A Structural VAR Analysis of the Determinants of Capital Flows Into Turkey

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Abstract

Since the beginning of 1990s, Turkey has been exposed to large amounts of capital flows with significant effects on the economic performance. This study examines the determinants of capital flows into Turkey in the traditional 'push-pull' factors approach. To this end, a structural vector autoregression (SVAR) model has been employed and impulse-response and variance decomposition functions have been produced covering the period from 1992:01 to 2005:12. The same analysis has also been carried out for the two sub-periods 1992:01-2001:12 and 2002:01-2005:12 to inspect if there exists a change in the roles of push and pull factors before and after the 2001 economic crisis. The empirical evidence suggests that the relative roles of some of the factors have changed considerably in the post crisis period and pull factors are in general dominant over push factors in determining capital flows into Turkey.

I. Introduction

Capital inflows to developing countries and emerging market economies have surged considerably from the beginning of 1990s. Developing countries in Asia and Latin America have received an amount of nearly USD 670 billion of foreign capital in the five years from 1990 to 1994, as measured by the total balance on the capital accounts of these countries (Calvo, Leiderman and Reinhart; 1996). Although there has been a decline in the capital flows to developing countries in the wake of the Mexican crisis, capital inflows have begun to increase again by mid 1990s. This period also witnessed a change in the composition of the private capital flows, with a marked increase in the share of portfolio and short-term capital flows. Total capital flows to developing and emerging market economies have been on the order of nearly USD 192 billion in 1997, but have declined again by the end of 1990s following the East Asian financial crisis. In the first half of 2000s, capital flows have begun to rise again reaching to a total of USD 732 billion in the six years period from 2000 to 2005 (IMF; 2005).

Large amounts of capital inflows tend to create significant effects on the economic performance of recipient countries and these effects are broadly discussed in the literature (See e.g. Calvo, Leiderman and Reinhart; 1993 and 1996, Hoggarth and Sterne; 1997, Lopez-Mejia; 1999, Fernandez-Arias and Montiel; 1996, Balkan, Biçer and Yeldan; 2002, Alper and Sağlam; 2001, Yentürk; 1999, Celasun, Denizer and He; 1999). It is suggested in the standard open economy models that a surge in capital inflows leads to a rise in consumption and investment. A rise in the capital inflows increases the amount of bank credits extended to the private sector, since resident banks often appear to act as intermediaries between international capital markets and domestic borrowers. This in turn raises domestic consumption and investment demand given the increase in available funds. This development gives rise to inflationary pressures in the economy led by the boost in total aggregate domestic demand.

The increases in consumption and investment spending occur for both tradable and non-tradable goods. Since the non-traded goods are more limited in supply, the rise in demand will result in an increase in the relative prices of non-tradable goods. This will bring about an excessive growth of the services sector, because non-tradable goods are essentially provided by the services sector.

Therefore, countries that receive large capital inflows experience a considerable expansion in their services sectors.

Another effect of capital inflows on aggregate demand appears through the appreciation of the real exchange rate. Since an inflow of capital increases the supply of foreign exchange, the domestic currency tends to appreciate leading to a boost in imports. Along with the enhanced consumption, this development further widens the trade deficit and current account deficit comes up to uncomfortable levels.

Capital inflows can lead to an accumulation of vulnerabilities in a country's financial system, such as liquidity and currency risks, if the banking system lacks a sufficient regulatory and supervisory framework and has not developed enough to handle the difficulties caused by the capital flows. In a world of high capital mobility, where capital can leave a country as swift as it arrives, it is well known that there is a real risk that its effects on inflation, the exchange rate and the banking sector might cause significant macroeconomic instability. The experiences in Mexico and Turkey in 1994, in East Asia in 1997, in Russia in 1998 and finally in Argentina and Turkey in 2001 all demonstrate the potential problems and particularly sharp contraction in economic activity that can follow sudden reversals of capital inflows. Therefore, it is of great importance to examine the determinants of the capital flows in order to increase our understanding of how to avoid or minimize such costs.

The determinants of capital flows have been extensively analyzed in the literature starting from the seminal paper of Calvo, Leiderman and Reinhart; 1993. The literature basically examines the determinants of capital flows from developed countries to developing and emerging market economies in the context of push and pull factors as in Mody, Taylor and Kim; 2001, Kim; 2000, Dasgupta and Ratha; 2000, Ying and Kim; 2001, Hernandez, Mellado and Valdes; 2001, Taylor and Sarno; 1997, Fernandez-Arias; 1996, Chuhan, Claessens and Mamingi; 1993. Push factors refer to external determinants of capital flows from the developed countries to emerging economies such as the interest rates and economic activity in industrial countries. Pull factors, on the other hand, refer to domestic determinants of capital inflows in a particular emerging market economy such as domestic interest rates, stock market prices, macroeconomic stability, exchange rate regime, inflation, domestic credit level, creditworthiness and industrial production.

Determining the relative roles of push and pull factors in driving capital flows is a crucial issue regarding the actions of the policymakers in capital recipient countries. If capital flows are determined by push factors, domestic policymakers will have little to do to control the capital flows. On the other hand, to the extent that capital flows are determined by pull factors, domestic policymakers will have more power on capital flows by introducing sound macroeconomic policies.

The relative roles of push and pull factors vary across different empirical studies. Calvo, Leiderman and Reinhart; 1993, and Fernandez-Arias; 1996 argue that push factors, particularly low US interest rates have a dominant role in driving capital flows into developing countries. Likewise, Kim; 2000 finds that push factors such as decreases in world interest rates and/or recessions in industrial countries have a dominant role in driving capital flows. Similarly, Ying and Kim; 2001 find that push factors such as US business cycles and foreign interest rates account for more than 50 percent of capital flows into Korea and Mexico. On the other hand, Mody, Taylor and Kim; 2001, and Dasgupta and Ratha; 2000 find that, in general, pull factors have a heavier importance in determining capital flows. Hernandez, Mellado and Valdes; 2001 show that private capital flows were determined mainly by pull factors, and push factors were not significant in explaining the capital flows. Taylor and Sarno; 1997 argue that push and pull factors are equally important in determining the long-run movements in equity flows, while push factors are more important than pull factors in explaining the dynamics of bond flows. Chuhan, Claessens and Mamingi; 1993 similarly argue that about half of the explained increase in flows to the Latin American countries can be attributed to push factors, whereas pull factors are estimated to be three to four times more important than push factors in motivating the capital flows to the Asian countries.

This paper attempts to analyze the determinants of capital flows into Turkey following its capital account liberalization in 1989, in the context of the traditional 'push-pull' factors approach. To determine the macroeconomic variables that best explain the behavior of capital inflows, structural vector autoregression (SVAR) analysis has been employed covering the period from 1992:01 to 2005:12. The structure of the paper is as follows: Section II gives an overview of the association between capital inflows and some key macroeconomic variables in Turkey. Section III presents the data, the specification of the structural VAR model and the interpretation of the

results from impulse-response and variance decomposition analysis. Section IV concludes and drives some policy implications.

II. Some Observations on the Macroeconomic Effects of Capital Inflows to Turkey

After the capital account liberalization in Turkey in August 1989, which entirely lifted the restrictions on capital movements and rendered the economy fully integrated with international financial markets, there has been a marked surge in the capital flowing into Turkey. In the two years period from 1992 to 1993, capital inflows as measured by the sum of portfolio and other short-term capital flows have reached to USD 16 billion. Turkey witnessed a serious capital outflow in 1994 amounting to USD 6.5 billion due to the financial crisis in that year. After the economic crisis in 1994, capital inflows to Turkey have increased moderately during 1995-97 until the Russian crisis in 1998, when there has been a capital outflow from Turkey. During 1999-2000, capital inflows have gone up again, but in 2001 there has been a capital outflow amounting to USD 17.2 billion caused by the deep economic and financial crisis in that year, when the real GDP contracted by 7.5 percent. Mainly as a result of the sound monetary and fiscal policies and widespread structural reforms in the post-crisis period, Turkey has succeeded in attaining to sustained macroeconomic stability and high growth rates with steadily declining inflation. This recovery and stabilization period has also been an era when a significant amount of capital, USD 44 billion from 2003 to 2005, flew into Turkey.

The liberalization of the capital account at a time when Turkey lacked deep and sound financial markets, hence the ability to manage the capital flows properly, rendered the Turkish economy quite susceptible to large amounts of capital movements. The sizable capital inflows and outflows also led to a number of serious repercussions on the real economic activity. From the beginning of 1990s, real GDP growth rates have been observed to be significantly associated with capital movements to Turkey (Figure 1). As can be observed from Figure 1, expansion and crisis periods follow the same pattern as capital flows, which indicates that the growth pattern of the Turkish economy has become highly dependent on capital movements.

**Figure 1: Capital Flows to Turkey and Real GDP Growth**
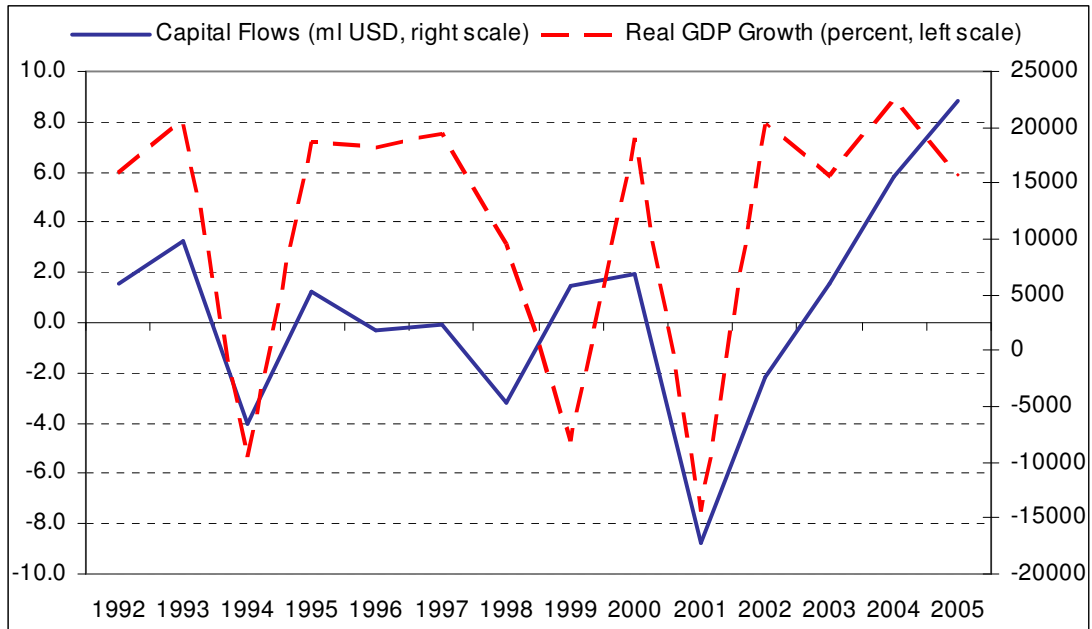
Source: CBRT.

The literature on the macroeconomic effects of capital inflows to developing countries has shown that capital inflows, to a large extent, lead to real exchange rate appreciation.[1] As discussed in the first section, capital inflows cause real exchange rate appreciation mainly through two channels: The first one is the rise in the demand for domestic currency, and the second one is the increase in the relative prices of the non-tradables sector. Figure 2 reveals that Turkey has been no exception as for the satisfaction of this relationship: Capital inflows to Turkey have been associated with the appreciation of the real exchange rate. This association is quite pronounced in the period after 2001, in which the real appreciation of the exchange rate has been on the order of nearly 50 percent from end-2001 to end-2005. Figure 2 indicates, on the other hand, that sudden and large capital outflows have caused sharp real exchange rate depreciations in Turkey. Especially, the crisis years of 1994 and 2001, when there has been enormous capital outflows and subsequent financial market turmoil, represent a quite acute evidence of this relationship.

This well-established association between capital inflows and real exchange rate appreciation has been proved to have significant implications on the trade balance of the recipient country. The

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[1] See e.g. Calvo, Leiderman and Reinhart; 1993 and 1996, and Fernandez-Arias and Montiel; 1996.

import demand appears to have been boosted by the real appreciation of the domestic currency, while export performance, in general, has been impacted negatively. This, in turn, leads to a widening current account deficit. Figure 2 is well illustrative of this association for the Turkish case: The current account deficits widens in line with the surge in capital flows. In 2005, current account deficit as a percent of GDP reached to a record 6,4 percent, when the capital inflows have also risen to a record level of USD 22,4 billion.

**Figure 2: Capital Flows, Real Exchange Rate and Current Account Deficit**
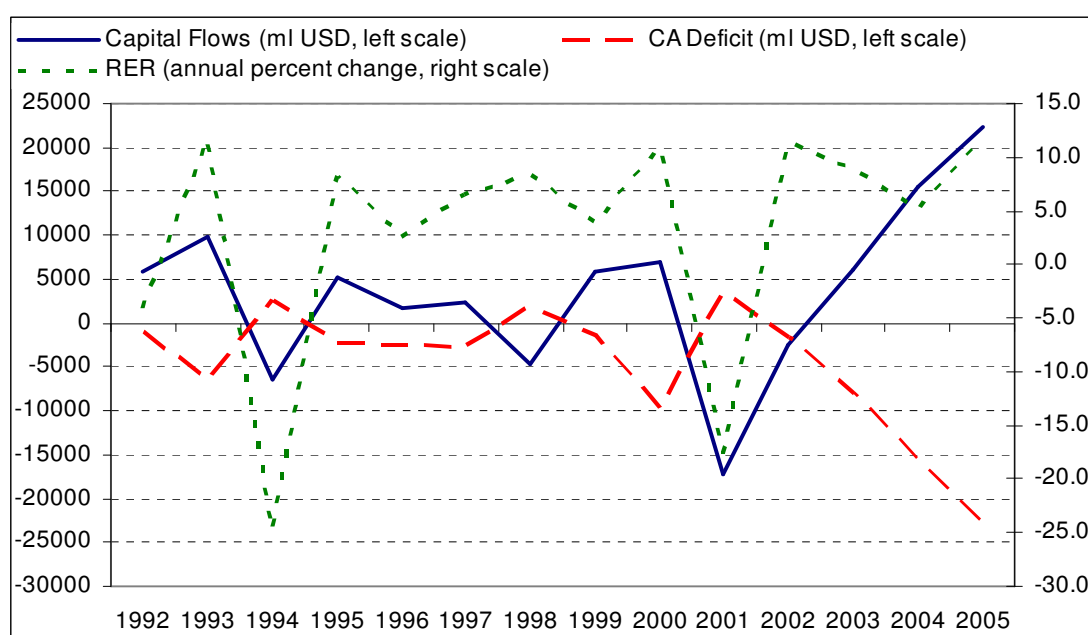
Source: CBRT.

Figure 3 depicts the close positive association between capital inflows and real credit extended to the private sector. As mentioned earlier in section I, domestic banks function as intermediaries between international and domestic capital markets. Increasing amounts of capital inflows lead to an expansion of the funds available to lend in the banking system. In Turkey, like many other developing countries, foreign capital inflows are released to the economy through bank lending channel. This lending boom generally takes the form of consumer and investment credits, which, in turn, helps the private sector to finance their consumption and investment expenditures, boosting the economic activity. In the period after 2001, there has been a sharp increase in the real amount of credits extended to the real sector in Turkey, when the amount of capital inflows also surged steadily. The boom in credits to the private sector in this period has been reflected in

the enormous rise in the expenditures for durable goods and housing, as well as in private fixed capital investments.

Figure 3: Capital Flows and Credit to Private Sector
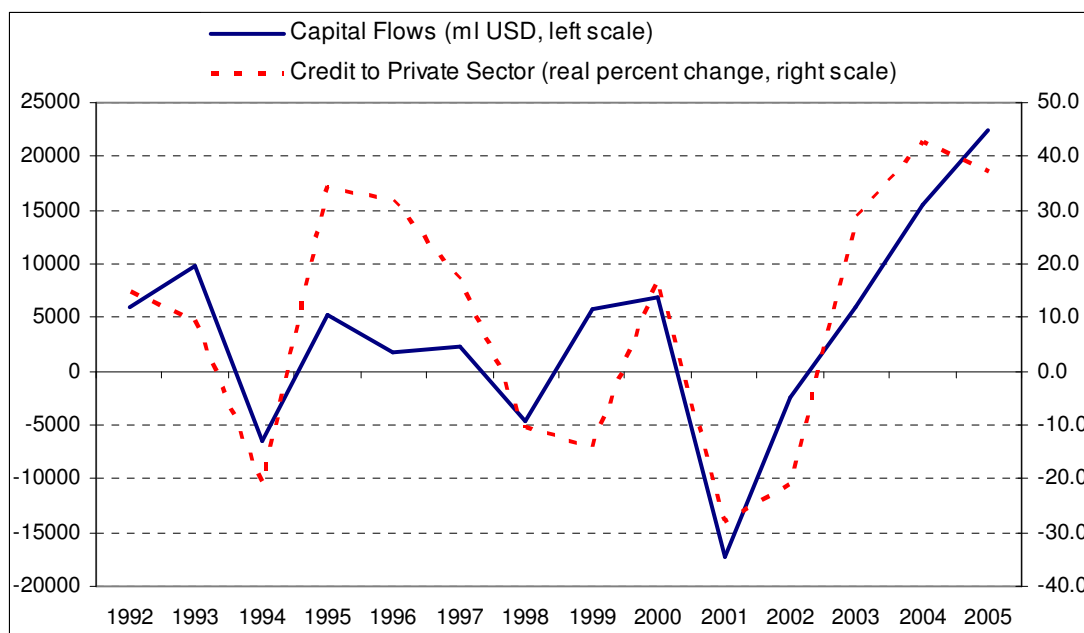
This brief overview of the macroeconomic effects of capital inflows reveals that the Turkish experience, in general, is not different from the practices in other developing countries and emerging market economies in Latin America or in East Asia. All in all, the Turkish experience is observed to remain fairly in conformity with what the literature on the macroeconomic effects of capital inflows suggests.

III. Data and Econometric Analysis

This section tries to identify the main determinants of capital inflows to Turkey by utilizing structural VAR techniques. The choice of the explanatory variables, which are thought to best explain the capital inflows, has been in line with the 'push-pull' factors approach. The data is on a monthly basis and covers the period of 1992:01-2005:12. All the variables are in logarithms except for the US and Turkish interest rates, capital movements and current account balance.

III. 1. Data

CAPF: Capital inflows to Turkey. This variable has been measured as the sum of portfolio and short-term capital flows, hence this variable essentially reflects capital flows that are of rather short-term nature.

The definitions of the push and pull factors are as follows:

Push Factors:

USINT: Interest rate on 3-month US Treasury bill.
USIPI: US industrial production index.

Pull Factors:

RIR: Real rate of interest on Turkish Treasury bills.
ISE: Istanbul Stock Exchange price index.
BD: Budget balance.
CA: Current account balance.

US data are obtained from the Federal Reserve Board. Interest rates on Turkish Treasury bills are obtained from the Undersecretariat of Treasury, and all other data are obtained from the Central Bank of Turkey.

US 3-month Treasury bill rates indicate borrowing costs for the recipient country and alternative rates of return for the investors in capital exporting countries. Therefore, a rise in this variable is expected to have a negative impact on capital flows into Turkey. US industrial production growth, on the other hand, implies an increase in the funds available for investment abroad, thus its expected effect on capital inflows is positive. A rise in the domestic stock market index is expected to positively affect capital inflows, since it indicates an improvement in the investment opportunities and improved economic fundamentals in the capital recipient country. Likewise, an increase in the real rate of interest on Treasury bills, which is computed as the weighted average compound Treasury auction rates deflated by the consumer price index, is anticipated to raise the capital inflows, since it indicates a rise in the returns of domestic securities. As an indicator of

fiscal fragility, the budget balance, which is measured as the annual cumulative budget balance deflated by the consumer price index, is expected to affect the capital inflows negatively. The current account balance, as an indicator of external sector fragility is also expected to create a negative impact on capital inflows.

III. 2. The Determinants of Capital Inflows: Econometric Evidence

In this section, the main determinants of capital inflows to Turkey have been examined using structural vector autoregression (SVAR) time series analysis. To capture the relative impacts of push and pull factors on capital flows into Turkey, first, impulse-response functions are produced from the estimated SVAR model, and then variance decomposition analysis is employed.

III. 2. 1. Specification of the SVAR Model

In order to empirically examine the determinants of capital flows into Turkey, shocks to both external and domestic factors have been considered in the context of a small open economy. External shocks (push factors) include world supply shocks (proxied by US industrial output) and foreign interest rates (proxied by US 3-month interest rates on Treasury bills). Among the domestic shocks, real rate of interest, stock exchange index, budget balance and current account balance have been considered. Within this framework, capital inflows, CAPF, can be modeled as follows:

$$CAPF_t = f\{u_t^{USINT}, u_t^{USIPI}, u_t^{RIR}, u_t^{ISE}, u_t^{BD}, u_t^{CA}, u_t^{CAPF}\} \tag{1}$$

Equation 1 defines the capital inflows as a function of shocks on US interest rates, US industrial production, real interest rate, stock exchange index, fiscal balance, current account balance, and shocks on capital inflows itself.

Since the structural shocks in Equation 1 are unobservable, additional identifying restrictions are necessary to uncover the underlying structural shocks in the data. A seven-variable VAR model

has been considered in order to extract the seven structural shocks. Following Ying and Kim; 2001, the VAR[2] model can be specified as follows:

$$Y_t = \sum_{i=0}^{\infty} A_i U_{t-i} = A(L)U_t \tag{2}$$

where $Y_t = (USINT_t,\ USIPI_t,\ RIR_t,\ ISE_t,\ BD_t,\ CA_t,\ CAPF_t)'$, $Ut = (u_t^{USINT},\ u_t^{USIPI},\ u_t^{RIR},\ u_t^{ISE},\ u_t^{BD},\ u_t^{CA},\ u_t^{CAPF})'$ and $A(L) = \sum_{i=0}^{\infty} A_i L^i = \{a_{ij}(L)\}$ as L lag operator. A_i is the matrix of impulse responses of endogenous variable to structural shocks.

In order to identify the long-run effects of structural shocks, a number of restrictions have been imposed on the impulse response matrix A_i. The following assumptions have been made regarding the long-run structural shocks:

1. Shocks to other variables in the system have no long-run effects on US interest rate. US interest rates appears to be the most exogenous variable of the system. This assumption leads to the restrictions $a_{12}(L) = a_{13}(L) = a_{14}(L) = a_{15}(L) = a_{16}(L) = a_{17}(L) = 0$.

2. US industrial production is assumed to be affected only by shocks to US interest rate. This restriction is incorporated as $a_{23}(L) = a_{24}(L) = a_{25}(L) = a_{26}(L) = a_{27}(L) = 0$.

3. Real interest rate in Turkey is influenced by shocks to US interest rates, which yields the restrictions $a_{32}(L) = a_{34}(L) = a_{35}(L) = a_{36}(L) = a_{37}(L) = 0$.

4. Shocks to real interest rate and US interest rate and industrial production are assumed to affect stock exchange price index, which leads to the restrictions $a_{45}(L) = a_{46}(L) = a_{47}(L) = 0$.

5. Us industrial production, current account and capital flows have no long-run effect on fiscal balance, $a_{52}(L) = a_{56}(L) = a_{57}(L) = 0$.

6. The effects of shocks to capital flows on current account are assumed to be transitory, this restriction is introduced as $a_{67}(L) = 0$.

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[2] The variables in the estimated unrestricted VAR model are in levels (Sims; 1980), although they appear to be unit root processes. The order of the unrestricted VAR has been determined as one according to the Schwarz and Hannan-Quinn information criteria. Dummy variables for the crisis years 1994 and 2001 have also been introduced into the unrestricted VAR model.

7. Shocks to all other variables are assumed to affect capital inflows to Turkey in the long-run, hence it is the determined endogenously in the system.

With the above-mentioned 23 restrictions, the system is over-identified. The system of equations arising from these restrictions can be exposed as follows:

$$USINT_t = a_{11}u_t^{USINT} \tag{3a}$$

$$USIPI_t = a_{21}u_t^{USINT} + a_{22}u_t^{USIPI} \tag{3b}$$

$$RIR_t = a_{31}u_t^{USINT} + a_{33}u_t^{RIR} \tag{3c}$$

$$ISE_t = a_{41}u_t^{USINT} + a_{42}u_t^{USIPI} + a_{43}u_t^{RIR} + a_{44}u_t^{ISE} \tag{3d}$$

$$BD_t = a_{51}u_t^{USINT} + a_{53}u_t^{RIR} + a_{54}u_t^{ISE} + a_{55}u_t^{BD} \tag{3e}$$

$$CA_t = a_{61}u_t^{USINT} + a_{62}u_t^{USIPI} + a_{63}u_t^{RIR} + a_{64}u_t^{ISE} + a_{65}u_t^{BD} + a_{66}u_t^{CA} \tag{3f}$$

$$CAPF_t = a_{71}u_t^{USINT} + a_{72}u_t^{USIPI} + a_{73}u_t^{RIR} + a_{74}u_t^{ISE} + a_{75}u_t^{BD} + a_{76}u_t^{CA} + a_{77}u_t^{CAPF} \tag{3g}$$

The long-run restrictions can be presented in the matrix form:

$$
\begin{bmatrix} USINT_t \\ USIPI_t \\ RIR_t \\ ISE_t \\ BD_t \\ CA_t \\ CAPF_t \end{bmatrix} =
\begin{bmatrix}
* & 0 & 0 & 0 & 0 & 0 & 0 \\
* & * & 0 & 0 & 0 & 0 & 0 \\
* & 0 & * & 0 & 0 & 0 & 0 \\
* & * & * & * & 0 & 0 & 0 \\
* & 0 & * & * & * & 0 & 0 \\
* & * & * & * & * & * & 0 \\
* & * & * & * & * & * & *
\end{bmatrix}
\begin{bmatrix} u_t^{USINT} \\ u_t^{USIPI} \\ u_t^{RIR} \\ u_t^{ISE} \\ u_t^{BD} \\ u_t^{CA} \\ u_t^{CAPF} \end{bmatrix} \tag{4}
$$

The imposition of the restrictions into the impulse-response matrix A_i allows us to uncover the structural shocks from the VAR model. Next section presents the impulse-response functions and variance decomposition analyses produced from the structural VAR model.

III. 2. 2. Impulse-Response Analysis

The effects of shocks to push and pull factors on capital inflows to Turkey over the whole sample period 1992:01-2005:12 have been presented in Figures 4 and 5, respectively. Figure 4 shows the effects of push factors, namely the response of capital inflows to Turkey to one standard deviation shocks to US interest rate and US industrial production index. The impulse-response functions have been estimated over the twelve-month horizon.

As shown in Panel A of Figure 4, a one standard deviation shock to US interest rate tends to increase the amount of the capital flowing into Turkey in the first month on the order of nearly USD 500 million, and the increase in capital inflows remains at around USD 100 million over the following months. This seemingly positive relationship between the US interest rates and the capital inflows to Turkey can be mostly attributed to the concurrence of the crisis periods (or contagion effects of financial crisis elsewhere, e.g. in East Asia and Russia) in Turkey with the decline in US interest rates. Namely, at times when Turkey experienced economic crisis (or remained exposed to contagion effects) and resulting considerable capital outflows, there had also been a downward trend in the US interest rates. This coincidence is most evident in 1998 when Turkey had been exposed to contagion effects of the Russian financial crisis, and 2001 when Turkish economy experienced a severe crisis.

When the same analysis is carried out over the two sub-periods 1992:01-2001:12 and 2002:01-2005:12, a different picture emerges regarding the relationship between capital inflows to Turkey and US interest rates[3]. Over the first sub-period, a shock to US interest rate initially leads to an increase in capital flows as in the whole sample period, but beginning from the fifth month, a slight amount of capital outflow occurs (Appendix A, Figure A. 1. I). However, the analysis over the second period reveals a quite different result (Appendix B, Figure B. 1. I): A shock to US interest rate causes a capital outflow by USD 320 million in the first month and capital outflow continues to remain in the negative territory without signs of recovery over the twelve-month horizon. In the period after 2001, there emerges a relationship between foreign interest rates and capital flows in Turkey consistent with what the theory on capital flows suggests. This can be

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[3] Impulse-response functions over the two sub-periods are presented in Appendix A and Appendix B, respectively.

attributed basically to the so-called 'normalization'[4] of the Turkish economy after the deep crisis in 2001, when both economic and politic stability have been entrenched. It should also be noted that Turkey had not been exposed to any contagion effects during this period that could have adversely affected capital inflows.

Panel B of Figure 4 shows that a shock to US industrial production initially leads to capital outflows from Turkey, but one month later capital inflows increase by USD 70 million and remain nearly at that level over the twelve-month horizon. Over the two sub-periods, US industrial production shocks immediately enhance capital flows to Turkey (Figures A. 1. II and B. 1. II). There after, capital inflows remain in the positive vicinity over the first sub-period, and linger around zero over the second sub-period. The impulse-response analysis over the whole sample period and the two sub-periods suggests that, in general, a rise in foreign economic activity happens to raise the financial funds available to Turkey. This finding is indicative of a positive association between accelerating economic activity in industrial world and capital inflows to Turkey.

Figure 4. Impact of Push Factors: Response of CAPF to Structural One S.D. Innovations to USINT and USIPI (1992:01-2005:12)

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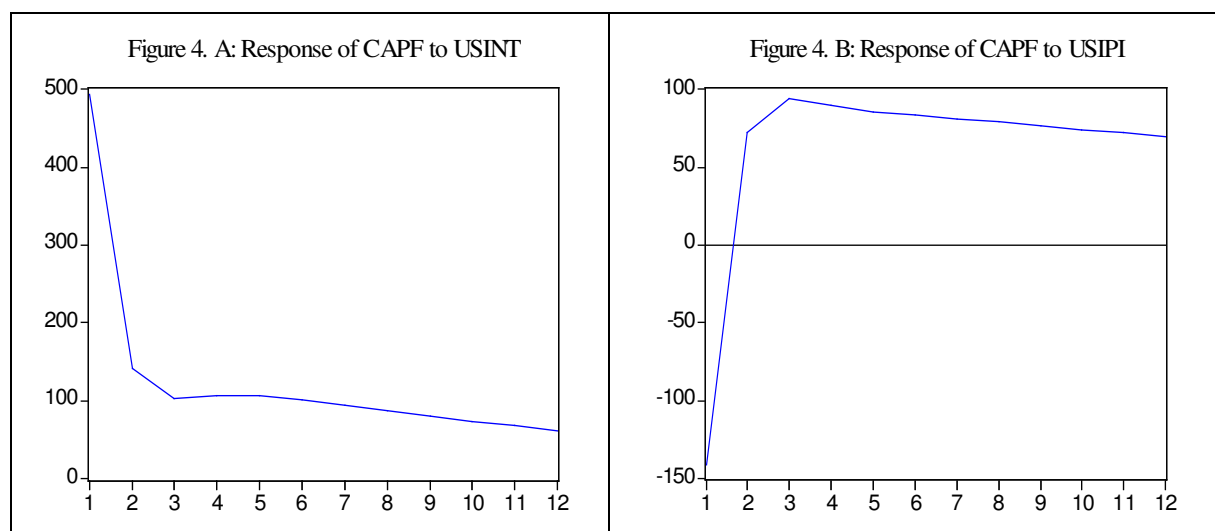
[4] The Turkish economy has been characterized by persistent fiscal imbalances, chronic and high inflation, volatile growth rates and macroeconomic instability during 1990s. However, the economy has undergone a fundamental restructuring in the post-crisis period mainly driven by prudent monetary and fiscal policies accompanied by various comprehensive structural reforms. The term 'normalization' in this study is used to characterize the stable macroeconomic environment during the period after the 2001 economic crisis, in which inflation rate came down to single digits along with high growth rates averaging 7,8 percent over the last four years.

Figure 5 presents the effects of shocks to pull factors, namely real interest rate, stock exchange price index, budget balance and current account balance, on capital flows into Turkey.

Panel A of Figure 5 indicates that a shock to real interest rate in Turkey induce an immediate capital outflow. The initial negative impact of real interest rate shock diminishes over time, but capital outflow remains on the order of nearly USD 75 million by the end of twelve-month horizon. The impulse-response function estimated over the first sub-period 1992:01-2001:12 presents a similar picture (Figure A. 2. I). The unexpected effect of real interest rate on capital flows is mostly due to the risk premium inherited in the T-Bill rates in Turkey. At times of economic and/or politic instability, the enhanced risk premium is immediately reflected in the interest rates, which simultaneously triggers massive capital outflows. When the crisis prone and instable nature of the Turkish economy during the whole 1990s is considered, this outcome is understandable. But, when the second sub-period 2002:01-2005:12 is examined (Figure B. 2. I), it is seen that a shock to real interest rate tends to initially enhance capital inflows with keeping it in the positive territory over the twelve-month horizon. This outcome, which is also consistent with the theory, reflects once again the improved economic and politic stability, hence 'normalization' of the Turkish economy in the post crisis period.

Figure 5. Impact of Pull Factors: Response of CAPF to Structural One S.D. Innovations to RIR, ISE, BD and CA (1992:01-2005:12)
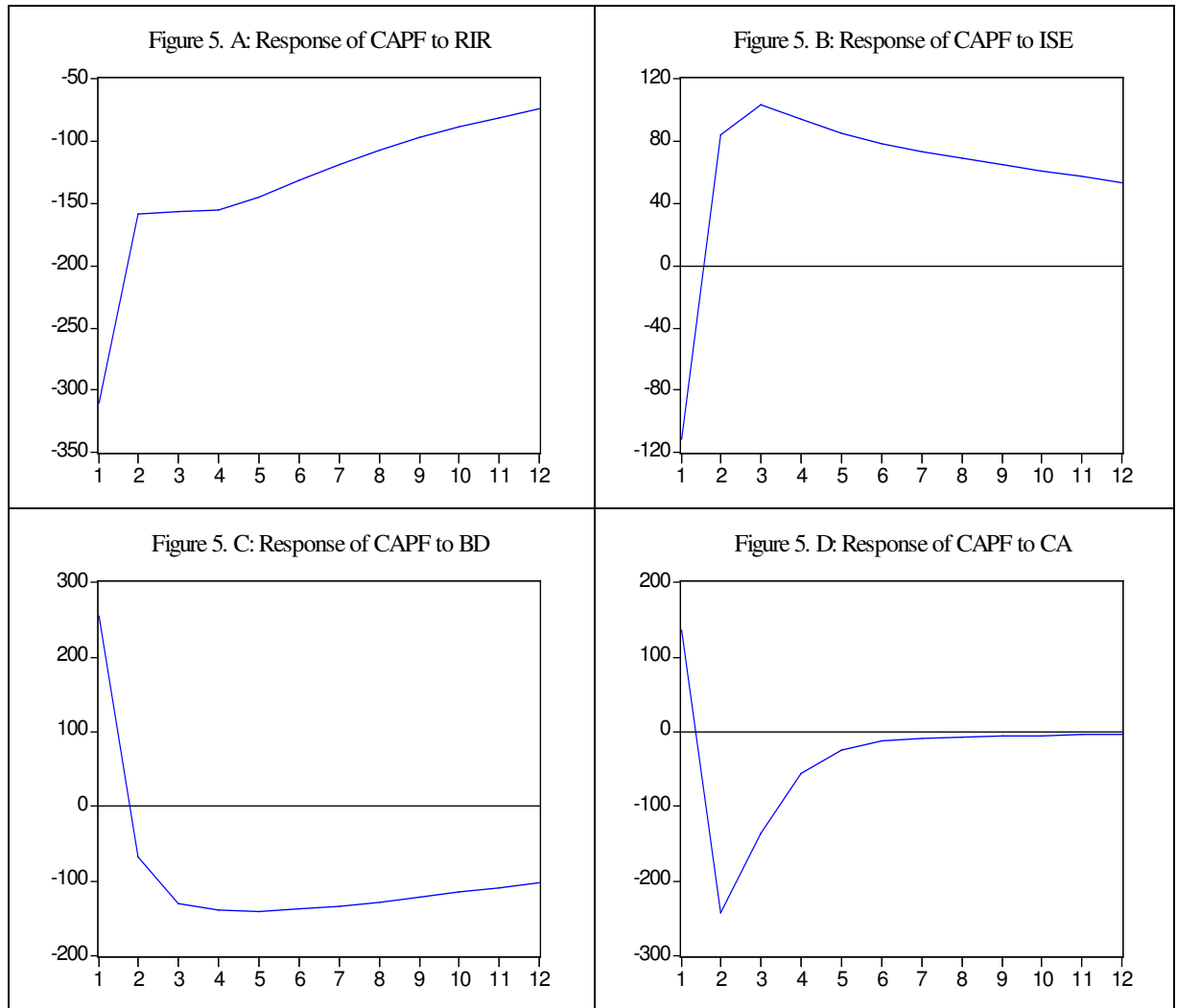
The conventional theory on capital movements suggests that increases in returns of investment opportunities in the recipient country would attract capital flows into these countries. Hence, a shock to ISE is expected to stimulate capital inflows to Turkey. Panel B of Figure 5 presents a relationship consistent with the theory. Although a shock to stock exchange index causes capital outflow initially, just one month later, capital inflows happen to increase and remain in the positive domain by the end of twelve-month horizon. This finding indicates a positive association between the stock exchange price index and capital inflows, which is consistent with the findings of Balkan, Biçer and Yeldan; 2002. The immediate negative response of capital flows can be attributed to the lagged effect of a stock exchange shock. Since the changes in the

stock market index essentially reflect the perceived economic and politic improvements, capital inflows react after some time has elapsed. The impulse-response analysis over the two sub-periods (Figures A. 2. II and B. 2. II) also reveals a similar outcome, although the effect of shocks to ISE on capital flows begin to die out beginning from the forth month in the first sub-period, and fifth month in the second sub-period.

An expansion in the budget deficit might be expected to influence capital flows through two channels. The first channel leads to an increase in capital flows: Since increased budget deficit necessitates further financing, the debt burden of the government also grows with the issuance of new government domestic borrowing securities. The rise in public sector borrowing requirement and the consequent growth of public debt, in turn, prompts interest rates on government borrowing securities to pick up, which attracts further capital inflows. On the other hand, the second channel tends to generate a decline in capital inflows: So long as the budget balance is perceived as an indicator of fiscal fragility by the foreign investors, a deterioration in the budget balance tends to deter capital inflows. Panel C of Figure 5 (as well as Figures A. 2. III and B. 2. III) is indicative of a negative relationship between the budget balance and capital flows. This negative association suggests that the second channel is in force for the Turkish case.

Current account balance, like budget balance, might bring about two-sided effects on capital flows: Widening current account deficit requires essentially foreign financing basically in terms of portfolio investments and/or foreign direct investments leading to a rise in capital inflows. Alternatively, since the current account balance is perceived as an indicator of a country's external fragility, a widening current account deficit is likely to reduce capital inflows. Panel D of Figure 5 (also Figures A. 2. IV and B. 2. IV) points to a negative association between the current account balance and the capital inflows in Turkey, which suggests that the current account balance is perceived as an external fragility indicator and deteriorating current account balance causes capital outflows.

III. 2. 3. Variance Decomposition Analysis

Variance decomposition provides evidence on the relative importance of each of the shocks. Table 1 shows the percentage of the forecast error variance due to each shock in the structural VAR model over the twelve-month horizon, covering the whole sample period 1992:01-2005:12.

Capital inflows are explained mostly by its own shocks during the whole sample period and the first sub-period (Table C. 1, Appendix C). Nevertheless, the relative importance of shocks to capital inflows on itself declines markedly in the second sub-period, especially towards the end of twelve-month horizon (Table C. 2, Appendix C).

Table 1: Variance Decomposition of CAPF for the Period 1992:01-2005:12

| Period | S.E. | Push Factors | | Pull Factors | | | | |
		USINT	USIPI	RIR	ISE	BD	CA	CAPF
1	0.3836	23.86	1.96	9.48	1.22	6.36	1.79	55.32
2	0.5362	22.97	2.20	10.61	1.70	6.05	6.68	49.80
3	0.6480	22.16	2.75	11.81	2.45	6.97	7.68	46.19
4	0.7374	21.76	3.20	12.97	2.98	8.05	7.48	43.56
5	0.8124	21.53	3.57	13.86	3.36	9.08	7.16	41.44
6	0.8771	21.36	3.91	14.49	3.64	10.01	6.87	39.72
7	0.9341	21.20	4.21	14.92	3.87	10.85	6.63	38.31
8	0.9853	21.06	4.49	15.22	4.06	11.58	6.44	37.15
9	1.0319	20.93	4.75	15.42	4.22	12.22	6.27	36.19
10	1.0747	20.81	4.98	15.56	4.36	12.77	6.13	35.38
11	1.1144	20.69	5.20	15.67	4.48	13.24	6.02	34.71
12	1.1516	20.58	5.41	15.74	4.57	13.64	5.92	34.14

Shocks to US interest rate explain nearly one fifth of the forecast error variance in capital inflows during 1992:01-2005:12. Shocks to US industrial production, on the other hand, explain only a small part of the variation in capital inflows. These results suggest that, in terms of the push factors, foreign interest rate shocks, rather than foreign output shocks have been more effective in determining capital inflows to Turkey during the whole sample period. As regards the pull factors, real interest rate appears to be the most effective one. Shocks to real interest rate explain nearly 16 percent, whereas shocks to budget balance explain nearly 14 percent of the variation in capital inflows over the twelve-month horizon. The third most effective pull factor seems to be the current account balance, followed by stock exchange prices. Shocks to pull factors jointly account for nearly 19 percent, while push factors jointly account for almost 26 percent of the variation in capital flows in the first month. But after twelve-months, pull factors become dominant reaching to 40 percent, as push factors remain almost at the same level. This finding implies that shocks to push factors, especially shocks to foreign interest rate, affect capital flows in the shorter-run, whereas the effect of pull factors dominate push factors beginning from the third month.

An examination of the variance decomposition in terms of push and pull factors over the two sub-periods reveals a quite different picture. The real interest rate appears to be the most important determinant of the capital movements over the first sub-period (Table C. 1, Appendix C). But, this finding remains quite controversial given the endemic high degree of risk premium in the interest rates of Turkish domestic borrowing instruments. As explained above, interest rate shocks have been associated with large capital outflows in Turkey, since at times of economic crisis, interest rates hike to very high levels along with ensuing sizeable capital flight.

Another important finding concerning the first sub-period is the increased relative importance of the budget balance. However, it should be noted that fiscal imbalances have played an important role in the outbreak of economic crisis during 1990s accompanied by large capital outflows. Therefore, in interpreting the determinants of capital flows, especially the role of pull factors, caution is needed given the prevalent macroeconomic imbalances and crisis prone nature of the Turkish economy throughout the last decade. Having said that, pull factors appear to be dominant over push factors with a large margin in determining capital flows over the first sub-period.

As far as the relative importance of push and pull factors during the second sub-period is concerned, one can see that shocks to stock exchange index explain one third of the variation in capital flows in the first month, declining to 26 percent after twelve months (Table C. 2, Appendix C). Following the economic crisis in 2001, the implementation of prudent economic policies alongside considerable structural reforms has significantly improved the economic fundamentals, which is reflected as increases in the stock exchange index. Actually, this finding can be interpreted as an evidence of the sensitivity of capital flows to enhanced macroeconomic stability, as well as to rising returns of investment.

Variance decomposition analysis in the second sub-period indicates that, shocks to foreign interest rate become more important compared to the whole sample period and the first sub-period. Shocks to foreign interest rate explain nearly 30 percent of the variation in capital flows after twelve months. The role of current account balance, which is an indicator of external fragility, increases markedly in the second sub-period. Shocks to fiscal and external balances

jointly explain nearly 15 percent of the variation in capital movements over the twelve-month horizon.

A striking finding arising from the variance decomposition analysis is that real interest rate has almost no importance in explaining capital movements in the second sub-period. This can be mainly ascribed to the declining real interest rates from 2002 and onwards when there have been significant capital inflows. The variation in capital flows during this period is basically captured by the shocks to stock exchange index, which reflects the improvements in economic fundamentals. Variance decomposition analysis in the second sub-period suggests that push factors jointly explain almost one third of the variation in capital flows over the twelve-month horizon and pull factors are relatively more dominant in the determination of capital flows.

IV. Conclusion

Increasing amounts of capital flows to developing countries and emerging market economies tend to stimulate economic activity in these countries on one hand, and lead to serious macroeconomic fluctuations on the other hand. Various experiences of developing and emerging market economies, including the Turkish cases in 1994 and 2001, have shown that a sudden reversal of capital inflows creates severe adverse effects on the economy, even prompting financial crisis. Therefore, it is of great interest to have an understanding of the main factors that drive capital movements. This would also help avoid the undesirable consequences of sudden capital reversals by introducing proper economic policies.

This paper analyzes the determinants of capital inflows to Turkey in the framework of push-pull factors approach by introducing a structural VAR model. Then, impulse-response and variance decomposition analysis have been employed to investigate the relative importance of each factor, covering the whole sample period 1992:01-2005:12 and two sub-periods; 1992:01-2001:12 and 2002:01-2005:12. The results vary considerably according to the period under investigation.

The impulse-response analysis in the whole sample period reveals that shocks to foreign interest rates (US interest rate) tend to increase, whereas shocks to domestic real interest rates tend to decrease capital flows to Turkey. This inconsistent phenomenon, however, can be ascribed to the instable nature of the Turkish economy characterized by boom-bust cycles, and incredibly high

levels of inflation and interest rates during the 'lost decade' 1990s. The analysis over the second sub-period 2002:01-2005:12, on the other hand, points to a 'normalization' of the economy where the foreign interest rate shocks cause capital outflows and domestic interest rate shocks cause capital inflows, as expected. Impulse-response analysis, in general, suggests that shocks to foreign industrial output (US industrial production index) have a positive association with capital inflows to Turkey.

The impulse-response analysis, in general, suggests that a shock to stock exchange index has a positive effect on capital flows into Turkey. As a rise in stock exchange index reflects the improved macroeconomic fundamentals as well as increased returns on investment, this finding is consistent with the theory. Conversely, according to the empirical findings, there appears to be a negative association between the shocks to both budget and current account balances and capital flows. This finding is supportive of the argument that, for the Turkish case, budget balance and current account balance are perceived as indicators of fiscal and external fragility, respectively, by foreign investors. Thus, deteriorating budget and current account balances lead to capital outflows.

Variance decomposition analysis over the whole sample period 1992:01-2005:12 reveals that capital inflows are explained mostly by its own shocks. Shocks to foreign interest rates appear to be the most effective factor to explain the variation in capital flows during the whole sample period, followed by shocks to domestic real interest rate and budget balance. Shocks to pull factors explain 40 percent, whereas shocks to push factors explain 26 percent of the variation in capital flows, suggesting that pull factors are dominant over the push factors in the determination of capital flows to Turkey during the whole sample period. Shocks to domestic real interest rate becomes the most important determinant of capital flows in the first sub-period 1992:01-2001:12, followed by shocks to budget balance. In the first sub-period, the relative importance of the shocks to foreign interest rate declines considerably compared to the whole sample period. In the second sub-period 2002:01-2005:12, the role of the shocks to stock exchange index increases significantly in explaining the variation in capital flows. Shocks to foreign interest rate become more important towards the end of the twelve-month horizon. The relative importance of the shocks to current account balance also increases in the second sub-period. Pull factors dominate

push factors during the first and second sub-periods, which is the case for the whole sample period.

To our knowledge, this study is the first one to investigate the determinants of capital flows into Turkey in the context of push-pull factors approach. Yet, the econometric evidence is consistent with the findings of Balkan, Biçer and Yeldan; 2002, in that a rise in stock exchange prices has a positive association with capital inflows. Also, the finding of Celasun, Denizer and He; 1999, that the short-run interest rate differential appears to be the most important pull factor in determining capital inflows to Turkey is compatible with the findings of this study, especially for the first sub-period. As for the international comparison, the finding that pull factors have a heavier importance than push factors in determining capital flows into Turkey is consistent with the findings of Mody, Taylor and Kim; 2001, Dasgupta and Ratha; 2000, and Hernandez, Mellado and Valdes; 2001, who suggest that capital inflows to developing countries and emerging market economies are mainly determined by pull factors.

The finding that pull factors have a dominant role in determining capital flows to Turkey clearly points to the importance of macroeconomic stability that would reduce the risk premium to a minimum level. In this respect, sound fiscal and monetary policies that would ensure sustainable budget and current account balances are of great significance.

The empirical analysis suggests that the relative role of foreign interest rates has increased considerably especially since the beginning of 2002. As a push factor, this marked rise in the relative importance of foreign interest rates in determining capital flows implies that capital flows can be volatile and reverse direction rapidly as external conditions change. Hence, a sudden sharp reversal of capital flows may precipitate the risk of an exchange rate crisis in countries that are dependent on foreign capital for financing high levels of current account deficits.

Appendix A: Impulse-Response Analysis for the Period 1992:01-2001:12

Figure A. 1: Impact of Push Factors: Response of CAPF to Structural One S.D. Innovations to USINT and USIPI

Figure A. 1. I: Response of CAPF to USINT

Figure A. 1. II: Response of CAPF to USIPI

Figure A. 2: Impact of Pull Factors: Response of CAPF to Structural One S.D. Innovations to RIR, ISE, BD and CA

Figure A. 2. I: Response of CAPF to RIR

Figure A. 2. II: Response of CAPF to ISE

Figure A. 2. III: Response of CAPF to BD

Figure A. 2. IV: Response of CAPF to CA

Appendix B: Impulse-Response Analysis for the Period 2002:01-2005:12

Figure B. 1: Impact of Push Factors: Response of CAPF to Structural One S.D. Innovations to USINT and USIPI
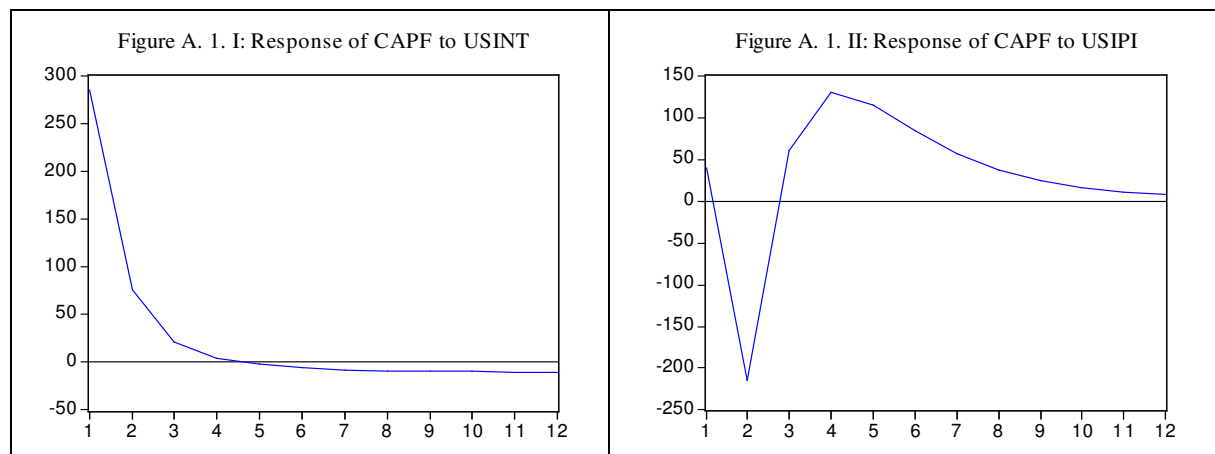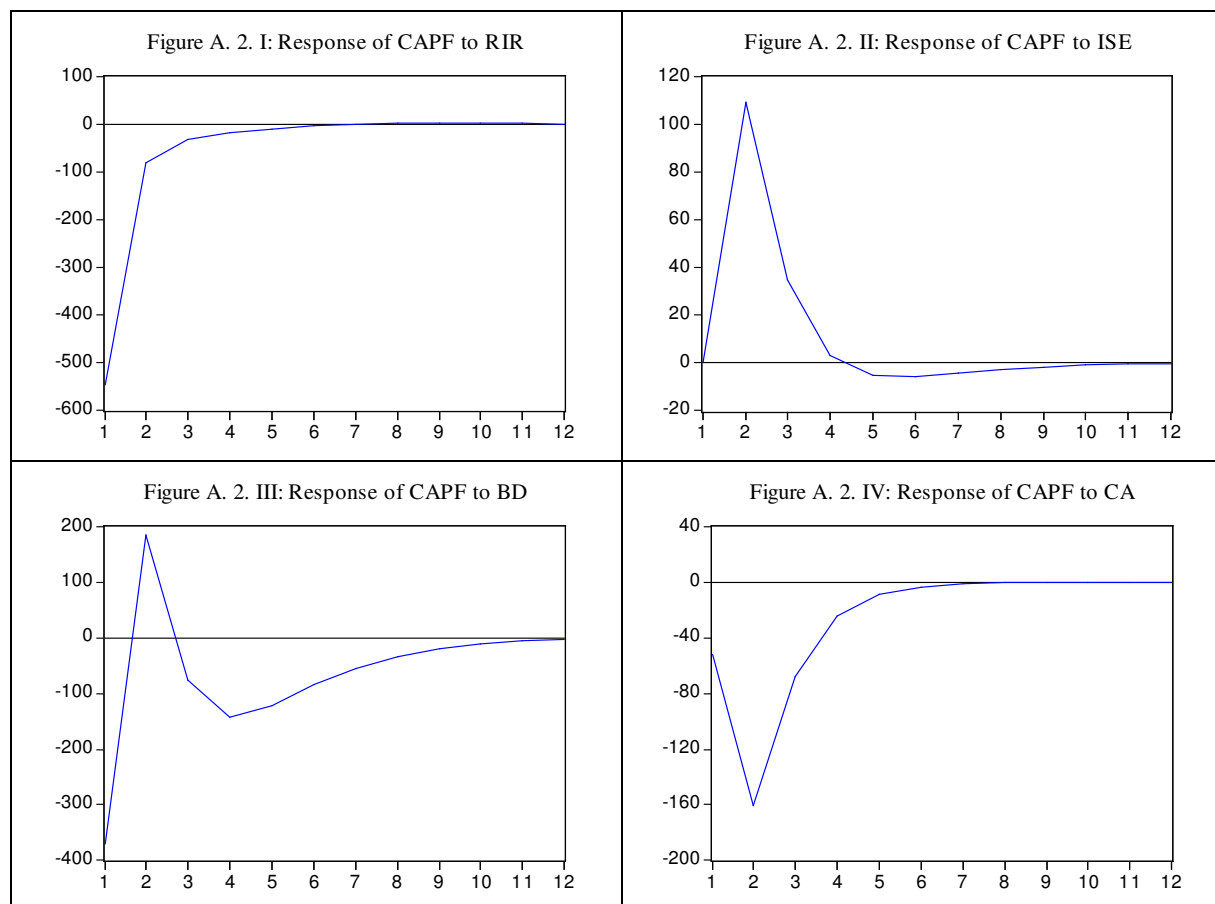

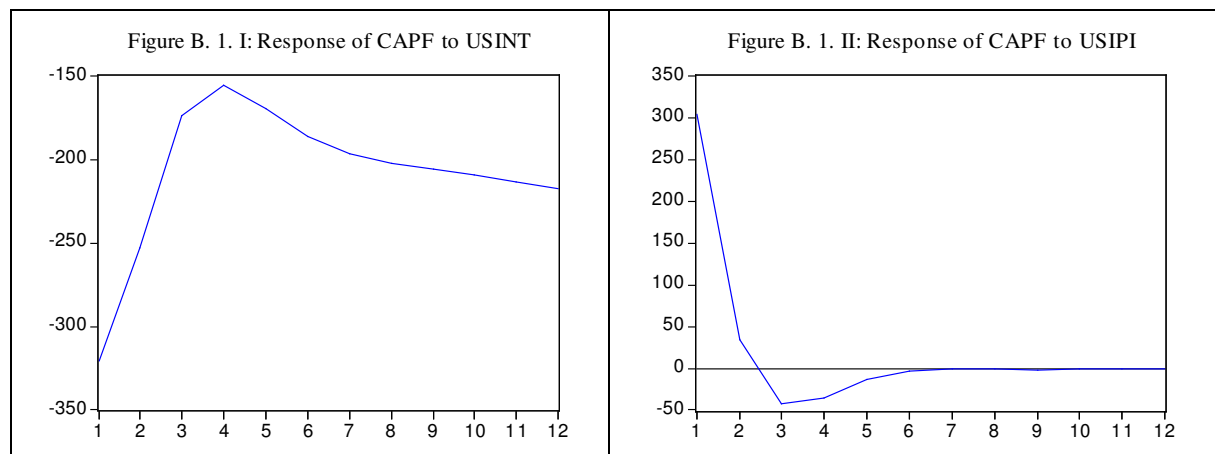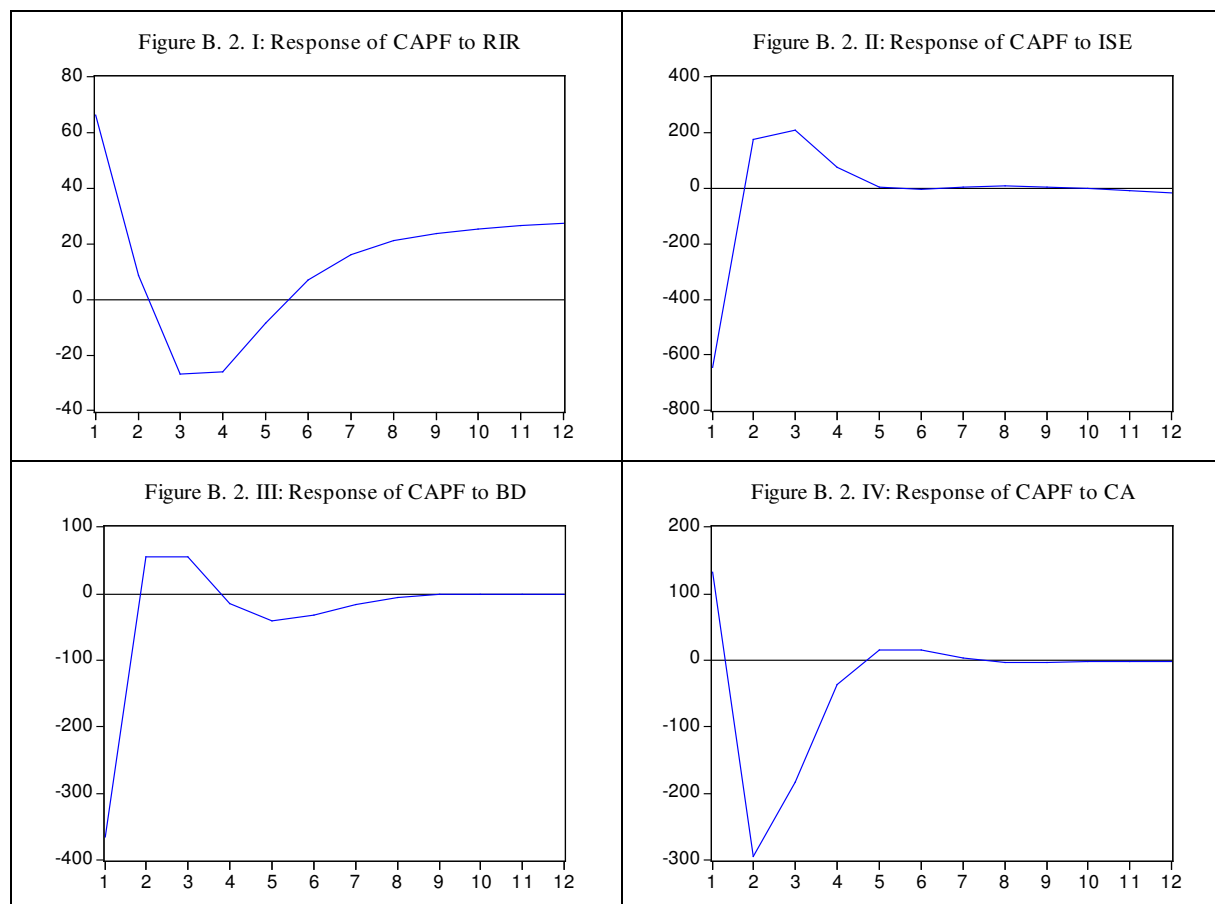Figure B. 1. I: Response of CAPF to USINT

Figure B. 1. II: Response of CAPF to USIPI

Figure B. 2: Impact of Pull Factors: Response of CAPF to Structural One S.D. Innovations to RIR, ISE, BD and CA

Figure B. 2. I: Response of CAPF to RIR

Figure B. 2. II: Response of CAPF to ISE

Figure B. 2. III: Response of CAPF to BD

Figure B. 2. IV: Response of CAPF to CA

Appendix C: Variance Decomposition Analysis

Table C. 1: Variance Decomposition of CAPF for the Period 1992:01-2001:12

Period	S.E.	Push Factors		Pull Factors				CAPF
		USINT	USIPI	RIR	ISE	BD	CA	
1	0.4930	7.30	0.15	26.70	0.00	12.24	0.24	53.37
2	0.5876	6.98	3.83	24.34	0.95	13.66	2.27	47.97
3	0.6381	6.93	4.07	24.09	1.04	13.94	2.60	47.34
4	0.6694	6.72	5.26	23.41	1.01	15.08	2.57	45.95
5	0.6904	6.58	6.15	22.92	0.99	15.86	2.52	44.98
6	0.7056	6.52	6.61	22.68	0.98	16.22	2.49	44.51
7	0.7176	6.49	6.82	22.57	0.98	16.36	2.48	44.30
8	0.7276	6.48	6.91	22.53	0.98	16.41	2.48	44.22
9	0.7365	6.48	6.95	22.51	0.97	16.42	2.47	44.18
10	0.7445	6.49	6.97	22.50	0.97	16.43	2.47	44.17
11	0.7518	6.50	6.97	22.50	0.97	16.42	2.47	44.16
12	0.7586	6.50	6.98	22.50	0.97	16.42	2.47	44.15

Table C. 2: Variance Decomposition of CAPF for the Period 2002:01-2005:12

Period	S.E.	Push Factors		Pull Factors				CAPF
		USINT	USIPI	RIR	ISE	BD	CA	
1	0.0878	8.61	7.74	0.37	34.48	11.11	1.47	36.23
2	0.1250	11.95	6.71	0.32	31.63	9.73	7.43	32.24
3	0.1576	13.02	6.32	0.34	32.06	9.18	9.07	30.02
4	0.1877	14.28	6.25	0.38	31.66	8.98	8.94	29.51
5	0.2155	15.82	6.13	0.37	31.04	8.91	8.78	28.94
6	0.2425	17.61	6.00	0.37	30.35	8.77	8.60	28.30
7	0.2703	19.52	5.86	0.38	29.63	8.58	8.40	27.63
8	0.2998	21.45	5.71	0.39	28.92	8.38	8.19	26.96
9	0.3318	23.35	5.57	0.42	28.20	8.17	7.99	26.30
10	0.3668	25.22	5.43	0.44	27.50	7.97	7.79	25.64
11	0.4049	27.07	5.30	0.47	26.81	7.77	7.60	24.99
12	0.4463	28.89	5.16	0.50	26.14	7.57	7.40	24.35

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