

Sustainable growth in Romania: a fundamental perspective

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Introduction

In the past three years, Romanian economy has made slow but steady steps toward stabilization and recovery. The CPI inflation rate has fallen from above 40% in 2001 to around 10% by mid-2004, while the real growth rate firmly stayed around 5% annually. How could we maintain such robust economic performance and achieve long-term sustainable growth? This paper sheds light on the factors underlying present smooth progress, by identifying and examining fundamental macroeconomic shocks-aggregate supply and demand shocks, which are not directly observable. In the empirical experiment below, real disturbances to the economy are decomposed to "aggregate supply" and "aggregate demand" shocks, by vector auto-regression (VAR) with structural restrictions based on macroeconomic theory. Direction and strength of supply and demand shocks should reflect the effectiveness of stabilization and structural policies. In order to investigate how the structural shocks are related to exogenous sources, the paper further implements granger causality tests and calculates impulse response functions on supply and demand shocks and exogenous variables, e.g. financial flows.

I. Aggregate Demand and Supply

Aggregate demand and supply shocks are decomposed from dual-variable VAR on log differences of aggregate output (q) and price (p), which are both stationary. The final objectives of this decomposition could be written in a moving average (MA) representation:

$$(1) \mathbf{A}(\mathbf{L})\mathbf{x}_t = \mathbf{u}_t, \text{Var}(\mathbf{u}_t) = \mathbf{I}$$

where \mathbf{x}_t is a column vector of observed time series, $(q_t, p_t)'$, $\mathbf{A}(\mathbf{L})$ is 2×2 matrices lag polynomial², and \mathbf{u}_t is a vector of mutually and serially uncorrelated structural shocks, $(s_t, d_t)'$, where s_t and d_t respectively denotes supply and demand shocks. In a typical Wold MA representation, endogenous variables are written as sum of lagged disturbances,

$$(1') \mathbf{x}_t = \mathbf{Z}(\mathbf{L})\mathbf{u}_t$$

The starting point of the decomposition is the reduced VAR in MA representation;

$$(2) \mathbf{B}(\mathbf{L})\mathbf{x}_t = \mathbf{e}_t, \text{Var}(\mathbf{e}_t) = \hat{\mathbf{U}} \text{ and } \mathbf{B}(0) = \mathbf{I}$$

where \mathbf{e}_t is vector of white noise residuals, $(e_{1t}, e_{2t})'$. Comparing (1) and (2), we clearly see the linear relationship between observed and structural shocks;

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² i.e. $\mathbf{A}(\mathbf{L})\mathbf{x} = \mathbf{A}(0)\mathbf{x} + \mathbf{A}(1)\mathbf{x}_{-1} + \mathbf{A}(2)\mathbf{x}_{-2} + \dots$, with $\mathbf{A}(i)$ being 2×2 matrix.

$$(3) \mathbf{e}_t = \mathbf{A}(0)\mathbf{u}_t$$

Thus the knowledge of $\mathbf{A}(0)$ enables us to recover structural disturbance \mathbf{u}_t from observed shocks \mathbf{e}_t . By self-multiplying the both side of equation (3) we obtain $\dot{\mathbf{U}} = \mathbf{A}(0)\mathbf{A}(0)'$, which impose three restrictions on $\mathbf{A}(0)$. The fourth restriction is imposed by utilizing long-term nature of structural disturbances. According to macroeconomic theory, aggregate supply curve stands vertical in the long run, which means demand shocks has no effect on aggregate output level. In equation (1)', this means that upper right entry of matrix $\dot{\mathbf{OZ}}(i)$ should vanish. Equivalently,

$$(4) \begin{bmatrix} q_1 \\ p_1 \end{bmatrix} = \begin{bmatrix} c_{11} & 0 \\ c_{21} & c_{22} \end{bmatrix} \begin{bmatrix} s_1 \\ d_1 \end{bmatrix}$$

If these structural shocks are identified successfully, supply shocks would raise the output and lower the prices, with both effects long lasting, while demand shocks temporarily stimulate the output and also increase the prices, with the latter persists as the supply curve stands vertical in the long run. Figure 1 below graphically plots how the output and prices react to the shocks in aggregate supply and demand. The responses are consistent with what macroeconomic theory predicts;

- Positive supply shocks correspond to down-right shift of aggregate supply curve while negative shocks represents down-left shift.
- For the demand side, positive demand shocks means up-right shift of demand schedule, and vice-versa.

Figure 2 depicts the time series of decomposed supply and demand shocks. The figure manifests the fundamental development underlying Romania's recent economic performance. Some extreme movement from late 1996 through 1997 is typical crisis pheno-

mena, with a drastic change in the terms of trade resulting the collapse of the supply side. Such movement is also widely observed in other crisis-hit emerging market economies. The graph provides a supporting evidence of a drastic change in the terms of trade and resulting collapse of supply side. However, except the crisis period - from late 1996 to 1999, the economy seems to be dominated by continuous positive supply shocks and modest demand shocks, which suggests that the aggregate supply curve has continuously shifted down-right, while up-right shift of aggregate demand curve has been modest, altogether contributing stabilization and steady growth.

Theoretically, the preferable supply shocks are attributed to productivity growth caused by new investments and structural reform, while stabilization and fiscal discipline eased pressure on the demand side. In the next section, we empirically examine the source of fundamental disturbances.

II. Sources of Real Shocks

Once the structural macroeconomic shocks are robustly identified, our interest now is how exogenous or policy variables affect those structural shocks. In the empirical experiment below, such exogenous variables are selected on two rationales. Firstly, they should be the variables that the government policy could influence. In this connection, public expenditure variables are eliminated considering current fiscal consolidation effort. Secondly, since estimated structural shocks are monthly time series, our investigation is limited to variables with monthly data available, most of which, consequently, are financial flows but non of them reflects directly the structural outcomes. The exogenous variables tested below are;

Bank lending rate, Wage, Money (M1), Broad money (M2), Net domestic credit, Net foreign asset and Foreign currency deposit. All but Bank lending rate are first differences of logs and stationary.

Firstly, granger causality are examined to find whether above eight variables granger-cause the supply or demand shocks. For each variable, the granger test was implemented on a tri-variate VAR on an exogenous variable with supply and demand shocks. The lag lengths are determined by Akaike Information Criteria. The test results, as summarized in Table 1, suggests that both supply and demand shocks have strong causal relationships with tested variables, except Bank lending rate does not significantly granger-cause demand shock. Most notably, financial flow variables, e.g. changes in Money (M1), Broad money (M2), Net foreign asset and Foreign currency deposits, significantly granger-cause demand shock within short lags of 1-2 months. Meanwhile, for supply shock, Bank lending rate and change in Net foreign asset have causal relation with longer lags of 6-7 months, while change in Foreign currency deposits has significance with 2 - month lag.

Having tested causalities, we now examine the direction of the influence by taking impulse response functions from the same tri-variate VARs estimated above. As graphed in Figures 3-8,

impulse response to those variables could be interpreted as follows.

- Rise in interest rate has contractional effect on both supply and demand side, the latter appearing with lags (Figure 3).
- Increase in wage damages the supply side and heats up the demand side, together potentially deteriorating the domestic and external balance, as well as sustainability of economic growth (Figure 4).
- Increase in narrow money (M1), which mainly consists of local currency stock, help maintain the supply capacity and squeeze the demand pressure, supposedly by easing pressure on firms to settle payments by their products (Figure 5).
- Increase in broad money supply (M2), in contrast, causes slightly positive demand shock and almost neutral with supply shock direction (Figure 6). The result is further examined with change in foreign currency stock below.
- Increase in net domestic credit has no significant direction on the supply side, while enhancing the demand shock (Figure 7).
- Increase in foreign currency deposits raise demand and lower supply quite significantly, which suggests the relationship between consumption and hard currency stock, as well as corporate liquidity problem (Figure 8).

Table 1

Granger Causality Tests Results

Independent Variables	Model lags	Chi of Dependent Variables	
		Supply shock	Demand shock
Bank lending rate	6	0.0070***	0.1373
Wage	1	0.0110**	0.0307**
Money (M1)	1	0.0698*	0.0000***
Broad money (M2)	3	0.0233**	0.0000***
Net domestic credit	1	0.0219**	0.0266**
Net foreign asset	7	0.0029***	0.1130
	2	0.5228	0.0050***
Foreign currency deposit	2	0.0051***	0.0000***

III. Concluding Remarks

The results of above experiment demonstrate that, in spite of significant causal relationship between financial variables and real shocks, the direction of influence is in many causes not definitive. Such neutrality of financial sector on real economic movement has seemingly further affirmed after the economic crisis, which suggests the malfunctioning of the financial intermediary. Such de-intermediation process corresponds with de-monetization

of the economy, which is closely related with rampant barter transactions dominating the corporate sector. The situation, together with current limitation on policy measures requiring fiscal expenditure, indeed makes everything "exogenous", or out of control, which makes the economy vulnerable to any additional external disturbances. The balance sheet problem of Romania might not be the one which induce financial crisis, but it might well stagnate the economy and prevent it from rapid growth.

Figure 1

Impulse Response of Output and Prices to Structural Shocks

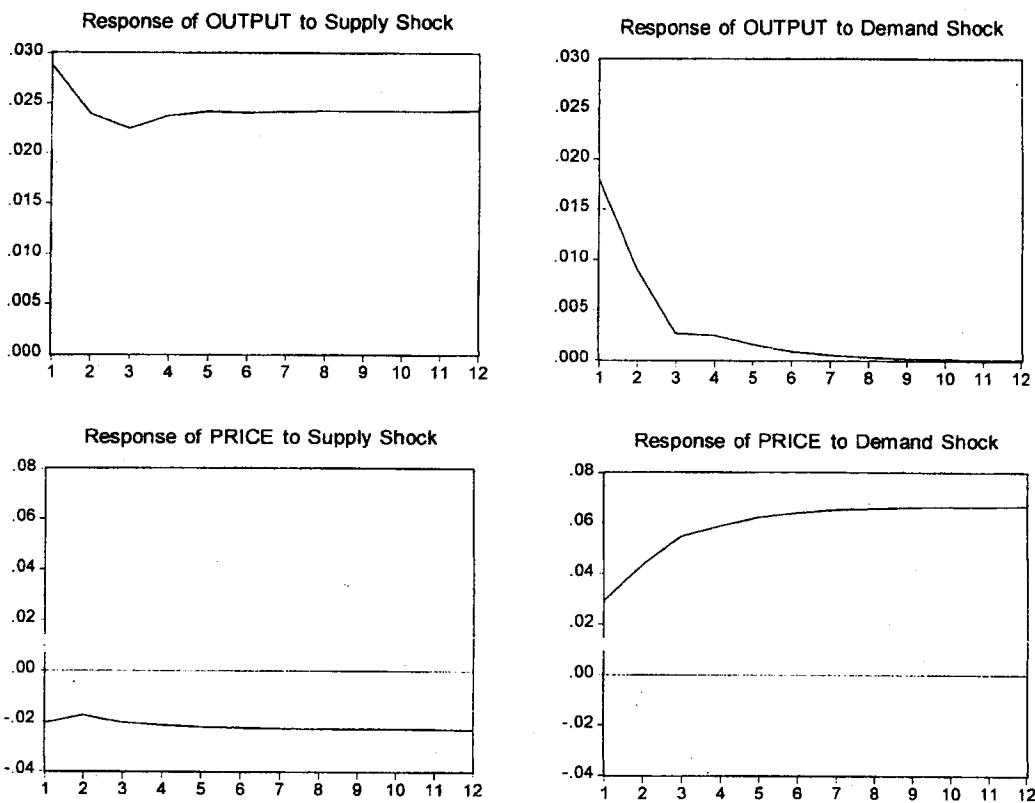


Figure 2

Romania: Aggregate Supply and Aggregate Demand Shocks

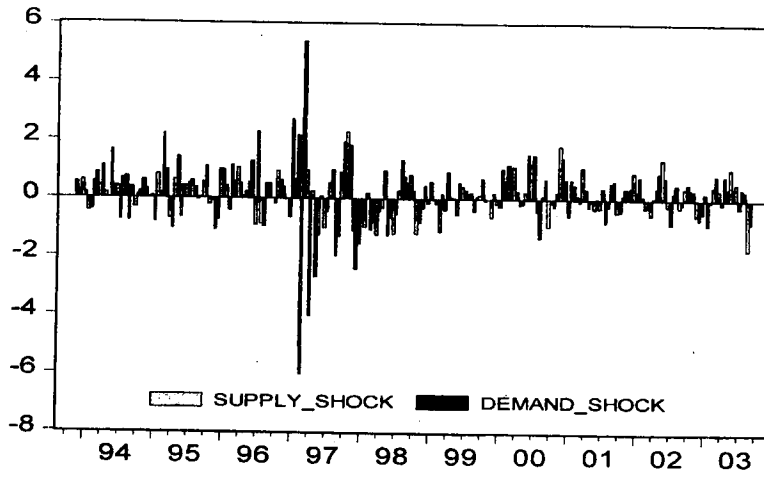


Figure 3

Impulse Response to Lending Rate

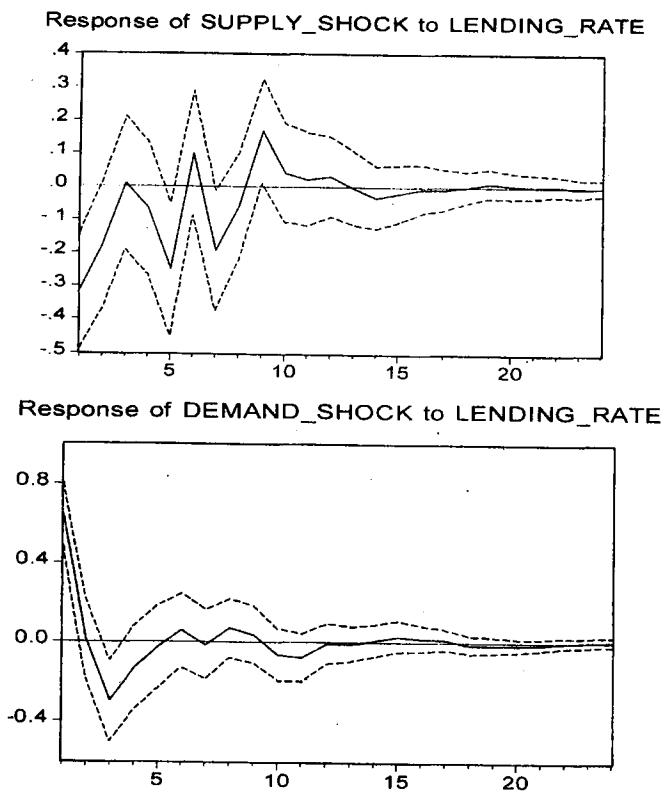


Figure 4

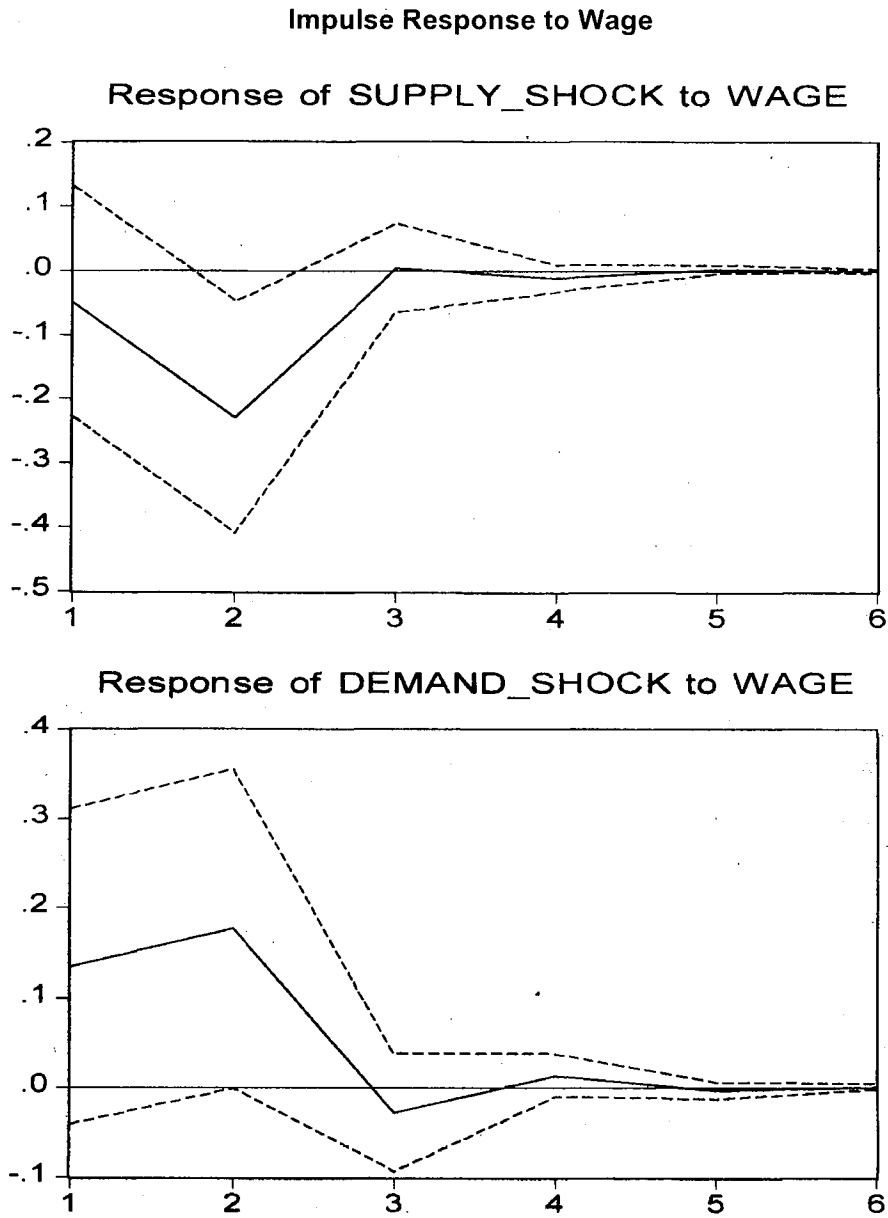
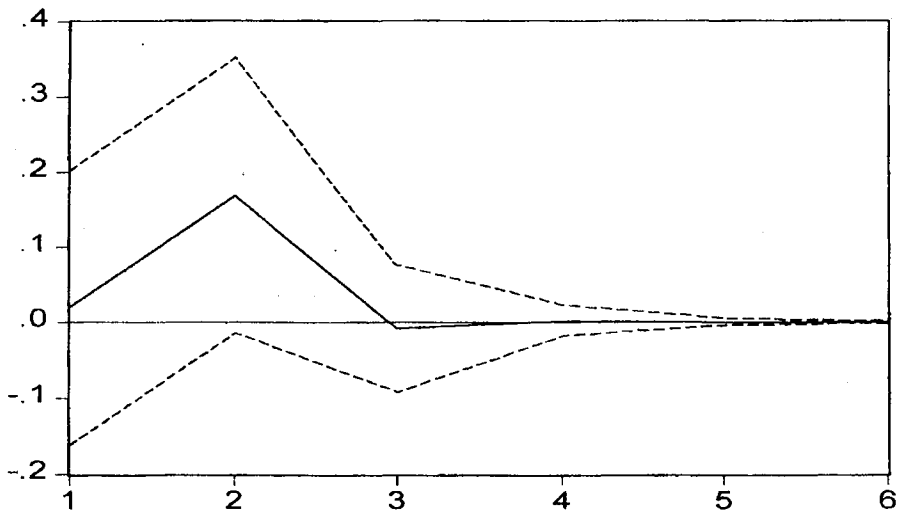


Figure 5

Impulse Response to Money (M1)

Response of SUPPLY_SHOCK to M1



Response of DEMAND_SHOCK to M1

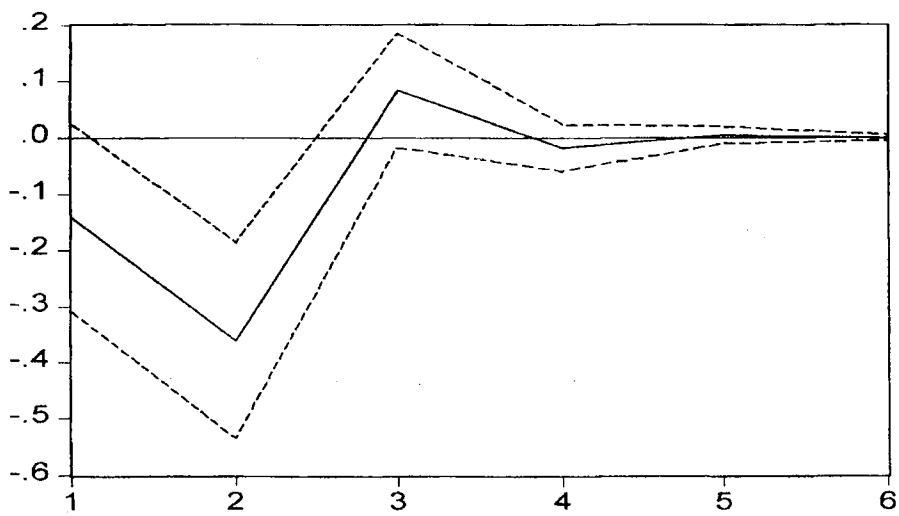
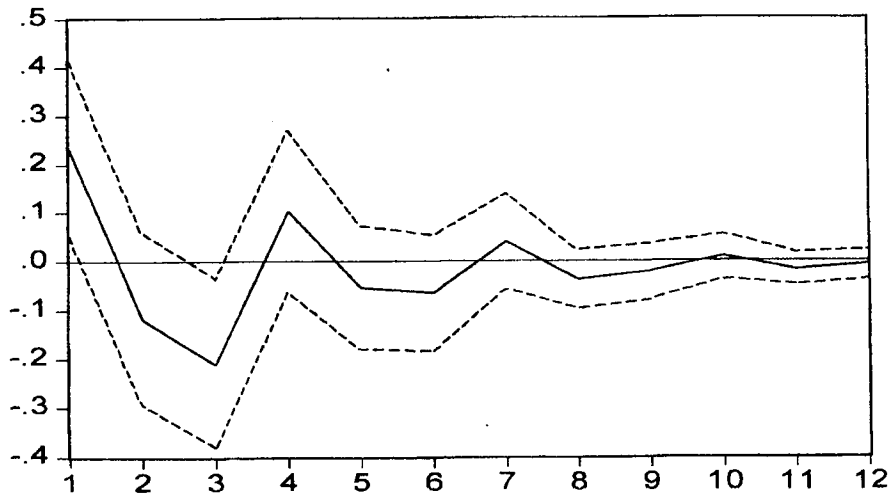


Figure 6

Impulse Response to Broad Money (M2)

Response of SUPPLY_SHOCK to M2



Response of DEMAND_SHOCK to M2

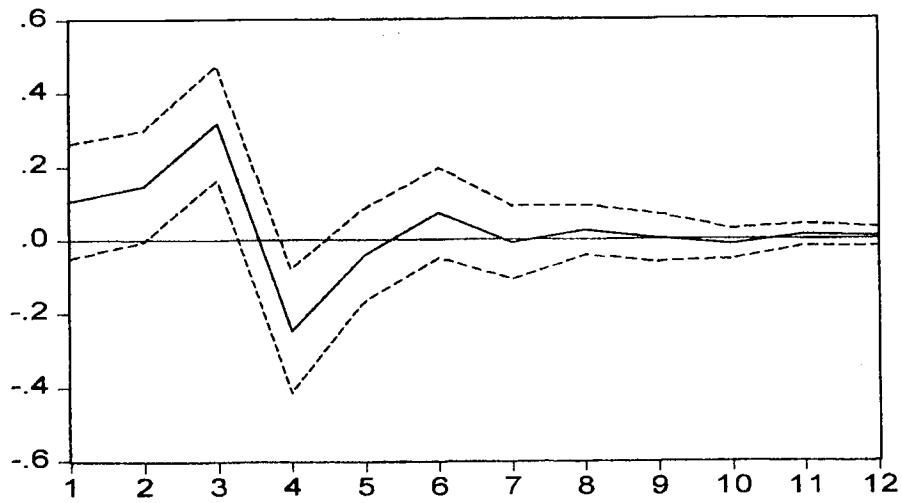
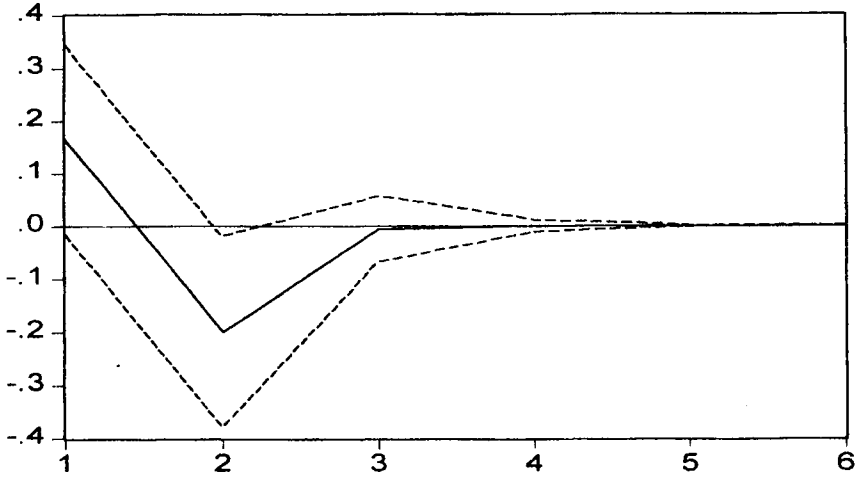


Figure 7

Impulse Response to Net Domestic Asset

Response of SUPPLY_SHOCK to NDC



Response of DEMAND_SHOCK to NDC

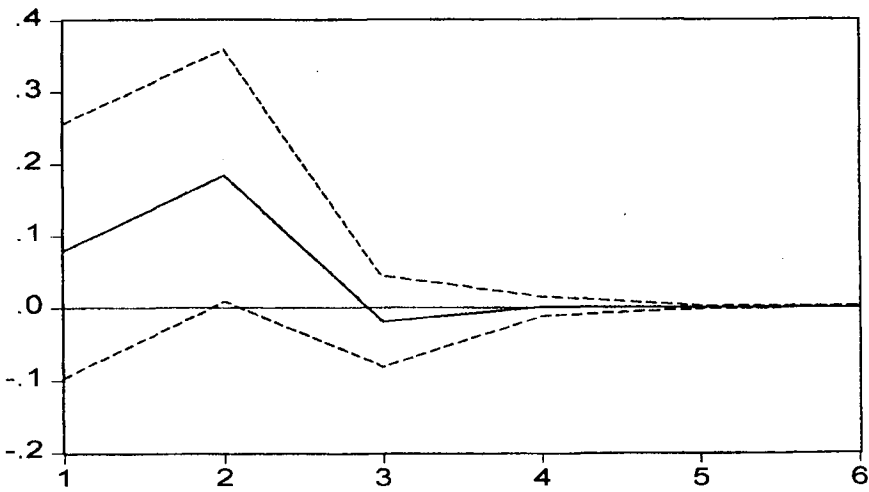


Figure 8

Impulse Response to Foreign Currency Deposit

