0.0000	0.1661			0.1688
Sum of Coefficients	-7.3916	0.3482			0.2774
4. DLCPI on ERRCU C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12)					
F-statistic	3.2501	5.2186	1.4742		
Probability	0.0016	0.0000	0.1650		
Sum of Coefficients	2.1953	0.8213	-0.2695		
5. DLCPI on ERRM1 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12)					
F-statistic	2.4517	5.6552		1.6804	
Probability	0.0132	0.0000		0.0993	
Sum of Coefficients	-1.1892	0.8816		-0.5489	
6. DLCPI on ERRM2 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12)					
F-statistic	2.6726	3.6828			1.2026
Probability	0.0073	0.0005			0.3070
Sum of Coefficients	-3.3514	1.4754			-0.9012
7. DLCU on ERRCU C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO –12)					
F-statistic	1.4489	2.5584	0.7008		
Probability	0.1752	0.0099	0.7432		
Sum of Coefficients	4.2821	0.8392	-0.1261		

8. DLM1 on ERRM1 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO –12)					
F-statistic	1.4074	3.2968		1.6302	
Probability	0.1933	0.0014		0.1126	
Sum of Coefficients	-1.3649	0.7535		-1.0009	
9. DLM2 on ERRM2 C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO –12)					
F-statistic	1.7125	3.3040			2.8739
Probability	0.0915	0.0014			0.0043
Sum of Coefficients	-11.5104	3.5360			-3.6532

2. Wald Test for Joint Coefficients of Each explanatory variable **(In presence of exchange rate as exogenous variable)**

2.1. DLOER as exogenous variable

LHS	RHS Variables					
	DLIND	*DLCPI*	*DLCU*	*DLM1*	*DLM2*	*DLOER*
1. DLIND on ERCULOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLOER(-1 TO -12)						
F-statistic	6.4345	1.4706	0.5653			1.0957
Prbability	0.0000	0.1836	0.8541			0.3944
Sum of Coefficients	7.6905	-2.8300	-1.0246			-0.1961
2. DLIND on ERM1LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	6.7630	2.1077		1.0666		1.8659
Probability	0.0000	0.0438		0.4164		0.0761
Sum of Coefficients	-36.3105	4.1483		-3.3565		-3.0052
3. DLIND on ERM2LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLOER(-1 TO -12)						
F-statistic	9.5603	1.9856			1.4355	1.4197
Probability	0.0000	0.0579			0.1980	0.2048
Sum of Coefficients	-23.8276	5.9365			-3.2458	-0.7958
4. DLCPI ERCULOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	1.5009	1.8411	0.6628			0.5566
Probability	0.1719	0.0805	0.7735			0.8606
Sum of Coefficients	7.6905	-2.8301	-1.0245			-0.1961
5. DLCPI ERM1LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	2.9059	2.9289		1.1611		1.6815
Probability	0.0072	0.0068		0.3481		0.1154
Sum of Coefficients	-36.3105	4.1483		-3.3565		-3.0052
6. DLCPI ERM2LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	3.7299	3.2706			1.1560	1.6918
Probability	0.0012	0.0032			0.3515	0.1127
Sum of Coefficients	-23.8276	5.9365			-3.2458	-0.7958

7. DLCU ERCULOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	1.4262	1.9306	0.6336			0.4695
Probability	0.2020	0.0657	0.7987			0.9187
Sum of Coefficients	7.6905	-2.8301	-1.0246			-0.1961
8. DLM1 ERM1LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	3.6682	3.3290		2.1590		2.9247
Probability	0.0014	0.0029		0.0390		0.0069
Sum of Coefficients	-36.3105	4.1483		-3.3565		-3.0052
9. DLM2 ERM2LOER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLOER(-1 TO –12)						
F-statistic	2.1276	3.0050			2.2725	1.3029
Probability	0.0419	0.0058			0.0301	0.2618
Sum of Coefficients	-23.8275	5.9365			-3.2458	-0.7958

2.2. DLSER as exogenous variable

LHS	RHS Variables					
	DLIND	*DLCPI*	*DLCU*	*DLM1*	*DLM2*	*DLSER*
1. DLIND on ERCULSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	3.3972	3.2511	0.5785			4.7193
Prbability	0.0044	0.0057	0.8394			0.0005
Sum of Coefficients	32.9650	-5.5402	-2.6325			-3.7401
2. DLIND ERM1LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSER(-1 TO –12)						
F-statistic	4.2053	3.2067		1.2762		4.4364
Probability	0.0011	0.0062		0.2894		0.0007
Sum of Coefficients	4.0701	-1.1650		-1.7938		-4.5455
3. DLIND on ERM2LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	6.8573	3.7456			1.4956	4.1399
Probability	0.0000	0.0023			0.1886	0.0012
Sum of Coefficients	-9.9147	-1.9779			0.2506	3.9844
4. DLCPI on ERCULSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	0.5641	1.2238	0.3239			0.4158
Probability	0.8505	0.3194	0.9778			0.9434
Sum of Coefficients	32.9650	-5.5402	-2.6325			-3.7401
5. DLCPI on ERM1LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	0.8101	0.7237		0.3099		0.5226
Probability	0.6383	0.7161		0.9813		0.8806
Sum of Coefficients	4.0701	-1.1650		-1.7938		-4.5455
6. DLCPI on ERM2LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	1.2604	1.1271			0.3658	0.7521
Probability	0.2982	0.3814			0.9644	0.6906
Sum of Coefficients	-9.9147	-1.9779			0.2506	3.9844
7. DLCU on ERCULSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSER(-1 TO -12)						

F-statistic	3.7841	2.1895	2.1505			1.6608
Probability	0.0022	0.0459	0.0497			0.1352
Sum of Coefficients	32.9650	-5.5402	-2.6325			-3.7401
8. DLM1 on ERM1LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	1.8889	1.4944		1.9590		1.8060
Probability	0.0849	0.1891		0.0736		0.1006
Sum of Coefficients	4.0701	-1.1650		-1.7938		-4.5455
9. DLM2 on ERM2LSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSER(-1 TO -12)						
F-statistic	1.0686	2.3767			2.5001	1.5824
Probability	0.4230	0.0314			0.0245	0.1585
Sum of Coefficients	-9.9147	-1.9779			0.2506	3.9844

2.3. DLHSER as exogenous variable

LHS	RHS Variables					
	DLIND	*DLCPI*	*DLCU*	*DLM1*	*DLM2*	*DLHSER*
1. DLIND on ERCULHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	3.5046	1.0472	0.4634			1.1777
Prbability	0.0014	0.4282	0.9239			0.3320
Sum of Coefficients	6.8869	-0.4342	-0.5115			-1.9472
2. DLIND on ERM1LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	8.0666	1.5429		0.7869		1.2897
Probability	0.0000	0.1504		0.6605		0.2632
Sum of Coefficients	-0.6659	0.7280		-0.2548		-0.5862
3. DLIND on ERM2LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	5.4812	2.0600			1.3431	1.3319
Probability	0.0000	0.0444			0.2347	0.2405
Sum of Coefficients	-6.9769	1.7316			-1.6714	0.2156
4. DLCPI on ERCULHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLHSER(-1 TO –12						
F-statistic	1.1645	2.1231	0.6715			0.8121
Probability	0.3410	0.0381	0.7674			0.6367
Sum of Coefficients	6.8869	-0.4342	-0.5115			-1.9472
5. DLCPI on ERM1LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	1.5562	1.7205		0.4195		0.6571
Probability	0.1459	0.0997		0.9464		0.7801
Sum of Coefficients	-0.6659	0.7280		-0.2548		-0.5862
6. DLCPI on ERM2LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	2.0181	2.5490			0.8098	1.0394
Probability	0.0491	0.0136			0.6388	0.4345
Sum of Coefficients	-6.9769	1.7316			-1.6714	0.2156

7. DLCU on ERCULHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	1.4655	0.7666	0.4230			1.4601
Probability	0.1792	0.6796	0.9448			0.1814
Sum of Coefficients	6.8869	-0.4342	-0.5115			-1.9472
8. DLM1 on ERM1LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	0.9062	1.0360		0.6839		0.8593
Probability	0.5493	0.4372		0.7562		0.5924
Sum of Coefficients	-0.6659	0.7280		-0.2548		-0.5862
9. DLM2 on ERM2LHSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLHSER(-1 TO -12)						
F-statistic	1.8322	2.5126			1.7724	1.4996
Probability	0.0765	0.0149			0.0882	0.1659
Sum of Coefficients	-6.9769	1.7316			-1.6714	0.2156

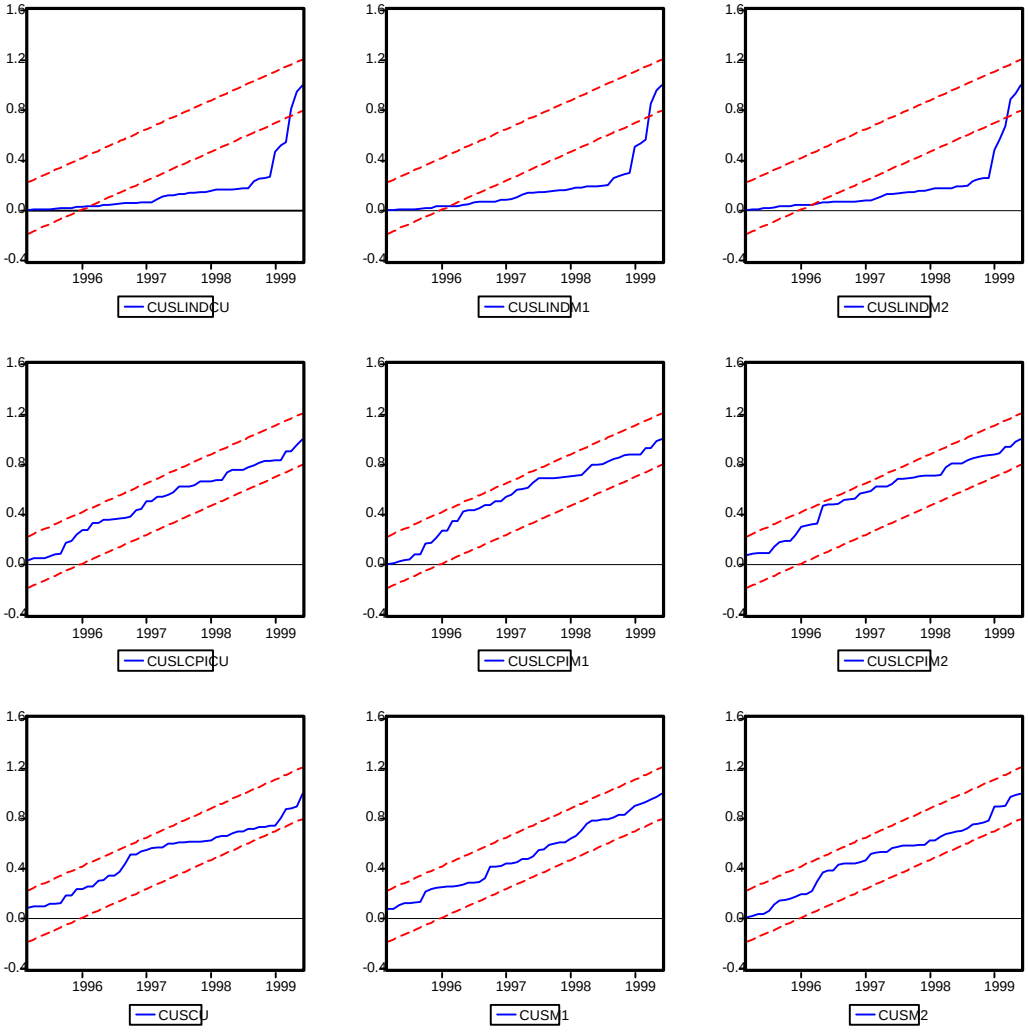
2.4. DLSSER as exogenous variable

LHS	RHS Variables					
	DLIND	*DLCPI*	*DLCU*	*DLM1*	*DLM2*	*DLSSER*
1. DLIND on ERCULSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	3.5051	1.0582	0.3852			0.9941
Prbability	0.0014	0.4194	0.9610			0.4719
Sum of Coefficients	6.5956	-0.2101	-0.4774			-1.7673
2. DLIND on ERM1LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	8.4788	1.5740		0.7641		1.2085
Probability	0.0000	0.1401		0.6819		0.3118
Sum of Coefficients	-0.4539	0.6953		-0.2053		-0.4581
3. DLIND on ERM2LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	5.1684	1.9907			1.2540	1.1753
Probability	0.0000	0.0524			0.2838	0.3337
Sum of Coefficients	-8.0587	1.9958			-1.7590	0.1353
4. DLCPI on ERCULSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	1.0272	2.2100	0.7344			0.8136
Probability	0.4444	0.0309	0.7097			0.6353
Sum of Coefficients	6.5956	-0.2101	-0.4774			-1.7673
5. DLCPI on ERM1LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	1.4774	1.7226		0.4735		0.6501
Probability	0.1745	0.0992		0.9182		0.7863
Sum of Coefficients	-0.4539	0.6953		-0.2053		-0.4581
6. DLCPI on ERM2LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	1.8629	2.5017			0.8336	0.9677
Probability	0.0711	0.0153			0.6165	0.4946
Sum of Coefficients	-8.0587	1.9958			-1.7590	0.1353
7. DLCU on ERCULSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLCU(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	1.3873	0.8965	0.4805			1.3656
Probability	0.2132	0.5581	0.9140			0.2235
Sum of Coefficients	6.5956	-0.2101	-0.4774			-1.7673
8. DLM1 on ERM1LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM1(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	0.7602	1.1866		0.7376		0.7596
Probability	0.6856	0.3261		0.7068		0.6862
Sum of Coefficients	-0.4539	0.6953		-0.2053		-0.4581
9. DLM2 on ERM2LSSER C DLIND(-1 TO -12) DLCPI(-1 TO -12) DLM2(-1 TO -12) DLSSER(-1 TO -12)						
F-statistic	1.9177	2.7008			1.7719	1.6609
Probability	0.0624	0.0095			0.0883	0.1146
Sum of Coefficients	-8.0587	1.9958			-1.7590	0.1353

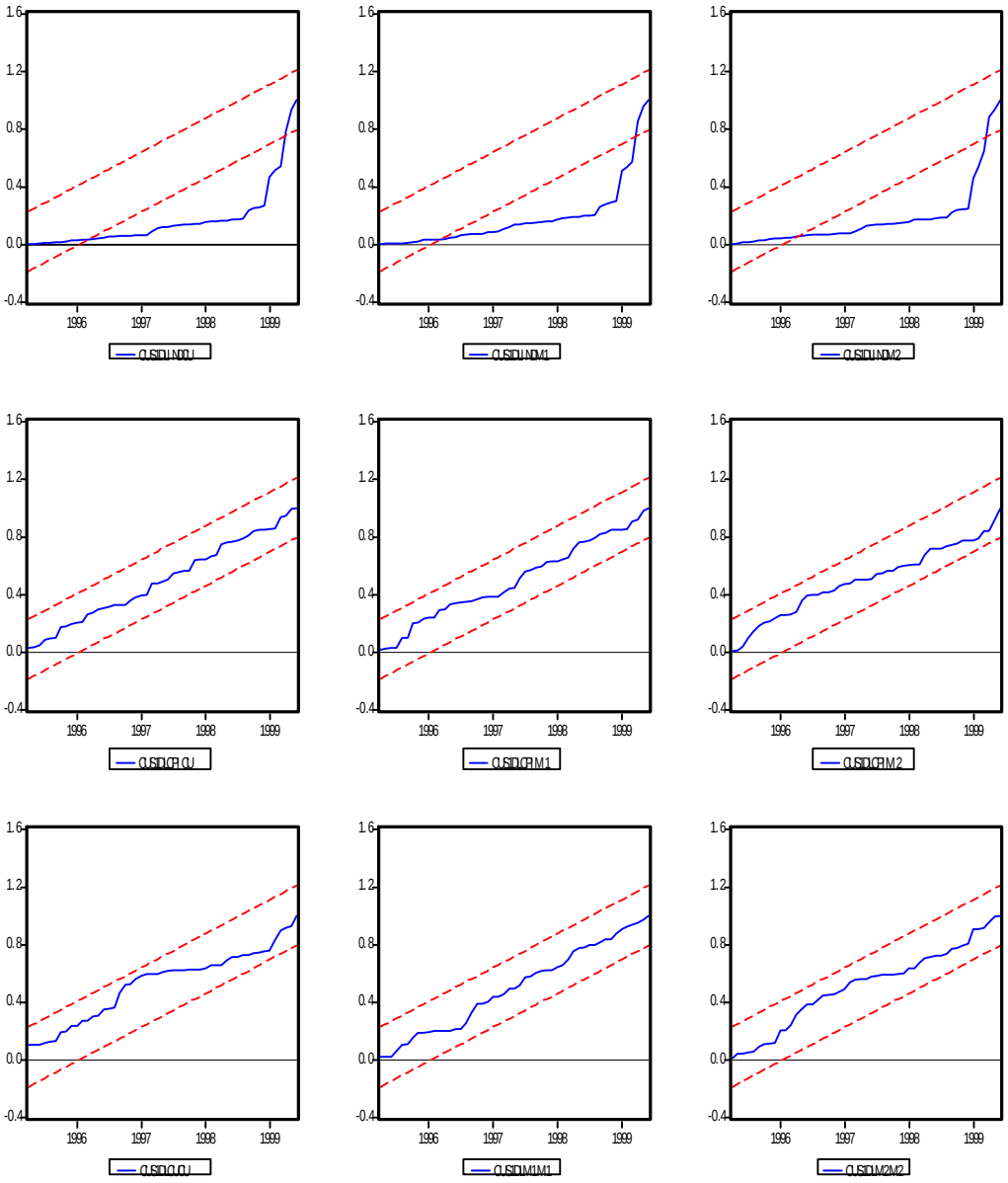
IV. CUSUM-SQ Test

1. CUSUM-SQ Test in absence of the exogenous variable

a) Without error terms

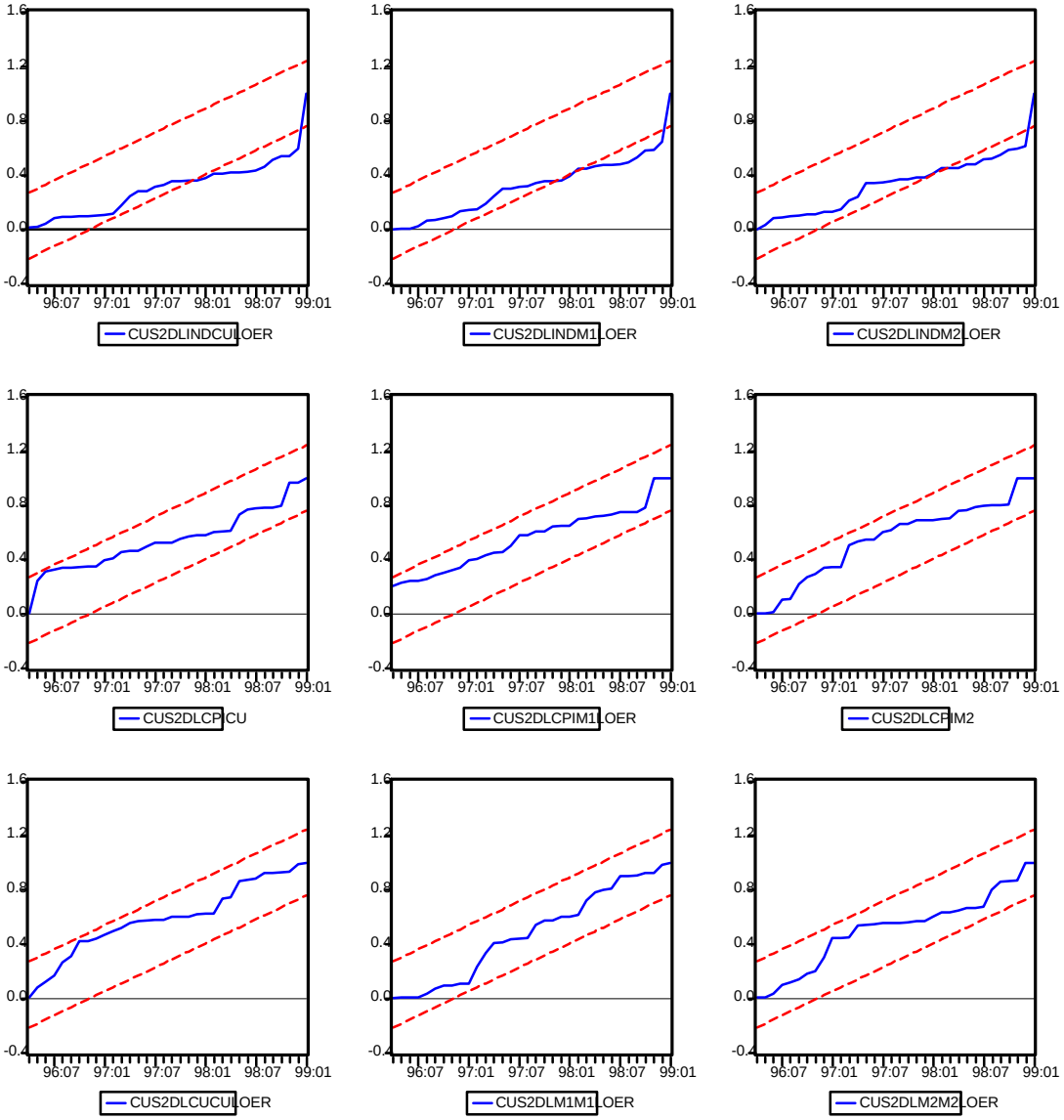


b) With error term

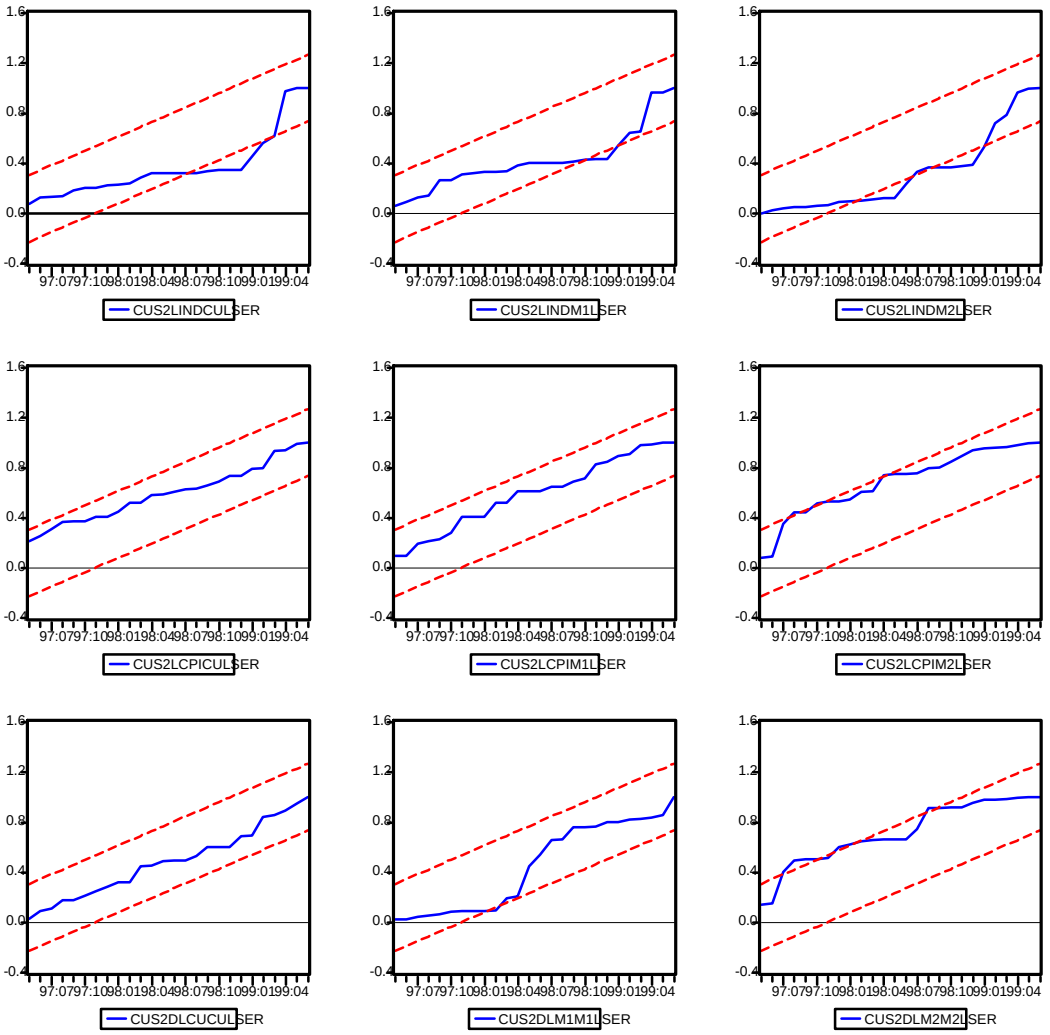


2. 2. CUSUM-SQ Test in presence of the exogenous variable

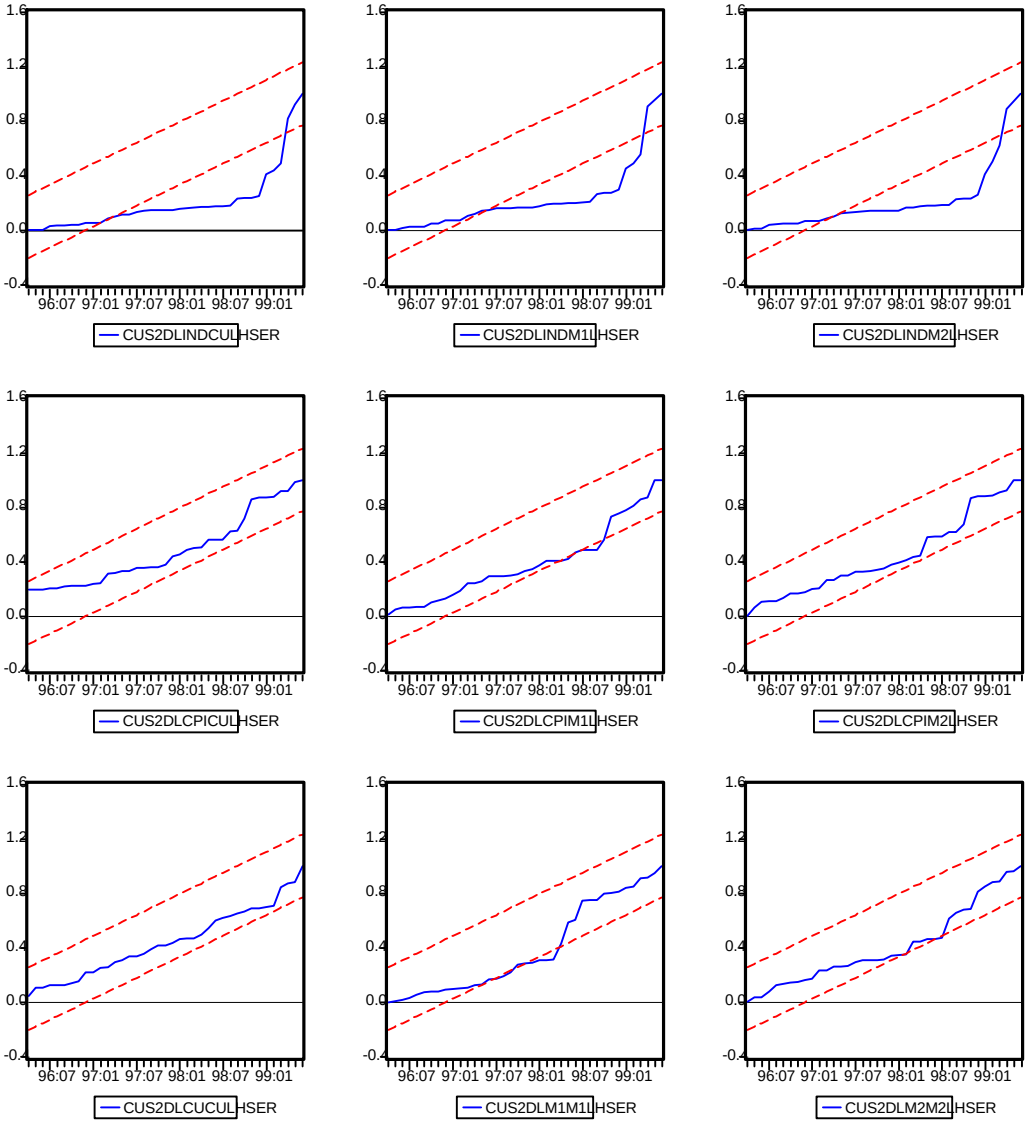
a. LOER as a exogenous variable



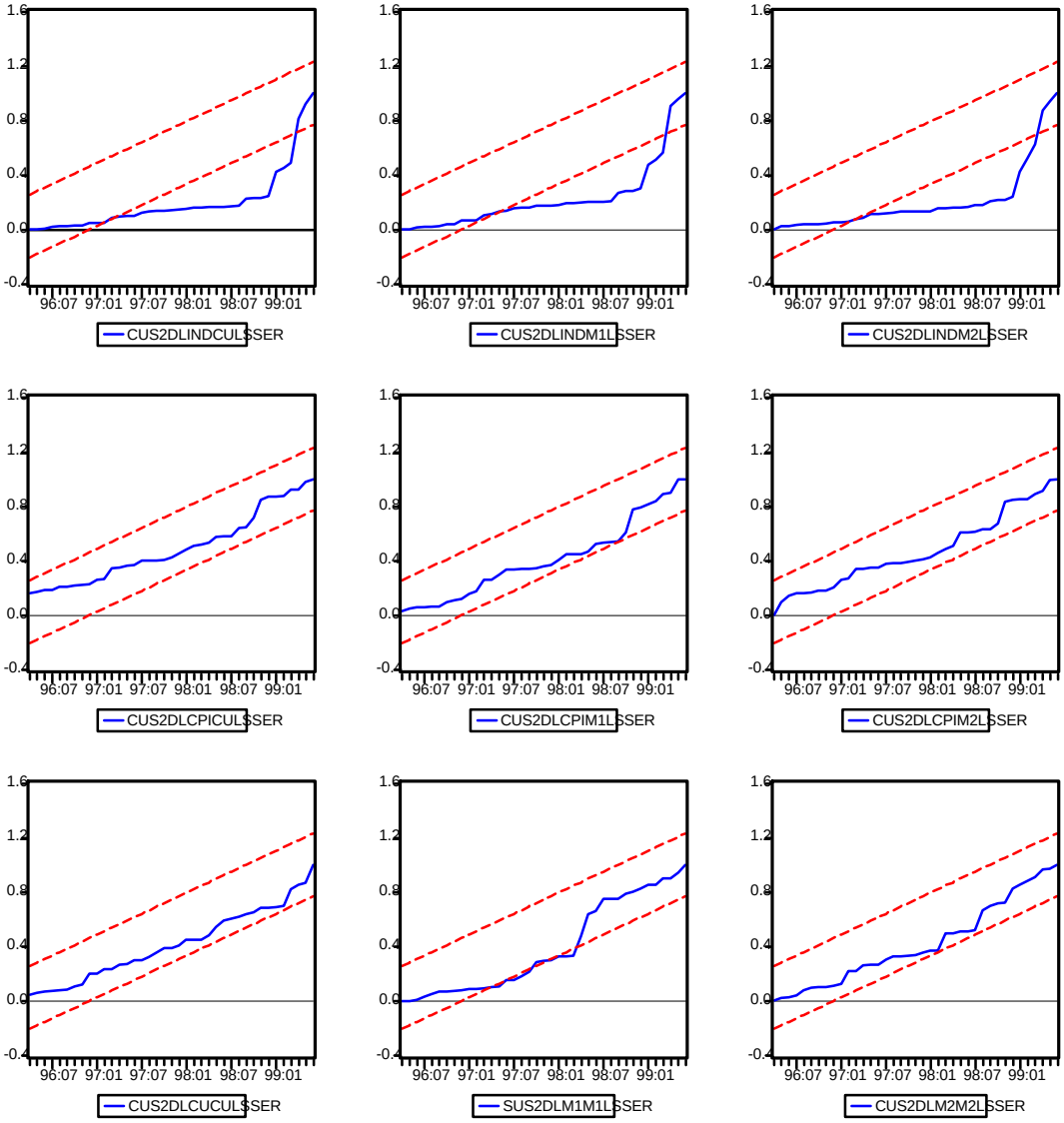
b. LSER as a exogenous variable



c. LHSER as a exogenous variable

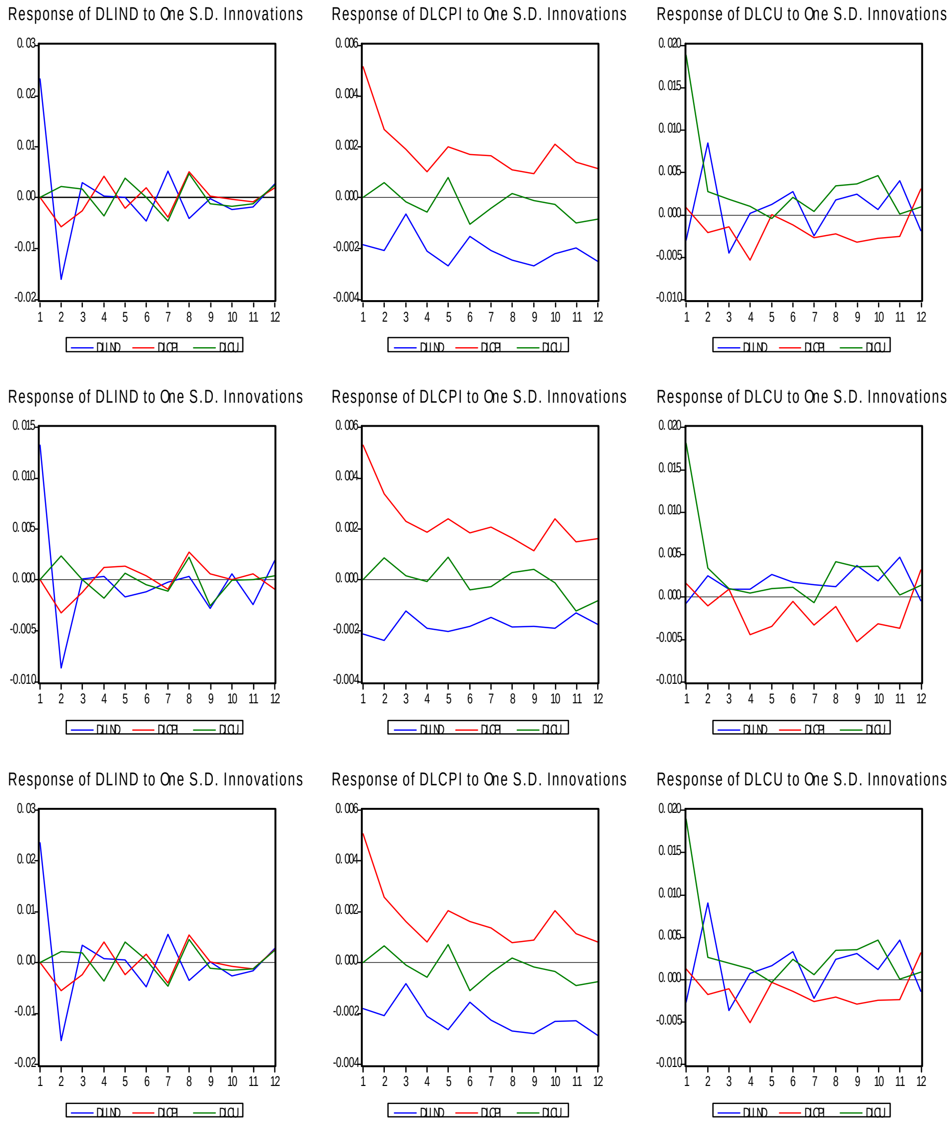


d. LSSER as a exogenous variable

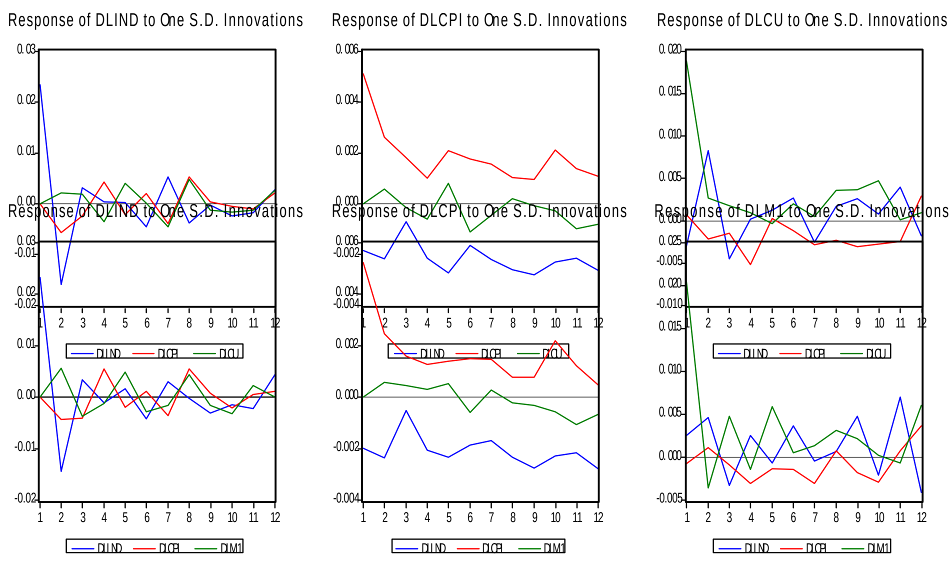


V. Impulse Response Functions (cases with exogenous variables)

1. CU

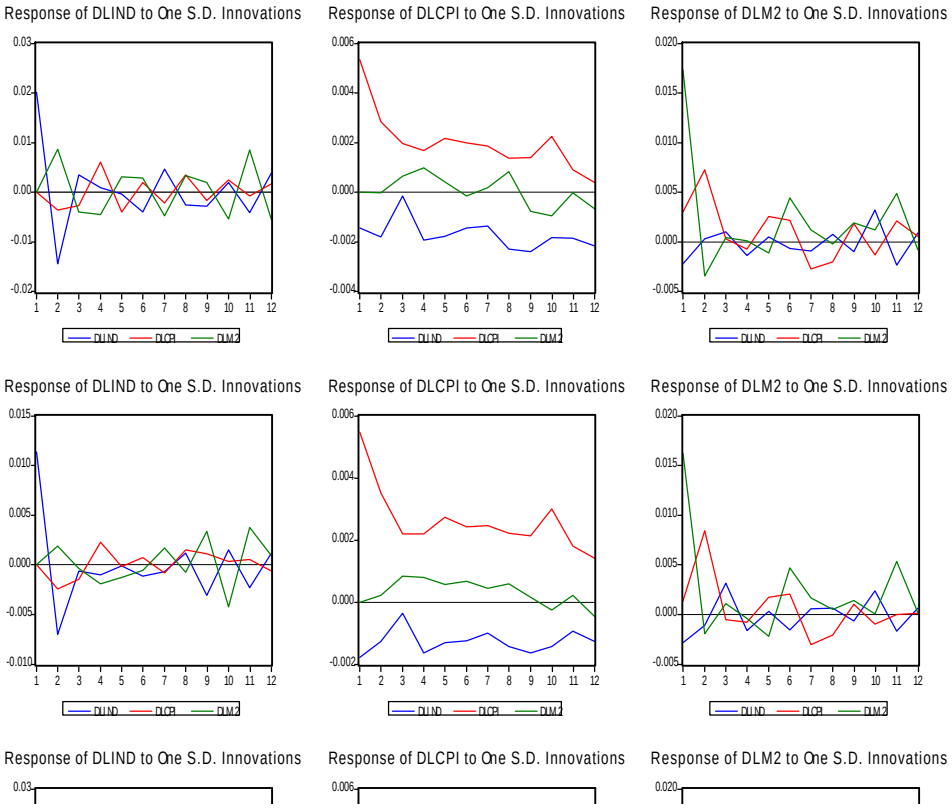


2. M1



Response of DLIND to One S.D. Innovations Response of DLCPI to One S.D. Innovations Response of DLM1 to One S.D. Innovations

3. M2


Response of DLIND to One S.D. Innovations
Response of DLCPI to One S.D. Innovations
Response of DLM2 to One S.D. Innovations
DLIND
DLCPI
DLM2

APPENDIX C. THE ESTIMATIONS OF THE ECMs FOR CHAPTER V

1.The case of CU and HSER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRCULHSER	-0.0856	0.0261	-3.2731	0.0017
C	0.0027	0.0018	1.5064	0.1370
DLIND	-0.0173	0.0190	-0.9120	0.3653
DLIND(-1)	-0.0605	0.0200	-3.0317	0.0035
DLIND(-2)	0.0244	0.0214	1.1403	0.2585
DLIND(-3)	0.0171	0.0207	0.8243	0.4129
DLCPI(-1)	0.2979	0.1035	2.8783	0.0055
DLCPI(-2)	0.1344	0.0971	1.3844	0.1711
DLCPI(-3)	0.0535	0.0863	0.6198	0.5376
DLCPI(-4)	0.0916	0.0872	1.0513	0.2971
DLCPI(-5)	-0.0419	0.0869	-0.4822	0.6314
DLCPI(-6)	-0.1064	0.0854	-1.2456	0.2175
DLCPI(-7)	-0.0010	0.0813	-0.0126	0.9900
DLCPI(-8)	0.0499	0.0822	0.6077	0.5456
DLCPI(-9)	0.0947	0.0841	1.1252	0.2648
DLCPI(-10)	-0.1636	0.0847	-1.9317	0.0579
DLCPI(-11)	-0.0251	0.0902	-0.2777	0.7822
DLCPI(-12)	0.3142	0.0823	3.8177	0.0003
DLCU	0.0391	0.0318	1.2291	0.2236
DLCU(-1)	-0.0108	0.0357	-0.3031	0.7628
DLCU(-2)	-0.0513	0.0326	-1.5717	0.1210
DLCU(-3)	-0.0747	0.0304	-2.4586	0.0167
DLHSER	0.0232	0.0602	0.3860	0.7008
DLHSER(-1)	-0.0353	0.0603	-0.5862	0.5599

DLHSER(-2)	0.0247	0.0576	0.4286	0.6697
DLHSER(-3)	0.0600	0.0446	1.3460	0.1831
R-squared	0.7274	Mean dependent var		0.0069
Adjusted R-squared	0.6192	S.D. dependent var		0.0108
S.E. of regression	0.0067	Akaike info criterion		-6.9448
Sum squared resid	0.0028	Schwarz criterion		-6.2178
Log likelihood	335.0436	F-statistic		6.7246
Durbin-Watson stat	1.6904	Prob(F-statistic)		0.0000

2. The case of CU and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRCULOER	-0.1013	0.0268	-3.7796	0.0004
C	0.0037	0.0018	2.0119	0.0490
DLIND	-0.0146	0.0217	-0.6713	0.5048
DLIND(-1)	-0.0674	0.0218	-3.0884	0.0031
DLIND(-2)	0.0356	0.0233	1.5280	0.1320
DLIND(-3)	0.0090	0.0228	0.3947	0.6945
DLCPI(-1)	0.3417	0.1172	2.9152	0.0051
DLCPI(-2)	0.1004	0.1029	0.9766	0.3329
DLCPI(-3)	0.0595	0.0841	0.7083	0.4817
DLCPI(-4)	0.0969	0.0836	1.1589	0.2513
DLCPI(-5)	-0.0898	0.0870	-1.0328	0.3061
DLCPI(-6)	-0.0938	0.0856	-1.0966	0.2774
DLCPI(-7)	0.0347	0.0822	0.4226	0.6742
DLCPI(-8)	0.0128	0.0803	0.1597	0.8737
DLCPI(-9)	0.0831	0.0805	1.0314	0.3067
DLCPI(-10)	-0.1520	0.0915	-1.6607	0.1023
DLCPI(-11)	0.0061	0.1113	0.0545	0.9568
DLCPI(-12)	0.3288	0.0924	3.5587	0.0008
DLCU	0.0009	0.0359	0.0258	0.9795
DLCU(-1)	-0.0163	0.0368	-0.4414	0.6606
DLCU(-2)	-0.0607	0.0324	-1.8731	0.0662
DLCU(-3)	-0.0699	0.0317	-2.2089	0.0312
DLOER	-0.0049	0.0838	-0.0590	0.9531
DLOER(-1)	-0.0325	0.0838	-0.3881	0.6994
DLOER(-2)	0.1357	0.0738	1.8375	0.0714
DLOER(-3)	-0.0337	0.0662	-0.5088	0.6129

R-squared	0.7526	Mean dependent var	0.0072
Adjusted R-squared	0.6441	S.D. dependent var	0.0107
S.E. of regression	0.0064	Akaike info criterion	-7.0134

Sum squared resid	0.0023	Schwarz criterion	-6.2557
Log likelihood	317.0578	F-statistic	6.9355
Durbin-Watson stat	1.9090	Prob(F-statistic)	0.0000

3. The case of CU and SER

Dependent Variable: DLCPI
Sample(adjusted): 1992:06 1999:06
Included observations: 85 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRCULSER	-0.0821	0.0263	-3.1227	0.0028
C	0.0018	0.0022	0.8389	0.4049
DLIND	-0.0158	0.0196	-0.8057	0.4237
DLIND(-1)	-0.0593	0.0209	-2.8394	0.0062
DLIND(-2)	0.0341	0.0234	1.4551	0.1509
DLIND(-3)	0.0292	0.0233	1.2524	0.2153
DLCPI(-1)	0.3263	0.1117	2.9199	0.0050
DLCPI(-2)	0.1772	0.1191	1.4888	0.1419
DLCPI(-3)	0.0894	0.1006	0.8888	0.3777
DLCPI(-4)	0.1000	0.0910	1.0996	0.2760
DLCPI(-5)	-0.1121	0.0960	-1.1674	0.2477
DLCPI(-6)	-0.0923	0.0907	-1.0178	0.3129
DLCPI(-7)	0.0342	0.0868	0.3945	0.6947
DLCPI(-8)	0.0375	0.0836	0.4478	0.6560
DLCPI(-9)	0.0953	0.0836	1.1399	0.2589
DLCPI(-10)	-0.1640	0.0869	-1.8865	0.0642
DLCPI(-11)	-0.0455	0.0928	-0.4901	0.6259
DLCPI(-12)	0.3347	0.0950	3.5236	0.0008
DLCU	0.0411	0.0333	1.2343	0.2220
DLCU(-1)	-0.0222	0.0376	-0.5901	0.5574
DLCU(-2)	-0.0517	0.0349	-1.4818	0.1437
DLCU(-3)	-0.0646	0.0321	-2.0130	0.0487
DLSER	-0.0813	0.1106	-0.7351	0.4652
DLSER(-1)	0.0768	0.1190	0.6455	0.5211
DLSER(-2)	0.1079	0.1164	0.9268	0.3578
DLSER(-3)	-0.0107	0.1071	-0.0999	0.9207

R-squared	0.6652	Mean dependent var	0.0062
Adjusted R-squared	0.5234	S.D. dependent var	0.0098
S.E. of regression	0.0067	Akaike info criterion	-6.9140
Sum squared resid	0.0027	Schwarz criterion	-6.1668
Log likelihood	319.8434	F-statistic	4.6897
Durbin-Watson stat	1.8253	Prob(F-statistic)	0.0000

4. The case of CU and SSER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1999:06

Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRCULSSER	-0.0845	0.0262	-3.2264	0.0020
C	0.0027	0.0018	1.4838	0.1429
DLIND	-0.0194	0.0190	-1.0202	0.3115
DLIND(-1)	-0.0593	0.0200	-2.9700	0.0042
DLIND(-2)	0.0265	0.0214	1.2355	0.2212
DLIND(-3)	0.0192	0.0208	0.9191	0.3615
DLCPI(-1)	0.2911	0.1026	2.8377	0.0061
DLCPI(-2)	0.1415	0.0963	1.4685	0.1469
DLCPI(-3)	0.0637	0.0857	0.7427	0.4604
DLCPI(-4)	0.0865	0.0866	0.9983	0.3220
DLCPI(-5)	-0.0554	0.0873	-0.6345	0.5281
DLCPI(-6)	-0.1101	0.0865	-1.2736	0.2075
DLCPI(-7)	0.0058	0.0822	0.0704	0.9441
DLCPI(-8)	0.0468	0.0828	0.5654	0.5738
DLCPI(-9)	0.1013	0.0845	1.1986	0.2352
DLCPI(-10)	-0.1612	0.0848	-1.9014	0.0618
DLCPI(-11)	-0.0386	0.0905	-0.4266	0.6711
DLCPI(-12)	0.3215	0.0835	3.8512	0.0003
DLCU	0.0361	0.0318	1.1355	0.2605
DLCU(-1)	-0.0097	0.0356	-0.2736	0.7853
DLCU(-2)	-0.0511	0.0326	-1.5672	0.1221
DLCU(-3)	-0.0736	0.0306	-2.4014	0.0193
DLSSER	-0.0045	0.0625	-0.0728	0.9422
DLSSER(-1)	-0.0193	0.0620	-0.3113	0.7566
DLSSER(-2)	0.0273	0.0587	0.4649	0.6436
DLSSER(-3)	0.0571	0.0451	1.2661	0.2101

R-squared	0.7249	Mean dependent var	0.0069
Adjusted R-squared	0.6157	S.D. dependent var	0.0108
S.E. of regression	0.0067	Akaike info criterion	-6.9355
Sum squared resid	0.0028	Schwarz criterion	-6.2084
Log likelihood	334.6281	F-statistic	6.6387
Durbin-Watson stat	1.6857	Prob(F-statistic)	0.0000

5. The case of M1 and HSER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM1LHSER	-0.0754	0.0261	-2.8905	0.0053
C	0.0033	0.0021	1.5613	0.1235
DLIND	-0.0202	0.0199	-1.0189	0.3122
DLIND(-1)	-0.0430	0.0199	-2.1615	0.0345
DLIND(-2)	0.0438	0.0208	2.1092	0.0389
DLIND(-3)	0.0240	0.0200	1.1984	0.2352
DLCPI(-1)	0.3466	0.1090	3.1808	0.0023
DLCPI(-2)	0.1144	0.0997	1.1478	0.2554

DLCPI(-3)	0.0155	0.0920	0.1684	0.8668
DLCPI(-4)	0.0640	0.0893	0.7163	0.4764
DLCPI(-5)	-0.0600	0.0900	-0.6669	0.5073
DLCPI(-6)	-0.0816	0.0865	-0.9435	0.3491
DLCPI(-7)	-0.0012	0.0843	-0.0145	0.9885
DLCPI(-8)	0.0469	0.0848	0.5534	0.5820
DLCPI(-9)	0.0873	0.0878	0.9951	0.3235
DLCPI(-10)	-0.1488	0.0902	-1.6488	0.1042
DLCPI(-11)	0.0146	0.0980	0.1494	0.8817
DLCPI(-12)	0.3155	0.0927	3.4035	0.0012
DLM1	-0.0064	0.0339	-0.1889	0.8508
DLM1(-1)	-0.0248	0.0405	-0.6127	0.5423
DLM1(-2)	-0.0433	0.0362	-1.1978	0.2355
DLM1(-3)	-0.0806	0.0307	-2.6271	0.0108
DLHSER	0.0318	0.0619	0.5137	0.6092
DLHSER(-1)	-0.0382	0.0620	-0.6164	0.5398
DLHSER(-2)	0.0207	0.0598	0.3467	0.7299
DLHSER(-3)	0.0663	0.0453	1.4637	0.1482
R-squared	0.7082	Mean dependent var		0.0069
Adjusted R-squared	0.5924	S.D. dependent var		0.0108
S.E. of regression	0.0069	Akaike info criterion		-6.8766
Sum squared resid	0.0030	Schwarz criterion		-6.1496
Log likelihood	332.0081	F-statistic		6.1150
Durbin-Watson stat	1.7395	Prob(F-statistic)		0.0000

6. The case of M1 and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM1LOER	-0.0739	0.0253	-2.9256	0.0049
C	0.0035	0.0022	1.6261	0.1094
DLIND	-0.0170	0.0238	-0.7165	0.4766
DLIND(-1)	-0.0493	0.0231	-2.1365	0.0369
DLIND(-2)	0.0596	0.0233	2.5555	0.0133
DLIND(-3)	0.0227	0.0229	0.9881	0.3273
DLCPI(-1)	0.3675	0.1238	2.9685	0.0044
DLCPI(-2)	0.0875	0.1058	0.8270	0.4117
DLCPI(-3)	0.0566	0.0906	0.6251	0.5344
DLCPI(-4)	0.0707	0.0881	0.8019	0.4259
DLCPI(-5)	-0.1032	0.0915	-1.1282	0.2639
DLCPI(-6)	-0.0767	0.0891	-0.8607	0.3930
DLCPI(-7)	0.0397	0.0878	0.4522	0.6528
DLCPI(-8)	0.0085	0.0850	0.0998	0.9209
DLCPI(-9)	0.0736	0.0861	0.8552	0.3960
DLCPI(-10)	-0.1378	0.0995	-1.3851	0.1714
DLCPI(-11)	0.0185	0.1182	0.1566	0.8761
DLCPI(-12)	0.3101	0.1017	3.0498	0.0035

DLM1	-0.0255	0.0365	-0.6978	0.4882
DLM1(-1)	-0.0226	0.0411	-0.5508	0.5839
DLM1(-2)	-0.0352	0.0377	-0.9327	0.3549
DLM1(-3)	-0.0630	0.0329	-1.9169	0.0603
DLOER	-0.0023	0.0889	-0.0260	0.9794
DLOER(-1)	-0.0234	0.0893	-0.2618	0.7944
DLOER(-2)	0.1563	0.0789	1.9827	0.0522
DLOER(-3)	-0.0285	0.0702	-0.4066	0.6859
R-squared	0.7210	Mean dependent var		0.0072
Adjusted R-squared	0.5986	S.D. dependent var		0.0107
S.E. of regression	0.0068	Akaike info criterion		-6.8933
Sum squared resid	0.0026	Schwarz criterion		-6.1356
Log likelihood	312.0706	F-statistic		5.8920
Durbin-Watson stat	1.8787	Prob(F-statistic)		0.0000

7. The case of M1 and SER

Dependent Variable: DLCPI
Sample(adjusted): 1992:06 1999:06
Included observations: 85 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM1LSER	-0.0684	0.0262	-2.6167	0.0113
C	0.0024	0.0026	0.9204	0.3611
DLIND	-0.0198	0.0205	-0.9614	0.3403
DLIND(-1)	-0.0407	0.0211	-1.9342	0.0579
DLIND(-2)	0.0539	0.0224	2.4048	0.0193
DLIND(-3)	0.0332	0.0220	1.5100	0.1364
DLCPI(-1)	0.3708	0.1165	3.1828	0.0023
DLCPI(-2)	0.1320	0.1222	1.0801	0.2845
DLCPI(-3)	0.0656	0.1087	0.6039	0.5482
DLCPI(-4)	0.0619	0.0923	0.6703	0.5053
DLCPI(-5)	-0.1373	0.0987	-1.3909	0.1695
DLCPI(-6)	-0.0462	0.0923	-0.5011	0.6182
DLCPI(-7)	0.0313	0.0906	0.3455	0.7309
DLCPI(-8)	0.0310	0.0868	0.3574	0.7221
DLCPI(-9)	0.0833	0.0880	0.9466	0.3477
DLCPI(-10)	-0.1440	0.0935	-1.5399	0.1289
DLCPI(-11)	0.0079	0.1020	0.0777	0.9384
DLCPI(-12)	0.3159	0.1061	2.9766	0.0042
DLM1	-0.0155	0.0356	-0.4349	0.6652
DLM1(-1)	-0.0316	0.0429	-0.7369	0.4641
DLM1(-2)	-0.0263	0.0377	-0.6967	0.4887
DLM1(-3)	-0.0695	0.0328	-2.1177	0.0384
DLSER	-0.0874	0.1144	-0.7641	0.4479
DLSER(-1)	0.1468	0.1238	1.1860	0.2404
DLSER(-2)	0.0655	0.1236	0.5301	0.5980
DLSER(-3)	-0.0026	0.1103	-0.0237	0.9812
R-squared	0.6388	Mean dependent var		0.0062

Adjusted R-squared	0.4858	S.D. dependent var	0.0098
S.E. of regression	0.0070	Akaike info criterion	-6.8380
Sum squared resid	0.0029	Schwarz criterion	-6.0909
Log likelihood	316.6169	F-statistic	4.1743
Durbin-Watson stat	1.8615	Prob(F-statistic)	0.0000

8. The case of M1 and SSER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1999:06
Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM1LSSER	-0.0736	0.0261	-2.8217	0.0064
C	0.0033	0.0022	1.5025	0.1380
DLIND	-0.0222	0.0199	-1.1181	0.2678
DLIND(-1)	-0.0423	0.0200	-2.1194	0.0380
DLIND(-2)	0.0456	0.0209	2.1876	0.0324
DLIND(-3)	0.0259	0.0203	1.2769	0.2063
DLCPI(-1)	0.3342	0.1079	3.0965	0.0029
DLCPI(-2)	0.1197	0.0988	1.2115	0.2302
DLCPI(-3)	0.0299	0.0917	0.3260	0.7455
DLCPI(-4)	0.0600	0.0890	0.6739	0.5028
DLCPI(-5)	-0.0714	0.0904	-0.7897	0.4326
DLCPI(-6)	-0.0849	0.0876	-0.9689	0.3363
DLCPI(-7)	0.0063	0.0854	0.0734	0.9417
DLCPI(-8)	0.0436	0.0857	0.5090	0.6126
DLCPI(-9)	0.0945	0.0883	1.0701	0.2887
DLCPI(-10)	-0.1455	0.0906	-1.6061	0.1133
DLCPI(-11)	0.0045	0.0981	0.0455	0.9639
DLCPI(-12)	0.3189	0.0937	3.4023	0.0012
DLM1	-0.0105	0.0338	-0.3095	0.7580
DLM1(-1)	-0.0251	0.0407	-0.6173	0.5393
DLM1(-2)	-0.0411	0.0365	-1.1258	0.2645
DLM1(-3)	-0.0774	0.0313	-2.4775	0.0159
DLSSER	0.0027	0.0647	0.0422	0.9665
DLSSER(-1)	-0.0188	0.0641	-0.2933	0.7702
DLSSER(-2)	0.0241	0.0612	0.3942	0.6947
DLSSER(-3)	0.0679	0.0456	1.4890	0.1415
R-squared	0.7048	Mean dependent var		0.0069
Adjusted R-squared	0.5876	S.D. dependent var		0.0108
S.E. of regression	0.0069	Akaike info criterion		-6.8650
Sum squared resid	0.0030	Schwarz criterion		-6.1380
Log likelihood	331.4917	F-statistic		6.0154
Durbin-Watson stat	1.7193	Prob(F-statistic)		0.0000

9. The case of M2 and HSER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1999:06

Included observations: 89 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM2LHSER	-0.0577	0.0337	-1.7116	0.0919
C	0.0003	0.0023	0.1226	0.9028
DLIND	-0.0268	0.0198	-1.3527	0.1810
DLIND(-1)	-0.0374	0.0196	-1.9115	0.0605
DLIND(-2)	0.0549	0.0203	2.7025	0.0088
DLIND(-3)	0.0337	0.0204	1.6520	0.1035
DLCPI(-1)	0.3225	0.1151	2.8028	0.0067
DLCPI(-2)	0.0888	0.1051	0.8448	0.4014
DLCPI(-3)	0.0835	0.0948	0.8805	0.3819
DLCPI(-4)	0.1033	0.0934	1.1064	0.2727
DLCPI(-5)	-0.0661	0.0946	-0.6988	0.4873
DLCPI(-6)	-0.0369	0.0928	-0.3979	0.6921
DLCPI(-7)	-0.0179	0.0913	-0.1963	0.8450
DLCPI(-8)	0.0705	0.0920	0.7663	0.4464
DLCPI(-9)	0.0849	0.0940	0.9036	0.3697
DLCPI(-10)	-0.1858	0.0931	-1.9955	0.0503
DLCPI(-11)	0.0417	0.0969	0.4304	0.6684
DLCPI(-12)	0.2078	0.0846	2.4566	0.0168
DLM2	0.0430	0.0370	1.1631	0.2492
DLM2(-1)	-0.0316	0.0385	-0.8195	0.4156
DLM2(-2)	0.0254	0.0383	0.6641	0.5090
DLM2(-3)	-0.0314	0.0373	-0.8428	0.4025
DLHSER	0.0178	0.0652	0.2733	0.7855
DLHSER(-1)	-0.0052	0.0649	-0.0794	0.9370
DLHSER(-2)	0.0465	0.0606	0.7677	0.4455
DLHSER(-3)	0.0963	0.0470	2.0500	0.0445
R-squared	0.6819	Mean dependent var		0.0069
Adjusted R-squared	0.5557	S.D. dependent var		0.0108
S.E. of regression	0.0072	Akaike info criterion		-6.7905
Sum squared resid	0.0033	Schwarz criterion		-6.0635
Log likelihood	328.1777	F-statistic		5.4029
Durbin-Watson stat	1.7657	Prob(F-statistic)		0.0000

10. The case of M2 and OER

Dependent Variable: DLCPI
Sample(adjusted): 1992:02 1998:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM2LOER	-0.0454	0.0280	-1.6211	0.1105
C	0.0003	0.0023	0.1468	0.8838
DLIND	-0.0280	0.0235	-1.1941	0.2374
DLIND(-1)	-0.0486	0.0230	-2.1121	0.0391
DLIND(-2)	0.0674	0.0239	2.8192	0.0066
DLIND(-3)	0.0411	0.0242	1.6965	0.0953
DLCPI(-1)	0.3198	0.1322	2.4184	0.0188
DLCPI(-2)	0.1292	0.1149	1.1241	0.2657

DLCPI(-3)	0.1145	0.0943	1.2138	0.2298
DLCPI(-4)	0.0939	0.0932	1.0074	0.3180
DLCPI(-5)	-0.1230	0.0967	-1.2724	0.2084
DLCPI(-6)	-0.0352	0.0974	-0.3617	0.7189
DLCPI(-7)	0.0366	0.0960	0.3814	0.7043
DLCPI(-8)	0.0120	0.0957	0.1255	0.9005
DLCPI(-9)	0.0760	0.0933	0.8146	0.4187
DLCPI(-10)	-0.1629	0.1005	-1.6214	0.1105
DLCPI(-11)	-0.0171	0.1152	-0.1486	0.8824
DLCPI(-12)	0.2301	0.0936	2.4578	0.0170
DLM2	0.0533	0.0411	1.2972	0.1998
DLM2(-1)	-0.0116	0.0414	-0.2794	0.7810
DLM2(-2)	0.0096	0.0411	0.2332	0.8164
DLM2(-3)	-0.0136	0.0398	-0.3407	0.7346
DLOER	-0.0520	0.0974	-0.5344	0.5951
DLOER(-1)	0.0270	0.0949	0.2849	0.7767
DLOER(-2)	0.2050	0.0817	2.5099	0.0149
DLOER(-3)	-0.0059	0.0748	-0.0788	0.9375
R-squared	0.6953	Mean dependent var		0.0072
Adjusted R-squared	0.5617	S.D. dependent var		0.0107
S.E. of regression	0.0071	Akaike info criterion		-6.8053
Sum squared resid	0.0029	Schwarz criterion		-6.0476
Log likelihood	308.4200	F-statistic		5.2038
Durbin-Watson stat	1.8654	Prob(F-statistic)		0.0000

11. The case of M2 and SER

Dependent Variable: DLCPI
Sample(adjusted): 1992:06 1999:06
Included observations: 85 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM2LSER	-0.0560	0.0330	-1.6988	0.0946
C	-0.0004	0.0025	-0.1424	0.8872
DLIND	-0.0232	0.0202	-1.1533	0.2534
DLIND(-1)	-0.0346	0.0206	-1.6788	0.0985
DLIND(-2)	0.0641	0.0219	2.9288	0.0048
DLIND(-3)	0.0474	0.0220	2.1591	0.0349
DLCPI(-1)	0.3735	0.1227	3.0427	0.0035
DLCPI(-2)	0.1502	0.1292	1.1631	0.2495
DLCPI(-3)	0.1130	0.1084	1.0422	0.3016
DLCPI(-4)	0.1038	0.0932	1.1140	0.2698
DLCPI(-5)	-0.1510	0.0999	-1.5117	0.1359
DLCPI(-6)	0.0038	0.0971	0.0389	0.9691
DLCPI(-7)	0.0166	0.0958	0.1728	0.8634
DLCPI(-8)	0.0423	0.0934	0.4525	0.6526
DLCPI(-9)	0.0862	0.0919	0.9379	0.3521
DLCPI(-10)	-0.1886	0.0938	-2.0099	0.0490
DLCPI(-11)	0.0224	0.0964	0.2320	0.8173
DLCPI(-12)	0.2398	0.0993	2.4160	0.0188

DLM2	0.0530	0.0399	1.3299	0.1887
DLM2(-1)	-0.0435	0.0414	-1.0495	0.2982
DLM2(-2)	0.0039	0.0399	0.0989	0.9216
DLM2(-3)	-0.0344	0.0382	-0.9011	0.3712
DLSER	-0.0936	0.1177	-0.7953	0.4297
DLSER(-1)	0.1884	0.1263	1.4919	0.1410
DLSER(-2)	0.1169	0.1251	0.9347	0.3537
DLSER(-3)	-0.0147	0.1172	-0.1251	0.9009
R-squared	0.6237	Mean dependent var		0.0062
Adjusted R-squared	0.4642	S.D. dependent var		0.0098
S.E. of regression	0.0071	Akaike info criterion		-6.7969
Sum squared resid	0.0030	Schwarz criterion		-6.0498
Log likelihood	314.8702	F-statistic		3.9112
Durbin-Watson stat	1.9381	Prob(F-statistic)		0.0000

12. The case of M2 and SSER

Dependent Variable: DLCPI				
Sample(adjusted): 1992:02 1999:06				
Included observations: 89 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERRM2LSSER	-0.0554	0.0330	-1.6778	0.0983
C	0.0002	0.0023	0.0910	0.9278
DLIND	-0.0282	0.0198	-1.4229	0.1597
DLIND(-1)	-0.0378	0.0196	-1.9280	0.0584
DLIND(-2)	0.0566	0.0203	2.7848	0.0071
DLIND(-3)	0.0355	0.0205	1.7314	0.0883
DLCPI(-1)	0.3204	0.1137	2.8173	0.0065
DLCPI(-2)	0.0976	0.1033	0.9450	0.3483
DLCPI(-3)	0.0979	0.0934	1.0483	0.2985
DLCPI(-4)	0.1003	0.0925	1.0844	0.2823
DLCPI(-5)	-0.0812	0.0945	-0.8593	0.3934
DLCPI(-6)	-0.0428	0.0935	-0.4577	0.6487
DLCPI(-7)	-0.0079	0.0917	-0.0864	0.9314
DLCPI(-8)	0.0713	0.0923	0.7727	0.4426
DLCPI(-9)	0.0931	0.0941	0.9886	0.3266
DLCPI(-10)	-0.1854	0.0926	-2.0018	0.0496
DLCPI(-11)	0.0275	0.0967	0.2839	0.7774
DLCPI(-12)	0.2151	0.0858	2.5076	0.0147
DLM2	0.0431	0.0369	1.1681	0.2472
DLM2(-1)	-0.0303	0.0384	-0.7885	0.4333
DLM2(-2)	0.0245	0.0380	0.6437	0.5221
DLM2(-3)	-0.0319	0.0371	-0.8612	0.3924
DLSSER	-0.0109	0.0676	-0.1609	0.8727
DLSSER(-1)	0.0120	0.0670	0.1793	0.8582
DLSSER(-2)	0.0567	0.0620	0.9152	0.3636
DLSSER(-3)	0.0996	0.0471	2.1148	0.0384
R-squared	0.6823	Mean dependent var		0.0069
Adjusted R-squared	0.5563	S.D. dependent var		0.0108
S.E. of regression	0.0072	Akaike info criterion		-6.7917

Sum squared resid	0.0033	Schwarz criterion	-6.0647
Log likelihood	328.2318	F-statistic	5.4125
Durbin-Watson stat	1.7671	Prob(F-statistic)	0.0000

Appendix D: METHOD OF JOHANSEN AND JUSELIUS (1990)

Following Johansen and Juselius (1990), consider

$$\mathbf{X}_t = \mathbf{\Pi}_1\mathbf{X}_{t-1} + ...+ \mathbf{\Pi}_k\mathbf{X}_{t-k} + \boldsymbol{\varepsilon}_t \qquad (t = 1, ... , T) \qquad (1)$$

Where $\mathbf{X}_t$ is sequence of random vector with components $(X_{1t}, \ldots ,X_{pt})$. The innovation to this process, $\boldsymbol{\varepsilon}_{1,} \ldots , \boldsymbol{\varepsilon}_{T,}$ are drawn from a *p*-dimentional i.i.d. Gaussian distribution with covariance $\mathbf{\Lambda}$, and $\mathbf{X}_{-k+1}$,. . ., $\mathbf{X}_0$ are fixed.Because most economic variables are nonstationary in their levels, VAR models such as equation (1) generally are estimated in first- difference form. While such an approach sattisfies the requirement that the data are stationary, it also implies some loss of information concerning the long term – relationship between the series and a misspecification if series are cointegrated.

Letting Δ represent the first – difference operator, Johansen and Juselius (1990) suggest writing equation (1) in the equivalent form

$$\Delta\mathbf{X}_t = \mathbf{\Gamma}_1\Delta\mathbf{X}_{t-1} + ...+ \mathbf{\Gamma}_{k-1}\Delta\mathbf{X}_{t-k+1} - \mathbf{\Pi}_k\mathbf{X}_{t-k} + \varepsilon_t \qquad (t = 1, ..., T) \qquad (2)$$

Where

$$\mathbf{\Gamma}_i = -\mathbf{I} + \mathbf{\Pi}_1 + \ldots + \mathbf{\Pi}_i \qquad (i = 1,..., k-1)$$

and

$$\mathbf{\Pi} = \mathbf{I} - \mathbf{\Pi}_1 - ...- \mathbf{\Pi}_k.^{1} \qquad (3)$$

The only difference between a standard first-difference version of a VAR model and equation (2) is the term $\mathbf{\Pi X}_{t-k}$. It is this $\mathbf{\Pi}$ matrix that conveys information about the long–run relationship between the $\mathbf{X}$ variables. If $\mathbf{X}_t$ is nonstationary in levels but $\Delta\mathbf{X}_t$ is stationary, the $\mathbf{X}_t$ is integrated of order one. The individual elements of $\mathbf{X}_t$ may be cointegrated, how ever, so that one or more linear combinations of these nonstationary time-series are stationary.

Cointegration can be detected by examining the $\mathbf{\Pi}$ matrix. If the p x p matrix $\mathbf{\Pi}$ has rank 0 then all elements of $\mathbf{X}_t$ have unit roots and first–differencing might be recommended. If $\mathbf{\Pi}$ is of full rank p, then all elements of $\mathbf{X}_t$ are stationary in levels[2]. The interesting case in this study is when $0 <$ rank $(\mathbf{\Pi}) = r < p$. In this case, it is said that there are r cointegrating relations among the elements of $\mathbf{X}_t$ and p-r common stochastic trends.

If $\mathbf{\Pi}$ has rank $r<p$, it implies that $\mathbf{\Pi} = \alpha\beta'$, where α and β are p x r matrices. The β is interpreted as a matrix of cointegrating vectors, and α is a matrix of error corretion

parameters . To see this, consider multiplying equation (2) by the matrix **B** where **B**'=($\beta\alpha_1$) and α_1 is a *p x (p-r)* matrix orthogonal to α. This multiplication yields

$$\begin{pmatrix} b' \\ a_1' \end{pmatrix} \Delta X_t = \begin{pmatrix} b' \\ a_1' \end{pmatrix} [\Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{k-1} \Delta X_{t-k+1} + e_t] - \begin{pmatrix} b'ab'X_{t-k} \\ 0 \end{pmatrix} \tag{4}$$

Thus, $\mathbf{BX}_t$ is a column vector of *r* stationary processes – the cointegrating linear combinations of the elements of $\mathbf{X}_t$ and *p-r* common stochastic trends of nonstationary processes.

Johansen and Juselius (1990) demonstrate that β, the cointegrating vector, can be estimated as the eigenvector associated with the *r* largest, statistically significant eigenvalues found by solving

$$| \lambda \mathbf{S}_{kk} - \mathbf{S}_{k0}\mathbf{S}_{00}^{-1}\mathbf{S}_{0k} | = 0 \tag{5}$$

Where S_{00} represents the residual moment matrix from a least squares regresion of $\Delta\mathbf{X}_t$ on $\Delta\mathbf{X}_{t-1}$,..., $\Delta\mathbf{X}_{t-k+1}$, S_{kk} is cross- product moment matrix . Using these eigenvalues, one may test the hypothesis that there are at most *r* cointegrating vectors by conculating the likelihood test statistic

$$(-2)\ln(Q) = -T\sum_{r+1}^{p} \ln(1 - l_i)$$

Where λ_{r+1} ,..., λ_p are the *p - r* smallest eigenvalues, Johansen and Juselius (1990) all this test the trace test .They also develop the likelihood ratio test called the maximal eigenvalue test. In that test the null hypothesis of *r* cointegrating vectors is tested against alternative of *r+1* cointegrating vectors.