Macroeconomic Policy Analysis of Vietnam – A Macro-Econometric Model Approach

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Abstract

Since 1986, Vietnam has been implementing its transition from centrally planned economy to a market economy and has maintained an opening-up policy. Economic reforms on both demand side and supply side have largely contributed to successes of the economy. Since 1990, the economic development has been impressive, even if Vietnam was strongly affected by the Asian financial crisis in 1997-1998. The high economic growth was achieved in a stable macroeconomic situation. Inflation was kept within a controllable range. As a consequence of its integration into the world economy and its economic reforms, Vietnam has benefited from inflows of foreign direct investment (FDI) and foreign exchange expansion. Undoubtedly, the macroeconomic policies have played an important role in stabilizing the economy in this period. However the slowdown of economic growth during the Asian crisis has raised the need for suitable adjustments in economic policies to speed up the economic development. The objective of this paper is to analyze the impacts of short-term macroeconomic policy' s adjustments in Vietnam. These impacts are investigated by employed a macro-econometric model with the assumption of demand determined economy in the short term. Based on the characteristics of transition period, Vietnamese economy' s model is constructed and adjustments of fiscal policy and exchange rate policy are analyzed since 1998, when Vietnamese economic growth has been slowing down. Fiscal relaxation and exchange rate devaluation are two main policies which is suggested for promoting growth in this period.

Introduction

As demand management policies, macroeconomic policies have short-run effects through the changes in aggregate demand and prices. Cook and Kirkpatrick (1990) report that the objective of macroeconomic policies is to control the short-run behavior of an economy. The behavior is monitored by the movements in the three main aggregate level variables – the output level, the inflation rate and the balance of payment. In general, for internal balance, the policies raising aggregate demand in the short term will lead to increase in the

output and price level. For an open economy, external balance is affected by changes in domestic interest rate and exchange rate.

It has been evident that macroeconomic policies in Vietnam have contributed much to the success of the country after Renovation policy, especially over the last decade. As a result, the Vietnamese economy has made many significant achievements over more than 15 years of Renovation. In the last decade, the country enjoyed very promising economic performance. High economic growth was achieved in a stable economy and GDP doubled after 10 years.[1] Inflation has been curbed. Open door economic policy resulted in huge external financial inflows in the forms of Foreign Direct Investment (FDI) and Official Development Assistance (ODA), and strong external trade growth.

However, the slowdown in economic growth in some recent years has raised the need for suitable adjustments in economic management. In 1997-1998, the Asian economic crisis resulted in decline in exports and capital inflows of Vietnam. Domestic prices have been kept stable, but there have been some signs of stagnant domestic demand. Despite high economic growth rate gained in the last period, there is still a big gap in development level between the country and the region. For the future of Vietnamese economic development, it is necessary to keep a stable high economic growth rate.

The Vietnamese economy in transition period has been an attractive topic involving numerous studies. However quantified analysis of policies' impact on the economy has been limited. The main reason is that the transformation period from centrally planned economy to market economy has taken place for only a short period, and thus the necessary data for such study is limited. It is difficult but interesting to carry out quantitative analysis of the Vietnamese economy.

The main objective of this paper is to analyze impacts of macroeconomic policies' adjustments on the Vietnamese economy in the transition period. For the purpose of quantitative analysis, macro-econometric models can take into account macro behavioral relationships and are suitable for analyzing medium term and short term impacts of macroeconomic policies. With the given objective of study, macro-econometric modeling will be used as a method of quantitative analysis.

Data collecting for model is always difficult when applying quantitative study method for Vietnamese economy. In order to build a macro econometric model, macroeconomic time series data is collected from national account in the period 1986 to 2003. Other necessity necessary data is collect from other sources of Vietnamese government, ADB, WB and IMF.

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[1] In terms of 1994 constant price, GDP in 1990 was VND 131,968 billion and in the year 2000 was VND 273,666 billion VND.

The structure of this article is as follow: In the section 1, an introduction about the background, also the objective and methodology of the study in this paper is given. Section 2 overviews the Vietnamese economy performance and macroeconomic policies' implementation after Renovation program. Section 3 is employed to build a macro econometric model based on characteristics of the economy. Section 4 evaluates the impacts of macroeconomic policy adjustment. Two scenarios of fiscal policy relaxation and exchange rate devaluation implementation are considered. In the section 5, conclusions are drawn based on the results and suggestions for policy implications.

1. VIETNAMESE ECONOMIC PERFORMANCE AND MACROECONOMIC POLICY AFTER RENOVATION POLICY

1.1 Macroeconomic performance after renovation policy

Vietnamese economy has been in a transition period since 1986, transforming from a centrally planned economy to market economy under the "Doimoi" or "Renovation" program. Although the "Doimoi" program was initiated in 1986, only in the spring 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, and induce market development. The stabilization program was adopted in 1989 as a combination of reforms. The key components of the program were tight monetary and fiscal policies and an appropriate exchange rate policy. The reform included devaluating and unifying the market exchange rates, 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. A new banking system was established to replace the old mono banking system with a two level banking system that separated the functions of management carried out by state bank from business activities of commercial banks. A new taxation system was also established in this period. A series of tax laws was promulgated including turnover tax, profit tax, export and import taxes. The new tax system contributed to the increase in fiscal revenue and macroeconomic stabilization. Price liberalization was carried out in the period 1989-1991. In the meantime, supply side related policies such as encouraging the development of a multi-ownership economy, restructuring of SOEs, decollectivizing and granting individuals and families long-term user rights to productive land in the agricultural sector were essential factors included in the reform package.

In the 1990s, particularly the first half, the economy showed very good performance. High economic growth was attained under stable macroeconomic conditions. As a result of a stabilization program, hyper inflation was curbed.

Table 1.1. Vietnam: Some Macroeconomic Indicators (1990-2003)														
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
GDP growth (%)	5.1	5.8	8.7	8.1	8.8	9.5	9.3	8.2	5.8	4.8	6.8	6.9	7.0	7.2
Agriculture growth (%)	1.0	2.2	6.9	3.3	3.4	4.8	4.4	4.3	3.5	5.2	4.6	3.0	4.1	3.2
Industry growth (%)	2.3	7.7	12.8	12.6	13.4	13.6	14.5	12.6	8.3	7.7	10.1	10.4	9.4	10.3
Services growth (%)	10.2	7.4	7.6	8.6	9.6	9.8	8.8	7.1	5.1	2.3	5.3	6.1	6.5	6.6
Unemployment rate in cities (%)						5.88	5.88	6.01	6.85	6.74	6.44	6.28	6.01	5.78
CPI index (1994=100)	33.2	54.7	72.2	84.6	100.0	117.9	129.9	136.3	148.4	155.1	160.9	163.8	170.5	179.3
Inflation rate (%)	45.9	64.8	32.0	17.3	18.2	17.9	10.2	4.9	8.8	4.6	3.7	1.8	4.1	5.1
FDI (implemented) (USD. Mil.)	120	165	333	832	1048	2276	1838	2074	800	700	800	900	1100	
ODA (implemented) (USD. Mil.)						358	148	384	539	787	1123	780	1786	
Export fob (USD. Mil.)	2404	2087	2581	2985	4054	5449	7256	9185	9360	11541	14483	15029	16706	20176
Annual change (%)	23.5	-13.2	23.7	15.7	35.8	34.4	33.2	26.6	1.9	23.3	25.5	3.8	11.2	20.8
Import cif (USD. Mil)	2752	2338	2541	3924	5826	8155	11144	11592	11500	11742	15637	16218	19745	25227
Annual change (%)	7.3	-15.0	8.7	54.4	48.5	40.0	36.6	4.0	-0.8	2.1	33.2	3.7	21.7	27.8
Trade balance (USD. Mil)	-348	-251	40	-939	-1772	-2706	-3888	-2407	-2140	-201	-1154	-1189	-3039	-5051
Exchange rate (Dongs per dollar)	6483	10037	11202	10641	10966	11038	11033	11683	13268	13943	14168	14725	15280	15585
Short term interest rate (% monthly)	4.00	3.83	3.48	2.35	2.10	2.10	1.57	1.13	1.20	1.12	0.88	0.77	0.82	0.80
Deposit rate (% monthly)	4.50	3.79	2.84	1.70	1.40	1.40	0.80	0.78	0.84	0.50	0.35	0.46	0.57	0.60
Long term interest rate (% monthly)	3.50	3.38	2.71	1.50	1.41	1.70	1.58	1.23	1.25	1.18	0.85	0.82	0.85	0.82
Domestic saving (%GDP)	2.9	10.1	13.8	16.8	17.1	18.2	17.2	20.1	21.5	24.6	27.1	28.8	28.7	28.2
Domestic investment (%GDP)	12.6	15.1	17.6	24.3	25.5	27.1	28.1	28.3	29.0	27.6	29.6	31.2	33.2	35.1

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
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Table 1.1. Vietnam: Some Macroeconomic Indicators (1990-2003) (Cont.)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Population (1000 pers)	66016.7	67242.4	68450.1	69644.5	70824.5	71995.5	73156.7	74306.9	75456.3	76596.7	77635.4	78685.8	79727.4	81902.4
Employment (1000 pers)	29412.3	30134.6	30856.3	31579.4	32303.4	33091	33761	34493	35233	35976	36702	37676	38715	39720
Employment by sector														
Agriculture (1000 pers)	21476.1	21907.3	22339.5	22755.5	23155.5	23534.8	23874.3	24196.4	24504.1	24791.9	25044.9	25304.9	25572.8	25840
Industry (1000 pers)	3305.7	3390.3	3473.9	3561.9	3654.6	3755.7	3887.7	4020.7	4157.1	4300.4	4445.4	4712.3	5002.5	5215
Services (1000 pers)	4630.5	4837	5042.9	5262	5493.3	5800.5	5999	6275.9	6571.8	6883.7	7211.7	7658.8	8139.7	8665
Composition of employment														
Agriculture (%)	73.0	72.7	72.4	72.1	71.7	71.1	70.7	70.1	69.5	68.9	68.2	67.2	66.1	65.1
Industry (%)	11.2	11.3	11.3	11.3	11.3	11.3	11.5	11.7	11.8	12.0	12.1	12.5	12.9	13.1
Services (%)	15.7	16.1	16.3	16.7	17.0	17.5	17.8	18.2	18.7	19.1	19.6	20.3	21.0	21.8
GDP at constant 1994 prices (Bil. VND)	131968	139634	151782	164043	178534	195568	213832	231264	244596	256269	273666	292535	313135	335821
GDP at current prices (Bil. VND)	41955	76707	110532	140258	178534	228892	272037	313624	361016	399942	441646	481295	536098	605491
Composition of GDP														
Agriculture (%)	38.7	40.5	33.9	29.9	27.4	27.2	27.8	25.8	25.8	25.4	24.5	23.2	23.0	21.8
Industry (%)	22.7	23.8	27.3	28.9	28.9	28.8	29.7	32.1	32.5	34.5	36.7	38.1	38.5	40.0
Services (%)	38.6	35.7	38.8	41.2	43.7	44.1	42.5	42.2	41.7	40.1	38.7	38.6	38.5	38.2

Source: General Statistic Office of Vietnam (GSO); Ministry of Planning and Investment, Vietnam (MPI); ADB- key indicators; and author's estimates.

1.2. Macroeconomic policy after Renovation program

As one important part of stabilization program, tight fiscal policy was adopted to constrain the budget deficit. The current expenditure of the government was curtailed to comply with the scope of fiscal revenue. Fiscal deficits dropped sharply and were tightly controlled. The financing of state budget deficits by printing money was halted and has been stopped since 1992 (Nghieu 2000:40). Borrowing to finance budget deficits has only been used for development investments emphasizing infrastructure investment. However, with the changes in economic conditions in the late 1990s when economic growth slowed down and inflation was curbed at a safe level, tight fiscal policy seemed less suitable. A more flexible policy should be considered.

Other key policy was implemented in Vietnam is tight monetary policy. Under tight monetary policy, money supply was strictly controlled. Money growth was kept in accordance with GDP growth and has been demand determined. In theory, the State Bank of Vietnam (SBV) could use some monetary policy tools such as interest rates, credit ceilings, reserve requirements, recapitalization, and Treasury Bill auction to control money supply. However, in reality, the money supply in Vietnam has been controlled mainly by the credit ceiling imposed for every commercial bank from 1994 (Thanh 2003:4). In fact, indirect tools did not work well under the less-developed financial system existing in Vietnam thus the SBV controlled the money supply under a direct mechanism rather than using indirect monetary policy tools like many other market economies. The increase in nominal interest rate and then a positive real rate aiming to stopping credit subsidies contributed greatly in curbing inflation. For a long time, interest rates had been controlled by SBV. The ceiling lending rates and then the basic lending rates with upper bounds were set by SBV. The lending rate ceiling on foreign currency loans was abolished in November 2001. Since then domestic borrowers in foreign currencies have been allowed to negotiate interest rates with domestic and foreign banks. Only after June 2002, were interest rates fully liberalized. Banks are now allowed to set lending rates on the basis of their own appraisal and negotiation with their customers.

Exchange rate policy was also considered as a main part of stabilization policy in Vietnam. In 1989 when Vietnam embarked on radical reform toward a market economy, the exchange rate was unified by a sharp devaluation of the official exchange rate. During the 1990s, the VND was kept stable with several discrete realignments. The attempts of SBV to keep exchange rate stable in this period had the primary purpose of stabilizing domestic prices while the economy was substantially dependence on imports. However, in this period, VND was considered overvalued and was under devaluation pressure. During the period 1997-1999, pressures to devalue the VND increased as financing current account deficits became more difficult due to a slowdown in foreign direct investment (FDI), thin foreign currency reserves with a concurrent decline in growth of exports. Worries about overvaluation of VND became more acute following the East Asian economic crisis that led to sharp devaluation of crisis countries' currencies, and thus reduced the competitiveness of Vietnamese commodities. Under pressure to devaluation with an accompanying fear of bad outcomes of a sharp devaluation under the introduction of a flexible regime, the SBV has adopted a cautious exchange rate policy,

which has allowed the VND to devalue modestly and gradually, while keeping strict control over foreign exchange. Vietnam has also imposed stronger controls over imports and current account transactions. Between 1997 to 2000, the VND depreciated by at least 20% with respect to the USD, but appreciated by at least 19% or more relative to currencies of crisis-affected ASEAN countries (CIEM 2001:35). A further devaluation is necessary in consideration of future export prospects.

Since 1998, Vietnamese economy growth was slowing down after a period of high economic growth rate. The regional situation after the Asian crisis and the country economic conditions has changed and it requires appropriate adjustments in macroeconomic policy.

2. A MACRO-ECONOMETRIC MODEL FOR VIETNAM

The main objective of this study is to analyze impacts of macroeconomic policy adjustment on the economy by applying a econometric model as a quantitative method.

The model will describe the behavior of aggregated agents. In practice such a model generally considers five agents: the households, the firms, the financial institutions, the State and its agencies, and the rest of the world. The model is supposed to describe the behavior of agents, but this behavior is not decided by theory alone. Formulas will be based on historical data, and validated through statistical tests. The estimated formulations have been defined in advance, according to some theory. The role of econometrics will be only to validate pre-set structural equations, and to lead the choice between alternate versions. The parameters of the equations are empirically estimated based on time series data. The model is a dynamic one. It means that in some cases, the past values of variables will affect present ones. This is a general characteristic of macro-econometric models.

This section introduces the data sources for the model and methodology used in modeling.

2.1. Data system and software used in model

Before 1988, Material Product System (MPS) was used as a System of General Socio-economic Information in Vietnam. From 1989 to 1992, under the support of International Statistical Agency, Vietnam's General Statistical Office started studying to apply System of National Accounts (SNA). The government Decree No 183/TTg on the official application of SNA to periodically compile the country's national accounts was promulgated in December 25, 1992 by the Prime Minister. After several years applying SNA in Vietnam, GSO has calculated some aggregate indicators and compiled some main accounts for the demand of macroeconomic management. However, the application of SNA in Vietnam has been inefficient. The reasons are that the initial basic data is not adequate and the accounting and statistical system are not improved enough to correspond with the contents of SNA. Thus, to a certain extent, Vietnamese data is inaccurate and inadequate (General Statistics Office 1998).

The model uses annual data, and the equations are generally estimated for a period ranging between 1986 and 2003, that is, the period of the dramatic transformation and the opening up of the Vietnamese economy. Almost all data comes from the Statistical Yearbook of Vietnam and reports of International organization (such as ADB, IMF,WB); some other data come from the Ministry of Planning and Investment (MPI), Vietnam, and Development Strategy Institute (DSI), Vietnam.

The software used to construct and run the model is EVIEWS 4.0.

2.2. Method of estimation

A model is a set of one or more equations that jointly describe the relationship between a set of variables. The model equations can come from many sources: they can be simple identities, they can be the result of estimation of single equations, or they can be the result of estimation using any one of multiple equation estimators. There are two approaches to estimate the model equations. One approach is to estimate each equation in the system separately. A second approach is to estimate, simultaneously, the complete set of parameters of the equations in the system. In reality, single equation estimation method is easier and more flexible for adjusting and selecting the form of equation[2]. There are some advanced technique to estimate system of equations such as Two Stage Least Squares (TSLS) or Three Stage Least Squares (3SLS) [3], however with Vietnamese data condition, the observations are limited [4] and it is ineffective for using some techniques such kind of techniques.[5] An alternative technique is used for this model estimation is the Seemingly Unrelated Model (SUR). The SUR model is a recursive model consisting of a series of endogenous variable as a group. This kind of model can improve on the efficiency of ordinary least squares. By writing the equation system as one combined equation, estimating that equation using least squares estimation. This increase the efficiency because there are more degree of freedom with which to estimate the parameters for variables than single one[6].

Thus the Vietnamese model, ordinary least squares (OLS) method is applied to estimate the single equations to identify the form of each equation. And than SUR model is applied for estimating system of equations.

A common finding in time series regressions is that the residuals are correlated with their own lagged values. This serial correlation violates the standard assumption of regression theory that disturbances are not correlated with other disturbances.

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[2] If one of the equations in the system is misspecified and estimate the parameters using single equation methods, only the misspecified equation will be poorly estimated. If system estimation techniques are employed, the poor estimates for the misspecification equation may "contaminate" estimates for other equations.
[3] For further discussion see Griffiths, Hill and Judge 1993.
[4] Series data is form 1986 to 2003
[5] Requirement for the effectiveness when using TSLS or some other methods is that the observations are rather big
[6] For further discussion see Pindyck and Rubinfeld 1991:308-311.

In this case we could apply auto regressive model to correct the serial correlation error. The simplest and most widely used model of serial correlation is the first-order autoregressive, or AR(1), model. For the simple case, if the AR(1) model is specified as

$$Y_t = \beta X_t + U_t \quad (1)$$

$$U_t = \rho U_{t-1} + \varepsilon_t \quad (2)$$

The parameter ρ is the first-order serial correlation coefficient. In effect, the AR(1) model incorporates the residual from the past observation into the regression model for the current observation. For example, if EVIEWS software is used to estimate, the linear model is transformed into nonlinear model as

$$Y_t = \rho Y_{t-1} + \beta(X_t - \rho X_{t-1}) + \varepsilon_t$$

by substituting the second equation into the first, and rearranging terms. The coefficients ρ and β are estimated simultaneously.

EVIEWS software provides the DW test, the Q-statistic and the Breusch-Godfrey LM test to test the serial correlation[7].

2.3. Model Specification

The model is a simple macro-econometric one with the assumption of demand determined economy in the short term, implying that increase in aggregate demand leads to increase in output and prices.[8] Output (GDPR) of the economy is determined by domestic demand (DR) and corrected by trade balance (TB). Domestic demand (DR) is determined as sum of total investment (IR), private (CPR) and government consumption (CGR). Private consumption is determined by disposable income (DIR). Disposable income is determined as income (GDPR) after tax. Because of lack of data on tax, government revenue from tax (REVGR) is used as proxy for tax. Total investment (IR) includes foreign direct investment (FDIR), domestic investment from firms (IFRD) and government investment (IGR). Domestic investment from firm (IFRD) is explained by income (GDPR), real short run loaning interest rate (SRR), and government investment (IGR). Real short run interest rate is determined by nominal interest rate (SR) after adjustment for inflation rate (P). Inflation rate is determined by changes in domestic price, here GDP deflator (PGDP) is used as domestic price. Domestic price (PGDP) is affected by change in aggregate demand in short term (DR)[9] and import deflator as domestic price of import (PM)[10]. Import deflator is determined by nominal exchange rate (ER) and

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[7] For details see EVIEWs user's guide book or EVIEW help.
[8] Change in demand in short run will move the economy along the short run aggregate supply curve, which slopes upward in short run, thus changing the output level, employment and price level.
[9] In short term, the expansion of aggregate demand will lead to change in price and output. The increase in price leads to inflation. This effect is considered as demand pull inflation. For further discussion, see Mankiw 2000:363-364.
[10] For a strongly import-dependent economy like Vietnam, change in import price leads to change in domestic price. This effect is considered as cost push inflation.

trading price of import (PM$). Trade balance is determined by net export (XR-MR). Export (XR) is explained by world demand (WD) [11] and price-competitiveness determined by nominal exchange rate, domestic price (PGDP) and trading price of exports (PX$). Import is explained by domestic demand (DR), export [12], and price-competitiveness. Real money demand is determined by real income. Money growth is assumed to be demand determined. Employment of the economy is determined by real output (GDPR).

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[11] Definition of World demand corresponds to the share normally allocated to Vietnamese exporters, considering the evolution of demand on the world market by normal clients of Vietnam (including major trading partners of Vietnam such as US, Japan, China, Australia, Singapore, Germany, UK, Taiwan, France, Korea, Philippines, Holland, Malaysia, Belgium, Hong Kong, Thailand, Indonesia) for the goods which Vietnam exports.

WD= $\sum_{i=1}^{n} GGDP_i \times W_i$

GGDP(i): Income growth of trading partner i
X(i): trade weight of trading partner i

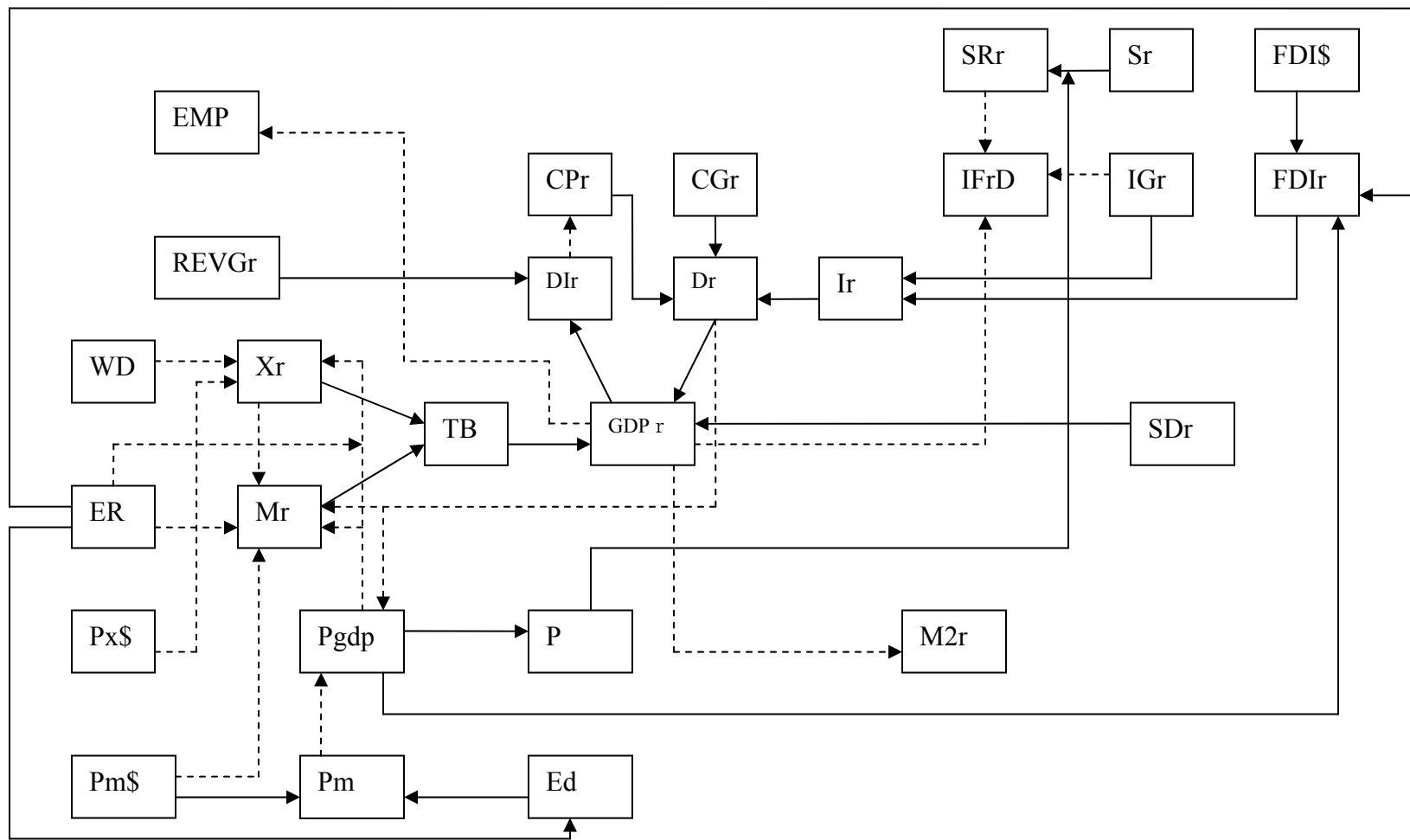[12] Part of imports are intermediate goods or materials used for exports.

Figure 2.1. Vietnam Macroeconomic Model Structure

Behavior Equations

(1). Private Consumption Equation

Real consumption (CPR) is simply defined as the function of real disposable income (DIR). Serial correlation is determined by using DW test.[13] Autoregressive (AR) model is applied to correct serial correlation.

Log(CPR)= 3.01+0.74*log(DIR)+[AR(1)= 0.903, AR(2)= -0.41]

Table 2.1. Estimation Result of Private Consumption Function

Dependent Variable: LOG(CPR)
Method: Least Squares
Sample(adjusted): 1988 2003
Included observations: 16 after adjusting endpoints
Convergence achieved after 5 iterations
LOG(CPR)=C(1)+C(2)*LOG(DIR)+[AR(1)=C(3),AR(2)= C(4)]

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	3.012369	0.301865	9.979183	0.0000
C(2)	0.738616	0.024964	29.58752	0.0000
C(3)	0.903265	0.236561	3.818322	0.0024
C(4)	-0.418865	0.239089	-1.751924	0.1053
R-squared	0.996886	Mean dependent var		11.90730
Adjusted R-squared	0.996108	S.D. dependent var		0.236052
S.E. of regression	0.014726	Akaike info criterion		-5.386025
Sum squared resid	0.002602	Schwarz criterion		-5.192878
Log likelihood	47.08820	Durbin-Watson stat		2.166292
Inverted AR Roots	.45+.46i		.45 -.46i	

The result of estimation shows that the coefficients conform well to theory. c(2) is positive and statistically significant at the 5 percent level, verifying a positive relationship between consumption and disposable income. The coefficient c(2)=0.74 means there will be 0.74% increase in consumption if there is 1% increase in disposable income.

(2). Domestic Investment From Firms Equation

Real domestic investment from firms (IFRD) is specified as the function of domestic real short-run interest rate (SRR), real income (GDPR) and government investment (IGR).

LOG(IFRD)=-7.07 - 0.004*SRR + 1.2*log(GDPR)+ 0.3*log(IGR)

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[13] According to the test, Durbin-Watson statistic is 0.666431, below 2, implying that there is serial correlation in the equation.

Table 2.2. Estimation Result of Private Investment Function

Dependent Variable: LOG(IFRD)
Method: Least Squares
Sample(adjusted): 1987 2003
Included observations: 17 after adjusting endpoints
LOG(IFRD)=C(1)+C(2)*(SRR)+C(3)*LOG(GDPR) +C(4)*LOG(IGR)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-7.076144	4.660618	-1.518284	0.1529
C(2)	-0.003973	0.001288	-3.085998	0.0087
C(3)	1.237718	0.559026	2.214061	0.0453
C(4)	0.300487	0.263691	1.139544	0.2750
R-squared	0.979358	Mean dependent var		10.47905
Adjusted R-squared	0.974595	S.D. dependent var		0.619376
S.E. of regression	0.098722	Akaike info criterion		-1.590688
Sum squared resid	0.126699	Schwarz criterion		-1.394638
Log likelihood	17.52085	Durbin-Watson stat		2.145583

The specification of the domestic investment from firms function is relatively simple. However, it seems to provide a reasonably good explanation of investment behavior in Vietnam. Real short-run interest rate negatively relates to domestic investment from firms as expected and is significant at 1 percent level. However, Vietnamese investment is quite interest-inelastic, with the interest elasticity estimated to be about -0.004. This is due to the fact that for a long time, the interest rate in Vietnam was tightly controlled by the State Bank.[14] Real income elasticity to investment is 1.2 and significant, implies that 1 percent increase in real income leads to 1.2 percent increase in real domestic investment from firms. One interesting result is that government investment could influence the private investment from firms as crowding in effect. Increased government investment, for example in infrastructure acts as to some extent a catalyst to private investment. The government investment elasticity is estimated to be 0.3%, meaning that 1 percent increase in government investment leads to 0.3% increase in private investment.

(3). Real Exports Equation

Exports are assumed to be a function of the price-competitiveness (ER*PX$/PGDP) and the world demand (WD), with positive coefficients for both variables. The exports equation may therefore be expressed as:

LOG(XR)= -8.27+ 2.46*LOG(WD)+ 0.87*LOG(ER*PX$/PGDP)

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[14] Until 2002, the interest rate was controlled by SBV. The SBV set the ceiling lending rates and then the base lending rates with upper bound for commercial banks.

Table 2.3. Estimation Result of Real Export Function

Dependent Variable: LOG(XR)
Method: Least Squares
Sample(adjusted): 1987 2003
Included observations: 17 after adjusting endpoints
LOG(XR)=C(1)+C(2)*LOG(WD)+C(3)*LOG(ER*PX$/PGDP)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-8.278408	3.184326	-2.599736	0.0210
C(2)	2.458018	0.149501	16.44151	0.0000
C(3)	0.869123	0.361072	2.407063	0.0305
R-squared	0.960613	Mean dependent var		11.05249
Adjusted R-squared	0.954986	S.D. dependent var		0.909209
S.E. of regression	0.192903	Akaike info criterion		-0.294477
Sum squared resid	0.520960	Schwarz criterion		-0.147439
Log likelihood	5.503052	Durbin-Watson stat		1.720234

All coefficients in the estimation export function bear the expected signs and are significant. As a small country, world demand has a big impact on Vietnam's export, reflected by the elasticity of world demand much larger than unity, 2.46. Elasticity of price-competitiveness is 0.87, implies significant export response to relative price changes.

(4). Real Imports Equation

Real imports are conventionally related negatively to price-competitiveness (ER*PM$/PGDP) and positively to real domestic demand. In reality, imports in Vietnam is not only for domestic demand but are also used for re-export as intermediate goods. Thus export is included in the import function as a explanation variable. The form of imports equation as

LOG(MR)=-3.85+ 0.96*LOG(DR)+ 0.43*LOG(XR)-0.14*LOG(ER*PM$/PGDP)

In the export equation the estimated coefficients also bear the right sign and are all significant at conventional levels. Domestic demand elasticity is rather high, 0.96, implies that Vietnamese economy depends heavily on imports. 1% increase in domestic demand will lead to 0.96% increase in imports. Exports elasticity is 0.43, implying that 1% increase in exports is responded by 0.43% imports. Demand for imports response to relative price change is not so significant. 1% change in relative price leads to 0.14% change in imports.

Table 2.4. Estimation Result of Real Imports Function

Dependent Variable: LOG(MR)
Method: Least Squares
Sample: 1986 2003
Included observations: 18
LOG(MR)=C(1)+C(2)*LOG(DR)+C(3)*LOG(XR)+C(4) *LOG(ER*PM$/PGDP)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3.852497	1.431353	-2.691508	0.0175
C(2)	0.957276	0.096834	9.885781	0.0000
C(3)	0.425392	0.038900	10.93550	0.0000
C(4)	-0.135214	0.083816	-1.613220	0.1290
R-squared	0.998794	Mean dependent var		11.25242
Adjusted R-squared	0.998536	S.D. dependent var		0.732698
S.E. of regression	0.028039	Akaike info criterion		-4.117324
Sum squared resid	0.011006	Schwarz criterion		-3.919464
Log likelihood	41.05592	Durbin-Watson stat		1.631280

(5). Real money demand equation

Keynes visualized the demand for money (real cash balances) as rising from transactions, speculative and precautionary motives. For the transaction and precautionary purposes, the higher income, the higher demand for money. For speculative purposes, the higher interest rate, the less demand for money (Jha 2003:30). In fact, the strongest motive influencing the demand for money in Vietnam is transactions, which depend on income. The speculative demand for money is not very pronounced in Vietnam since the money market is not well developed and few alternative financial assets exit. Government bonds and Treasury bills are largely purchased by the financial institutions as investment for their idle funds. Thus the money demand in Vietnam is assumed as a function of income. Lagged dependent variable is included in the equation to analyze adjustment between short term and long term. The equation is defined as

LOG(M2R)= -3.545782+ 0.450740*LOG(GDPR)+ 0.833869 *LOG(M2R(-1))

The real income elasticity to money demand is 0.45 in short term, implying 1 percent change in income lead to 0.45 percent change in demand for money. Long run elasticity is much higher, about 2.7 percent.

Table 2.5. Estimation result of Real Money Demand Function

Dependent Variable: LOG(M2R)
Method: Least Squares
Sample(adjusted): 1987 2003
Included observations: 17 after adjusting endpoints
LOG(M2R)=C(1)+C(2)*LOG(GDPR)+C(3)*LOG(M2R(-1))

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3.545782	2.260778	-1.568390	0.1391
C(2)	0.450740	0.313596	1.437329	0.1726
C(3)	0.833869	0.158339	5.266354	0.0001
R-squared	0.968564	Mean dependent var		10.96393
Adjusted R-squared	0.964073	S.D. dependent var		0.758041
S.E. of regression	0.143683	Akaike info criterion		-0.883629
Sum squared resid	0.289027	Schwarz criterion		-0.736591
Log likelihood	10.51085	Durbin-Watson stat		1.515932

(6). GDP deflator equation

GDP deflator can be understood as the general price level. For Vietnamese economy in the transition period, the two main factors assumed to have the impact on change in price level are import price, considered as cost push inflation, and aggregate demand change (DR) in the short term considered as demand pull inflation. It is useful to examine the effect of demand expansion policy on price level. The equation is defined as:
LOG(PGDP)= -3.123766+ 0.888774*LOG(PM)+ 0.255658*LOG(DR)

Table 2.6. Estimation Result of GDP Deflator Function

Dependent Variable: LOG(PGDP)
Method: Least Squares
Sample: 1986 2003
Included observations: 18
LOG(PGDP)=C(1)+C(2)*LOG(PM)+C(3)*LOG(DR)

	Coefficient	Std. Error	t-Statistic	Prob.
C_PGDP(1)	-3.352237	1.015591	-3.300774	0.0049
C_PGDP(2)	0.890023	0.016685	53.34398	0.0000
C_PGDP(3)	0.272739	0.082405	3.309723	0.0048
R-squared	0.998013	Mean dependent var		-0.611492
Adjusted R-squared	0.997749	S.D. dependent var		1.604323
S.E. of regression	0.076124	Akaike info criterion		-2.161893
Sum squared resid	0.086923	Schwarz criterion		-2.013498
Log likelihood	22.45704	Durbin-Watson stat		1.919235

The result of the equation are significant and of the expected sign. Price of import has strong impact on domestic price. 1 percent change in price of imports leads to 0.89 percent change in price level. The elasticity of total demand is 0.27, implies that 1 percent change in income leads to 0.27 percent change in price level.

(7). Employment Equation

For the employment function, demand for employment will be determined by aggregate demand. Increase in aggregate demand in short run could create more jobs. This idea combine with the idea of demand pull inflation discussed in equation (6) show the determination of output, labor and price level in the short term. Output expansion leads to the increase not only in employment but also in price level, implies the trade off between unemployment rate and inflation rate.[15] Serial correlation is determined by using DW test.[16] Autoregressive (AR) model is applied to correct serial correlation.

LOG(EMP)= 6.661686+ 0.307777 *LOG(GDPR)+[AR(1)= 0.458776]

Table 2.7. Estimation Result of Demand for Employment Function

Dependent Variable: LOG(EMP)
Method: Least Squares
Sample(adjusted): 1987 2003
Included observations: 17 after adjusting endpoints
Convergence achieved after 4 iterations
LOG(EMP)=C(1)+C(2)*LOG(GDPR)+[AR(1)=C(3)]

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	6.661686	0.116088	57.38462	0.0000
C(2)	0.307777	0.009492	32.42479	0.0000
C(3)	0.458776	0.244922	1.873154	0.0821
R-squared	0.996012	Mean dependent var		10.40613
Adjusted R-squared	0.995442	S.D. dependent var		0.110432
S.E. of regression	0.007455	Akaike info criterion		-6.800976
Sum squared resid	0.000778	Schwarz criterion		-6.653938
Log likelihood	60.80830	Durbin-Watson stat		1.735337
Inverted AR Roots	.46			

Result of estimation implies that for 1% increase in output there is for 0.3 percent increase in employment.
By applying SUR model to test for the efficient of OLS, the result of two methods is very close and the estimation of OLS method can be accepted for the model.

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[15] The idea reflects Phillip's curve.
[16] According to the test, Durbin-Watson statistic is 0.979834, below 2, implying that there is serial correlation in the equation.

Table 2.8. Result of applying SUR model

	Coefficient	Std. Error	t-Statistic	Prob.
Estimation Method: Seemingly Unrelated Regression				
Sample: 1986 2003				
Included observations: 18				
Total system (unbalanced) observations 120				
Iterate coefficients after one-step weighting matrix				
Convergence achieved after: 1 weight matrix, 9 total coef iterations				
Consumption				
C_CPR(1)	2.901921	0.183462	15.81757	0.0000
C_CPR(2)	0.747667	0.015232	49.08558	0.0000
C_CPR(3)	0.641477	0.147362	4.353070	0.0000
C_CPR(4)	-0.296180	0.147318	-2.010481	0.0472
Investment				
C_IFRD(1)	-7.113727	3.499958	-2.032518	0.0449
C_IFRD(2)	-0.004705	0.000976	-4.818946	0.0000
C_IFRD(3)	1.234334	0.418772	2.947511	0.0040
C_IFRD(4)	0.310105	0.197317	1.571607	0.1193
Export				
C_XR(1)	-8.905378	1.942122	-4.585385	0.0000
C_XR(2)	2.482339	0.129318	19.19561	0.0000
C_XR(3)	0.923995	0.221594	4.169771	0.0001
Import				
C_MR(1)	-4.287166	1.122918	-3.817881	0.0002
C_MR(2)	0.980079	0.076449	12.82002	0.0000
C_MR(3)	0.415072	0.030532	13.59462	0.0000
C_MR(4)	-0.106132	0.066430	-1.597646	0.1134
Money Demand				
C_M2R(1)	-2.325051	1.465072	-1.586987	0.1158
C_M2R(2)	0.295212	0.178702	1.651981	0.1018
C_M2R(3)	0.896829	0.082706	10.84355	0.0000
GDP deflator				
C_PGDP(1)	-3.473885	0.839998	-4.135587	0.0001
C_PGDP(2)	0.890341	0.011793	75.49757	0.0000
C_PGDP(3)	0.282467	0.068226	4.140165	0.0001
Labor Demand				
C_EMP(1)	6.648014	0.150151	44.27548	0.0000
C_EMP(2)	0.309008	0.012223	25.28034	0.0000
C_EMP(3)	0.644643	0.141861	4.544201	0.0000

Model system: the model includes 7 behaviors equations and 10 identities

(1). Private consumption equation

Log(CPR)= 3.01+0.74*log(DIR)+[AR(1)= 0.903, AR(2)= -0.41]

(2). Domestic Firm Investment Equation

LOG(IFRD)=-7.07 - 0.004*SRR + 1.2*log(GDPR)+ 0.3*log(IGR)

(3). Real Exports Equation

LOG(XR)= -8.27+ 2.46*LOG(WD)+ 0.87*LOG(ER*PX$/PGDP)

(4). Real Imports Equation

LOG(MR)=-3.85+ 0.96*LOG(DR)+ 0.43*LOG(XR)-0.14*LOG(ER*PM$/PGDP)

(5). Real money demand equation

LOG(M2R)= -3.545782+ 0.450740*LOG(GDPR)+ 0.833869 *LOG(M2R(-1))

(6). GDP deflator equation

LOG(PGDP)= -3.123766+ 0.888774*LOG(PM)+ 0.255658*LOG(DR)

(7). Employment equation

LOG(EMP)= 6.661686+ 0.307777 *LOG(GDPR)+[AR(1)= 0.458776]

(8). Real GDP includes domestic demand and trade balance and corrected by statistical discrepancy

GDPR=DR+TB-SDR

(9). Real domestic demand includes total investment and consumption

DR=IR+CPR+CGR

(10). Real total investment includes foreign direct investment, government investment and domestic investment from firms

IR=FDIR+IGR+IFRD

(11). Foreign direct investment in constant price

FDIR=(FDI$*ER/PGDP)/1000

(12). Real disposable income

DIR=GDPR-REVGR

(13). Real trade balance

TB=XR-MR

(14). Inflation rate

P=(PGDP/PGDP(-1) – 1)*100

(15). Real short run loaning interest rate

SRR=SR - P

(16). Import deflator

PM=ED*PM$

(17). Exchange rate index

ED=ER/10965.7[17]

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[17] Benchmark year exchange rate in 1994

Table 2.9. Model evaluation

	CPR	EMP	GDPR	IFRD	M2R	MR	PGDP	PM	XR
					Percentage error				
1998	0.63	-0.6	0.22	0.16	1.18	0.40	0.12	-2E-05	-0.11
1999	0.58	-0.42	0.22	0.46	1.09	0.43	0.13	-3E-05	-0.11
2000	-1.42	-0.33	-0.44	-0.62	0.71	-0.94	-0.29	2E-05	0.25
2001	-2.46	-0.39	-0.63	-0.79	0.31	-1.55	-0.47	3E-05	0.41
2002	-2.05	-0.09	-0.48	-0.46	0.04	-1.24	-0.38	2E-05	0.33
2003	0.38	0.38	0.11	0.42	0.08	0.31	0.09	-2E-05	-0.08
RMSPE	1E-02	8E-04	8E-04	1E-03	3E-03	4E-03	4E-04	3E-12	3E-04

Results of simulation for the past, in the period 1998-2003, are acceptable. The percentage errors of some indicators is from -2% to 1.158%. Root mean squared percentage error (RMSPE)[18] of indicators are very small. The model could be used to do simulations for the period of 1998-2003. Next section is use for policy simulation.

3. ASSESSMENT OF THE POLICIES' ADJUSTMENT

After the East Asian economic crisis, the Vietnamese economy slowed down. The VND was considered overvalued and appreciated relative to currencies of crisis-affected ASEAN countries, thus reducing the competitiveness of Vietnam commodities. Tight fiscal policy was no longer appropriate to promote growth. Some adjustments in macro policy were now needed. In this part, two simulations have been implemented to assess the impact of policy adjustment on Vietnamese economy in the period 1998-2003. The first one assumes a permanent increase in government investment. The second one studies the effect of nominal exchange rate devaluation. With these two simulations, the main channels through which the impact of policy adjustment on Vietnamese economy will be determined.

3.1. The impact of fiscal relaxation, government investment increase by 5%
The first simulation implemented corresponds to a permanent 5% increase in government investment. Table 3.1 presents the results of the simulations for the main variables relative to their baseline values.

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[18] $\text{RMSPE} = 100 \times \sqrt{\frac{1}{n} \sum_{t=1}^{n} \left(\frac{\hat{y} - y}{y} \right)^2}$

An increase in government investment has two implications. First, it directly raises the total demand. Second, it influences private investment. 5% increase in government investment leads to about 0.31% increase in output and about 1.88% increase in domestic investment from firms. More jobs are created; employment increases by 0.1%. Domestic prices rise by 0.2%. However, increase in government investment worsens the trade balance. Domestic price increases makes the Vietnamese commodities less competitive, thus exports reduces by 0.18%. Increase in domestic demand and domestic prices lead to 0.67% increase in imports.

Table 3.1. The Effect of 5% Increase in Government Investment

(percentage change from base)

	IGR	GDPR	IFRD	CPR	PGDP	M2R	EMP	XR	MR	TB
1998	5.00	0.40	2.01	0.36	0.22	0.30	0.12	-0.19	0.72	-5.67
1999	5.00	0.36	1.92	0.31	0.21	0.41	0.11	-0.19	0.70	-9.73
2000	5.00	0.34	1.90	0.29	0.22	0.49	0.10	-0.19	0.71	-11.61
2001	5.00	0.27	1.82	0.24	0.20	0.53	0.08	-0.18	0.66	-9.94
2002	5.00	0.26	1.80	0.23	0.20	0.56	0.08	-0.17	0.66	-8.09
2003	5.00	0.23	1.77	0.20	0.20	0.57	0.07	-0.18	0.67	-6.50
Average	5	0.31	1.88	0.27	0.20	0.43	0.10	-0.18	0.67	-8.14

The first conclusion for this simulation is that an increase in government investment could promote growth by increasing demand of the economy; however, it worsens the trade balance and leads to an increase in domestic prices.

3.2. The effect of devaluation

The second simulation concerns the nominal exchange rate. Competitiveness for domestic commodities could be gain by devaluing the domestic currency. Table 3.2 investigates the effects of 5 percent devaluation of the VND.

The simulated effect of a devaluation are quite interesting. Undoubtedly, a devaluation has a significant effect on output. Five percent devaluation would increase real GDP by a 0.27 percent. However, as import prices and domestic demand enter to determine domestic prices, the increase in nominal exchange rate implied by a devaluation leads to an increase in domestic prices. This would lead to a 4.51 % increase in the domestic price level.

Table 3.2. The effect of 5 % devaluation of the VND

(percentage change from base)

	ER	GDPR	IFRD	CPR	PGDP	PM	M2R	EMP	XR	MR	TB	ERR
1998	5	0.25	0.24	0.22	4.50	0.32	0.08	0.42	0.31	0.25	0.48	0.25
1999	5	0.27	0.34	0.24	4.51	0.39	0.08	0.41	0.34	0.32	0.47	0.27
2000	5	0.27	0.34	0.24	4.51	0.45	0.08	0.41	0.35	0.43	0.47	0.27
2001	5	0.28	0.34	0.24	4.51	0.50	0.08	0.41	0.35	0.31	0.47	0.28
2002	5	0.27	0.34	0.24	4.51	0.54	0.08	0.41	0.35	0.19	0.47	0.27
2003	5	0.27	0.33	0.23	4.51	0.57	0.08	0.41	0.35	0.09	0.47	0.27
AVER	5.0	0.27	0.32	0.23	4.51	0.46	0.08	0.41	0.34	0.26	0.47	0.27

The effect on trade is positive. Export increases by 0.34%. Import also increases by 0.26% as a result of increase in domestic demand. However increase in export is larger than in import; thus balance of trade is still improved by an increase of 0.47%. Because of inflationary effect of devaluation, 5% depreciation in nominal exchange rate leads to only 0.27% depreciation in real exchange rate.

3.3. Model limitations

The model presented in this paper emphasises the role of macro policies in the Vietnamese transitional economy. The model describes the behavior of aggregated agents mostly on the demand side of the economy. It gives a central role to macro policy as a way to promote growth in the short run. However there are still several limitations. Lack of accurate and adequate data is always the most difficult issues for quantitative studies of Vietnamese economy, and thus the model constructed in this study specified as the simple one. The model only focuses on the demand side of the economy and is not able to analyze the impact on supply side. Lack of data in banking and financial sector limits the ability of the model in analyzing impacts monetary policy in this study.

4. CONCLUSION

Since 1986, Vietnam has been in the transition from the centrally planned economy to a market economy. "Renovation" policy, or the Vietnamese "Doimoi" battle-cry moved the economic system towards major policy changes and economic reforms. In the late 1980s, Vietnam embarked on comprehensive reform towards a market economy. The reform aimed to stabilize the economy, remove administrative controls that stifled economic performance, and develop the markets. As the combination, the stabilization program adopted by the Vietnamese government in 1989 included three key macroeconomic policies which played an important role in stabilizing the economy. Tight fiscal policy and fiscal reform were implemented for the purpose of improving fiscal stance. Tight monetary policy and banking system reform were adopted as a measure to control money growth and establish the prerequisite fundamentals for market economy. Trade reform and an appropriate exchange rate adjustment were undertaken, on the one hand to promote trade relationships, on the other hand to stabilize domestic prices. macroeconomic policies in Vietnam have contributed much to the success of the country

after Renovation policy, especially over the last decade. However, the slowdown in economic growth in some recent years has raised the need for suitable adjustments in economic management.

Relaxing fiscal policy and devaluation of VND are suggested as two promoting growth policies. The simulation results show that relaxing fiscal policy implying a modesty increase in government investment could promote growth by increasing demand of the economy; however, it worsens the trade balance and leads to an increase in domestic prices. Devaluation of VND could both promote growth and improve trade by raising the competitiveness of domestic commodities. The domestic price also increase by nearly the level of devaluation.

Under the conditions in Vietnam in recent years, when the economy has been slowing down and inflation rate has been kept at low level, a modest fiscal relaxation and devaluation policy could be accepted to promote growth.

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Appendix

List of variables

	Variable	Unit	Explaination
Endogenous			
1	GDPR	Bil.dongs	GDP at constant prices
2	DR	Bil.dongs	Final demand at constant prices
3	IFRD	Bil.dongs	Domestic investment firms at constant prices
4	FDIR	Bil.dongs	Foreign direct investment at VND
5	CPR	Bil.dongs	Private consumption at constant prices
6	XR	Bil.dongs	Export at constant prices
7	MR	Bil.dongs	Import at constant prices
8	TB	Bil.dongs	Trade balance
9	P	%	Inflation rate
10	EMP	Thous.pers	Labor demand
12	PGDP	Index	GDP deflator
13	M2R	Bil.dongs	Real money demand
14	PM	Index	Import deflator
15	SRR	%	Real short run interest rate
16	IR	Bil.dongs	Real total investment
17	ED	Index	Exchange rate index
Exogenous			
16	CGR	Bil.dongs	Government consumption at constant prices
17	ER	dongs/US$	Exchange rate
18	FDI$	Mil US	Real FDI
19	IGR	Bil.dongs	Government investment at constant prices
20	PX$	index	Export trading price
21	PM$	index	Import trading price
22	RI	%	Nominal Interest rate
23	SDR	Bil.dongs	Statistical discrepancy at constant prices
24	WD	index	World demand
25	SR	%	Nominal short run interest rate
26	REVGR	Bil. dongs	Government revenue from tax at 1994 prices