



**BOĞAZIÇI ÜNİVERSİTESİ**

**ISS/EC-2001-09**

**The Transmission of a Sudden Capital Outflow:**

**Evidence from Turkey**

C.Emre Alper

Ismail Saglam

**ARAŞTIRMA RAPORU**

**RESEARCH PAPERS**

Boğaziçi University Department of Economics Research Papers are of preliminary nature, circulated to promote scientific discussion. They are not to be quoted without written permission of the author(s).

## THE TRANSMISSION OF A SUDDEN CAPITAL OUTFLOW: EVIDENCE FROM TURKEY•

C. Emre Alper and Ismail Saglam

Department of Economics and  
Center of Economics and Econometrics  
Bogazici University,  
Bebek, Istanbul 80815,  
Turkey.

First Version: June 1999

This version: July 2000

### Abstract

A sudden capital outflow may lead to liquidity problems and hence cause output losses in emerging market economies. The existence of real effects of such capital outflows are questioned initially, using the narrative approach during the past four financial crises in Turkey during the 1989-1999 period. The paper also investigates the transmission channels of sudden capital outflows during 1990's. In particular, the transmission of the financial crises through the interest rate, the other asset prices and credit channels are ventured to identify by a VAR methodology. The results indicate that the financial crisis of January 1994 and Russian crisis had real output effects. The three transmission channels that we examine, namely the interest rate, credit and other asset prices channels, are all found to be effective.

**Key words:** Financial crises, transmission mechanism.

**JEL classification numbers:** F32, E52.

---

• Presented at the "Contagion" Conference, June 4, 1999, organized by Center of Economics and Econometrics (CEE), Bogazici University, with financial support from Credits Suisse First Boston. The authors thank Yilmaz Akyuz, Hasan Ersel, Refik Erzan, Fatih Ozatay and Gulbin Sahinbeyoglu for their valuable comments. The usual disclaimer applies.

## I. Introduction

The world economy of the 1990's witnessed large-scale private capital flows to emerging markets. During the period of 1988-1997, the stock of debt of emerging market economies increased approximately by twofold from \$1trillion to \$2 trillion.<sup>1</sup>

The nature of these private capital flows has recently shifted from long-term to short-term. The main rationale for the boom in financial flows to the capital deficient economies is the recent steps taken by these economies to phase out the restrictions on the capital account while undertaking structural macroeconomic reforms. Turkey, for example, opened up its capital accounts by the end of 1980's in the hope of attracting foreign money to finance the public sector borrowing requirement, which would reduce the prevailing high real interest rate, and decrease the crowding-out in private investment.

The surge of foreign capital into Turkey due to high rates of return helped finance the government budget deficit; but, alas, it was unable to reduce the high real interest rate. This stemmed from the fiscal extravagance once the amount of funds available to the domestic economy increased. The existence of foreign capital worked like a two-edged sword. On the one hand, it stimulated growth; on the other, it increased the probability of macroeconomic mismanagement.

Turkey, since the financial liberalization of its economy in 1989, has been subject to four main financial crises, three of which originated internationally. The first crisis, which took place in Turkey in January 1994, was essentially due to the fact that the government refused to play by "the rules of the game". Six months before the crisis took place, the Turkish government took steps to suppress interest rates while simultaneously appreciating the real exchange rate vis-à-vis the dollar in an inflationary environment. The result was a rapid dollarization of the economy and hence a rapid loss of the central bank foreign exchange reserves, giving rise to, inevitably, a sharp devaluation of the currency and a jump in the interest rates.<sup>2</sup>

The second crisis was the collapse of the Mexican Peso in December 1994, which later spread to other Latin American countries. This process was called the *Tequila effect*. The third crisis, known as the *Asian flu*, took place in East Asia, which caught Korea in November 1997. The fourth crisis surfaced with the default of Russia in August 1998, and spread to other emerging economies, deserving the name the *Russian virus*.<sup>3</sup>

The three international episodes of financial crisis began in one country or in a group of countries and spread beyond its borders; this process is referred to as *contagion*. In the literature, there are two main definitions of contagion. The first one is fundamentals-based contagion that arises when the victim and the already infected countries are related via trade links or financial links. The second is the so-called *true contagion* that arises even if the above interconnections are not present. This type of contagion is generally due to volatile investor sentiment and aversion to risk as well as the existence of imperfect information.

These financial crises are costly to emerging market economies, since they can result in significant losses of time and output. Calvo (1998) lays out basic mechanisms, whereby a sudden stop in capital inflow or a sudden capital outflow can trigger crisis in an emerging economy, by pushing the economy into insolvency and induce bankruptcies that lead to the destruction of specific human capital. This sudden stop may destroy output and incentives to rebuild it, and may also destroy the credit channels.

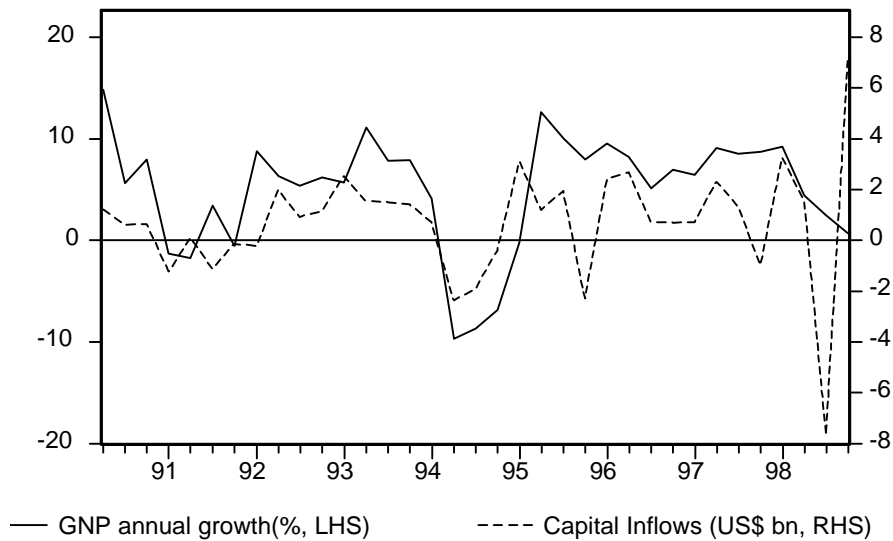
---

<sup>1</sup> For a brief review and recent figures and trends in financial integration see The Economic Report of the President (1999) and also Rodrik and Velasco(1999).

<sup>2</sup> See Ozatay (1996) for detailed discussion.

<sup>3</sup> The nature and causes of these crises have been discussed vastly in the literature. See, for example, Frankel and Rose (1996), Eichengreen and Rose(1997), Calvo (1998), Corsetti, Pesenti and Roubini (1998), Dornbush (1998), and Kaminsky and Reinhart (1998).

## Growth and Capital Inflows in Turkey (1990-1998)



**Figure 1**

The growth performance of Turkey, for example, is closely linked to the amount of short-term capital flows to and from the economy. Figure 1 depicts the close positive relation between year-on-year GNP growth and the short-term capital inflow (outflow when negative) that is defined as the sum of the portfolio investment and the other short-term capital.

This paper analyzes the real effects of the four financial crises in Turkey in the 1990's. The existence and the magnitude of contraction in the real sector following a financial crisis are investigated. Then the channels that transmit the financial shock onto the real variables are examined. Two different methodologies are employed. First, the narrative approach due to Friedman and Schwartz (1963), and then the VAR approach following Sims (1980).

The paper is organized as follows: Section 2 lays out the theoretical background for the transmission mechanisms of financial crises. Section 3 provides information about the data set used in estimations. Section 4 discusses the methodologies and estimation results, and finally Section 5 concludes.

## II. Transmission Channels of Financial Crises

A sudden stop in capital inflow or a sudden capital outflow may create serious impacts on the real sector, depending on the scarcity of capital in the domestic economy and the depth of the financial system. The paper aims to analyze the effects of a sudden capital outflow from a small open economy due to an exogenous shock, such as a shift in the investor preferences, or due to pure contagion. Thus, the ensuing analysis is going to assume that the capital outflow does not originate from the “fundamentals” of the small open economy.

A financial crisis elsewhere causes investment pessimism towards all emerging markets, and hence investors withdraw capital from these markets, regardless of their strength, and invest in “safe havens”, such as the U.S. Treasury bills. At the initial stages of the crisis, the reduction in the demand for domestic assets raises the interest rate, and the increase in the demand for foreign currencies causes the domestic currency to depreciate.

Assuming that the objective of the domestic monetary authority is to provide stability in the prices prevailing in the financial markets, such as the interest rate and the exchange rate, a sudden capital outflow brings about an equal amount of reduction in the foreign exchange reserves. If the monetary authority is unable to sterilize the effects of this outflow, the domestic money supply contracts.<sup>4</sup> Even if the central bank is able to sterilize the reduction in the money stock due to capital outflow, by buying government securities or lending money through the “discount window”, so that the reserve money remains constant, the interest rate would still rise. The increase in the interest rate is because of the scarcity of capital in the domestic financial markets after the foreign capital flees, and not due to monetary contraction.

The channels through which the effects of a financial crisis are transmitted onto the real variables are discussed below.<sup>5</sup>

### **Interest Rate Channel**

A sudden capital outflow, if unsterilized, results in the tightening of the money supply when the monetary authority defends the value of the domestic currency by selling foreign exchange. The monetary contraction, along with the increased risk premium and capital scarcity, raises the real interest rate, which in turn raises the cost of capital while reducing the present value of durable goods. In effect, the investment spending in productive sectors fall. Moreover, demand for and investment in the durable goods decrease, which both lead to a recession in the economy.

### **Other Asset Prices Channel**

There exist a link between stock prices and investment spending and another one between stock prices and consumption. A sudden capital outflow, if unsterilized, reduces the money supply. Along with the fleeing foreign investors, the domestic investors try to meet their excess demand for money by reducing their spending in the stock market or by selling a fraction of the stocks they hold. The fall in the demand for equities then lowers their prices. Lower equity prices imply lower market values of firms relative to the replacement cost of capital (Tobin's  $q$ ). The firms then cut their investment spending. On the other hand, lower equity prices imply lower financial wealth of households, thereby inducing them to decrease their consumption. Due to cuts in the investment spendings and consumption expenditures, a sudden capital outflow contracts the real economy.

### **Credit Channel**

The contraction in the money supply following a sudden capital outflow implies lower reserves and deposits of private banks, and thus diminishes their ability to lend. Besides, during a contagious crisis, new syndicated loans to banks in emerging markets are not offered, and furthermore previous loans are recalled, and again banks' ability to lend decreases. Bank loans are imperfect substitutes for bonds and equities, and are especially demanded by small firms or firms facing constraints in other credit markets. The shortage in the supply of bank credits then makes the potential borrowers reduce their private spending and investment, leading to a decrease in the overall economic activities.

The above transmission channels of financial crises implicitly assume that the central bank attempts to provide stability in the foreign exchange and money markets. The former it achieves via a simultaneous sale of foreign exchange during the capital outflow. However, this intervention in the foreign exchange markets destabilizes the money market since the money stock contracts. The

---

<sup>4</sup> The latter assumption as to the lack of sterilization is justifiable when the size of the capital outflow relative to the size of the net domestic assets is large or there is an upper bound on the net domestic assets prescribed by a credible disinflation program, both of which were the case for Turkey during the Russian crisis when \$8 billion out flowed within a month.

<sup>5</sup> Some of the channels that are discussed here are modified forms of the channels of monetary transmission. For an extensive review of the literature, see Mishkin (1995).

central bank then engages in measures to sterilize the aforementioned intervention and tries to keep the reserve money unchanged. Whether the central bank has success in achieving its objective of providing stability to both markets will have repercussions on the transmission channels.

### III. Data

The variables considered in the paper are the industrial production index, manufacturing production index, reserve money, real interest rate, exchange rate, trade surplus, short-term capital flow, Istanbul Stock Exchange index in USD, credits to the private sector by deposit banks, total bank deposits. The nominal variables are expressed in U.S. Dollars, and all variables except for the interest rate are expressed in logarithms. The sample covers the period 1989:09-1999:04 and the data are obtained from the web site of the Central Bank of Turkey. The series are seasonally unadjusted.

As a measure of aggregate economic activity, we use industrial production index, *IPI*, and manufacturing production index, *MPI*.

The reserve money of the central bank is denoted by *RM*. The *ex-post* real interest rate, *R*, is calculated using the Fisher equation and equal the difference between the nominal interest rate and the expected inflation rate divided by one plus the expected inflation rate. The nominal interest rate is taken as the simple annualized weighted average of the inter-bank overnight interest rates. The expected inflation in each month is derived assuming one-month perfect foresight and is equal to the percentage change in the consumer price index between next month and 11 months ago.

Two types of exchange rates are used: *USD*, Turkish lira value of the U.S. dollar and *BASKET*, the weighted average of the U.S. dollar and Deutsche Mark, with their weights being 40% and 60% respectively.

Exchange rates are the average of the central bank buying and selling rates each day within a month.

Trade surplus and Istanbul Stock Exchange index are respectively denoted by *TS* and *ISE*.

Short-term capital flow, obtained from the balance of payments accounts, is the sum of the portfolio investment and the other short-term capital. This sum multiplied by minus one is the capital outflow variable denoted by *KO*.

Credits by deposit banks, *CREDIT*, include the consumer credits, credits to the private sector, bonds and bills of the corporate sector plus the participation in private enterprises. Total bank deposit variable, *DEPOSIT*, is the sum of the sight and time deposits of the deposit banks.

Since monthly series are used to analyze the transmission channels of financial crises, and since monthly data for investment, wealth and Tobin's *q* are not available, these variables are not included in the analyses. So, there are assumed direct links (i) from the real interest rate to the real output in the interest rate channel, (ii) from the credit to the real output in the credit channel, and (iii) from the Istanbul Stock Exchange Index to the real output in the other asset prices channel.

## IV. Methodology and Results

### IV. I. Narrative Approach to Sudden Capital Outflows: Evidence from Single Equation Methodology

The narrative methodology employed in the paper owes to Friedman and Schwartz (1963) who investigated the real effects of monetary policy in the U.S. economy. To put simply, this methodology uses dynamic forecasting analysis to evaluate respectively the behavior of real output, exchange rate, private credits and the reserve money, following four episodes of financial shocks.

The January 1994 crisis<sup>6</sup> in Turkey, the December 1994 Mexican crisis, the November 1997 Asian crisis and finally the August 1998 Russian crisis.

The expected behavior of each variable for the entire sample is constructed in the following way. A univariate equation is estimated for each variable using up to 12 period-lagged values of the variable as well as a constant, a trend, and dummy variables standing for monthly seasonalities and religious holidays.<sup>7</sup>

Where applicable, generalized autoregressive conditional heteroskedasticity (GARCH) technique is used to improve the efficiency of the estimates. In its most general form, the following equation is estimated for each variable denoted by  $Y_t$ :

$$\begin{aligned}\Delta \ln(Y_t) &= \mathbf{a} + \mathbf{b}t + \sum_{i=1}^{12} \mathbf{g}_i \Delta \ln(Y_{t-i}) + \mathbf{Y}D_t + u_t \\ u_t &= \sqrt{h_t} \mathbf{n}_t \\ \mathbf{n}_t &\sim i.i.d.(0,1) \\ h_t &= \mathbf{k} + \sum_{i=1}^2 \mathbf{d}_i h_{t-i} + \sum_{i=1}^2 \mathbf{I}_i u_{t-i}^2\end{aligned}$$

where  $D_t$  denotes the vector of dummies. Then, in-sample forecasts are obtained for each variable. The forecasts represent the expected behavior of the variables, since the positive and negative shocks cancel out each other over the entire sample.

The forecast errors are then calculated as the difference between  $\Delta \ln(Y_t)$  and  $\Delta^f \ln(Y_t)$ . For each variable, the forecast errors starting from the aforementioned financial crises dates going up to six months are accumulated as below and reported in Tables 1-4.

$$CE_t^f = \sum_{i=a}^t [\Delta \ln(Y_i) - \Delta^f \ln(Y_i)]$$

where  $a = 1$  and  $t = 1, \dots, 6$  for all crises.

Table 1 reports results based on univariate dynamic estimation of the industrial production index and the manufacturing production index. In order to obtain the time series specification of the growth in the industrial production index, initially a regression is run on its twelve lagged values, a constant and the aforementioned dummy variables. Residuals from this regression display ARCH effects. The maximum likelihood estimation of a GARCH(1,1) with the above dynamic specification is used to derive the forecast errors. Similarly, a GARCH(2,0) is estimated for the manufacturing production index again with the same dynamic specifications as for the industrial production index.

Analysis of Table 1 gives the following facts regarding the real effects of financial crises for Turkey. The 1994 Mexican crisis and the 1997 Asian crisis have no detrimental impact on the Turkish real sector. The 1994 domestic financial crisis has the maximum cumulative contractionary effect on the industrial production and manufacturing production indices, respectively, in the fourth and the fifth month after the crisis, and the cumulative effect thereafter declines. The maximum

<sup>6</sup> See Ozatay (1996) for further discussion

<sup>7</sup> Religious holidays considered are Eid ul-Fitr (festival after Ramadan lasting for 3 days) and Eid ul-Adha (festival of sacrifice lasting for 4 days). In relation to their duration, the former and the latter are respectively called the *lesser* and the *greater*. The religious seasonal effects cannot be accounted for by monthly seasonal dummies, as the religious holidays are dated by the lunar calendar and move approximately 11 days earlier in the Julian calendar each year.

cumulative effects are -25.0% and -26.3% for the industrial production and manufacturing production indices, respectively.

**Table 1. Cumulative Forecast Errors for the Growth in the Aggregate Economic Activity**

Period	Industrial Production Index				Manufacturing Production Index			
	Feb 94	Jan 95	Dec 97	Sep 98	Feb 94	Jan 95	Dec 97	Sep 98
1	-0.098	0.046	0.059	-0.012	-0.073	0.021	0.078	0.009
2	-0.070	0.009	0.050	-0.048	-0.030	0.008	0.073	-0.050
3	-0.189	0.052	0.012	-0.089	-0.157	0.063	0.023	-0.109
4	-0.250	0.069	0.047	-0.116	-0.258	0.123	0.071	-0.089
5	-0.247	0.039	0.003	-0.081	-0.263	0.002	0.018	-0.121
6	-0.231	0.102	0.030	-0.104	-0.236	0.101	0.032	-0.095

Table 2 below reports results based on univariate dynamic estimation of the *BASKET* and the *USD* exchange rates. For the growth in the basket rate, the time series specification is found by running a regression on its twelve lagged values, a constant and the monthly dummy variables and the greater (the festival of sacrifice) dummy. Residuals from this regression do not reveal any ARCH effects. Similarly, no ARCH effect is present for the TL/USD.

**Table 2. Cumulative Forecast Errors for the Growth in the Basket Exchange Rate and in the TL/USD Rate**

Period	Basket Rate				TL/USD Rate			
	Feb 94	Jan 95	Dec 97	Sep 98	Feb 94	Jan 95	Dec 97	Sep 98
1	0.098	0.032	0.007	-0.008	0.092	0.013	0.019	-0.025
2	0.200	0.011	0.007	-0.017	0.178	-0.024	0.025	-0.049
3	0.550	0.001	0.003	-0.019	0.531	-0.074	0.015	-0.040
4	0.592	-0.071	-0.011	-0.016	0.557	-0.160	-0.002	-0.044
5	0.508	-0.089	-0.036	-0.025	0.461	-0.172	-0.033	-0.054
6	0.468	-0.112	-0.041	-0.040	0.404	-0.192	-0.051	-0.055

Table 2 shows that the January 1994 Turkey crisis led to a depreciation while the crises originating elsewhere led to minor appreciations. Appreciation of the TL during the three contagious financial crises is due to that the central bank's foreign exchange reserves were sufficiently high to defend the currency. Luckily, the timing of these crises did not coincide with periods in which the level of foreign debt repayments are high, helping the efforts of the Central Bank in protecting the value of the TL.

Table 3 gives results based on univariate dynamic estimation of private credits in U.S. Dollars using two different methodologies. The first methodology involves finding the time series specification of the growth in the private credits by running a regression on its twelve lags, a constant and the monthly dummy variables and the lesser (the festival of Ramadan) dummy. Residuals from this regression reveal ARCH effects. The maximum likelihood estimation of a GARCH(1,0) with the above dynamic specification is used to derive the forecast errors.



**Table 3. Cumulative Forecast Errors for the Growth in the Private Credits**

Period	Methodology I				Methodology II			
	Feb 94	Jan 95	Dec 97	Sep 98	Feb 94	Jan 95	Dec 97	Sep 98
1	-0.024	-0.042	0.096	0.030	-0.059	-0.037	0.089	0.019
2	-0.008	-0.066	0.060	0.054	-0.115	0.009	-0.045	-0.001
3	-0.007	-0.051	0.036	0.075	-0.173	0.029	-0.039	-0.036
4	-0.006	-0.049	0.047	0.171	-0.244	0.040	0.011	0.059
5	0.050	-0.049	0.048	0.135	-0.227	0.011	0.000	-0.069
6	0.067	0.007	0.048	0.112	-0.247	0.071	-0.013	-0.018

The second methodology, while defining the time series specification of the growth in the private credits, also includes lead and lag values of the growth in the production index. The additional terms account for the cyclical effects in the private credits. Other than its twelve lags, a constant, the dummy variables, and from 2 leads to 2 lags of the growth in the industrial production index are used in the time series specification. Residuals from this regression also reveal ARCH effects. The maximum likelihood estimation of a GARCH(2,0) with the above dynamic specification is used to derive the forecast errors.

From Table 3, it can be observed that even though there is no significant change in the private credits using the first methodology, the second methodology reveals the contractionary effect of the financial shocks on the private credits for the domestic financial crisis of January 1994. In the former crisis, the cumulative reduction after 6 months is 24.7% according to the second methodology. The impact of the Mexican and Asian financial crises, as well as the Russian crisis, on the private bank credits is insignificant.

The next table presents results for the real reserve money using the two methodologies discussed above. The dynamic specification using the first methodology consists of nine lags of the growth in the real reserve money, a constant and the dummy variables. Residuals from this regression do not reveal any ARCH effects.

**Table 4. Cumulative Forecast Errors for the Growth in the Real Reserve Money**

Period	Methodology I				Methodology II			
	Feb 94	Jan 95	Dec 97	Sep 98	Feb 94	Jan 95	Dec 97	Sep 98
1	-0.035	-0.014	0.019	-0.025	-0.051	-0.014	0.032	-0.018
2	-0.042	0.013	0.009	-0.023	-0.041	0.014	0.032	-0.003
3	-0.150	0.039	0.026	0.002	-0.149	0.033	0.037	0.016
4	-0.149	0.083	0.018	-0.005	-0.145	0.087	0.036	0.017
5	-0.116	0.136	0.082	0.015	-0.102	0.122	0.074	0.041
6	-0.075	0.115	0.059	0.016	-0.067	0.114	0.053	0.047

The second methodology, to identify the time series specification, includes nine lags of itself, a constant, and the dummy variables as well as from 1 leads to 2 lags of the growth in the industrial production index. Residuals from this regression reveal ARCH effects. The maximum likelihood estimation of a GARCH(2,0) with the above dynamic specification is used to derive the forecast errors.

An analysis of Table 4 shows that none of the four crises has any significant impact on the real reserve money. This is due to the sterilization efforts by the central bank.

To recapitulate, analysis using the narrative approach suggests that the real effects of the financial crises are more pronounced for the 1994 domestic crisis and the 1998 Russian crisis. The cumulative real effects peak five months after the crises, and decline afterwards. It can also be observed that the central bank reacts to financial shocks by defending the value of the domestic currency as well as sterilizing its effects on the domestic markets. This is due to the fact that the objective function of the Turkish central bank emphasizes stability in variables such as the inflation rate, interest rates and the exchange rate rather than attaining a targeted level of output.

However, there are two main caveats with this approach. The first one is the inability of the narrative approach to explicitly reveal the transmission mechanisms of the financial crises onto the real sector. The second concern is the problem of the disentanglement of two or more exogenous shocks working on the forecast errors. The accumulated forecast errors for each variable may not necessarily represent deviations due to the financial crises if there exists another simultaneous shock. For instance, during the second half of the 1998, the Turkish central bank engaged in a monetary program to reduce the inflation rate. The effects of this monetary program, which targeted the growth in net domestic assets, started to work on the Turkish economy just as the financial crisis in Russia emerged. In order to cope with these concerns, the VAR estimation technique is utilized next.

#### **IV. II. Responses to Sudden Capital Outflows: Vector Autoregressions**

In the paper, three channels of transmission mechanism are studied using the impulse response functions following the aforementioned ordering also known as *Choleski decomposition*. All impulse response functions are drawn with capital outflow variable preceding other variables in the system. The ordering for the three channels, respectively, are:

Interest rate channel:  $KO \rightarrow RM \rightarrow R \rightarrow IPI$

Other Asset Prices channel:  $KO \rightarrow RM \rightarrow ISE \rightarrow IPI$

Credit channel:  $KO \rightarrow RM \rightarrow DEPOSIT \rightarrow CREDIT \rightarrow IPI$

Figures 2-4 are generated by the technique of vector autoregression, a system of ordinary least-squares regressions in which each variable in the system is regressed on the lagged values of both itself and other variables in the system, following Sims (1980). In order to be able to apply this technique, all variables entering the system must be stationary, and since the focus is on the short-run consequences of the financial crises, all variables entering the VAR are detrended using the Hodrick-Prescott filter. The exogenous variables in the VAR systems include constant as well as dummy variables. In all estimations except for the interest rate channel VAR, the order of estimation is five.<sup>8</sup> For the interest rate channel VAR, the order is chosen to be 12 to overcome the possibility of underparametrization.

Using the VAR methodology, under some identifying assumptions, one can obtain time paths of the variables in the system in response to a shock in each variable, which are called *impulse response functions*. To identify the effects of a shock in each variable, some kind of

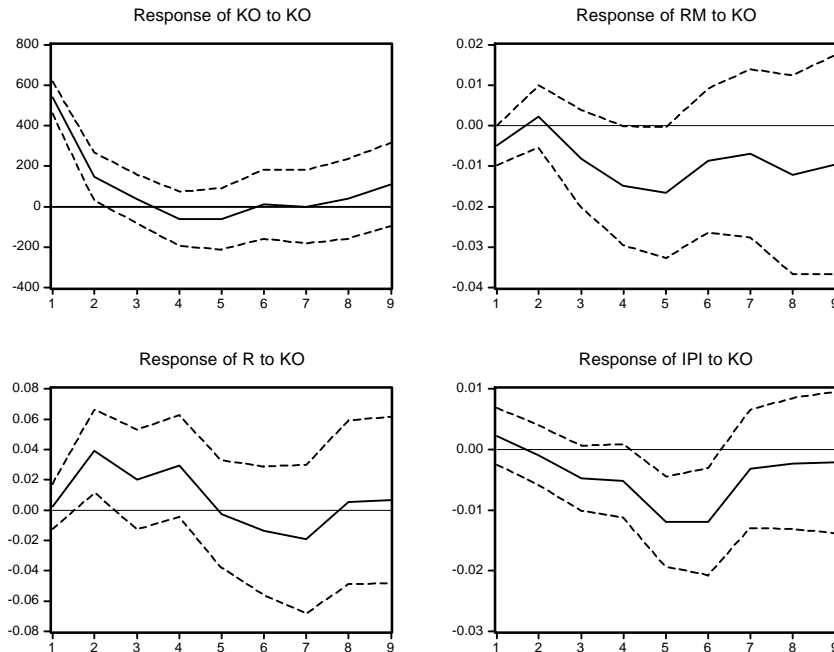
---

<sup>8</sup> Likelihood ratio tests conducted to select the appropriate lag length suggested the order of the VARs to be less than five. Similarly, the Schwarz criterion chose the appropriate order to be less than five. However, it was necessary to include at least five lags in the regressions to whiten the errors.

*ordering* is imposed on the shocks. The identifying assumption used in the paper is such that each variable in the ordering is contemporaneously affected by all preceding variables while affecting the succeeding variables, only.

The Transmission of a Sudden Capital Outflow  
via the Interest Rate Channel  
(KO --- RM --- R --- IPI)

Response to One S.D. Innovations  $\pm 2$  S.E.



**Figure 2**

Figure 2 shows the interest rate channel of the transmission of a sudden capital outflow on the real economy through impulse response functions. These functions are obtained by tracing out the effects of an unanticipated capital outflow shock on the time paths of the variables entering into the VAR system, which are the capital outflow, the log of the reserve money, the real interest rate, and the log of the industrial production index. The 2 standard error band around the impulse response of each variable is obtained through 2000 Monte Carlo simulations.<sup>9</sup>

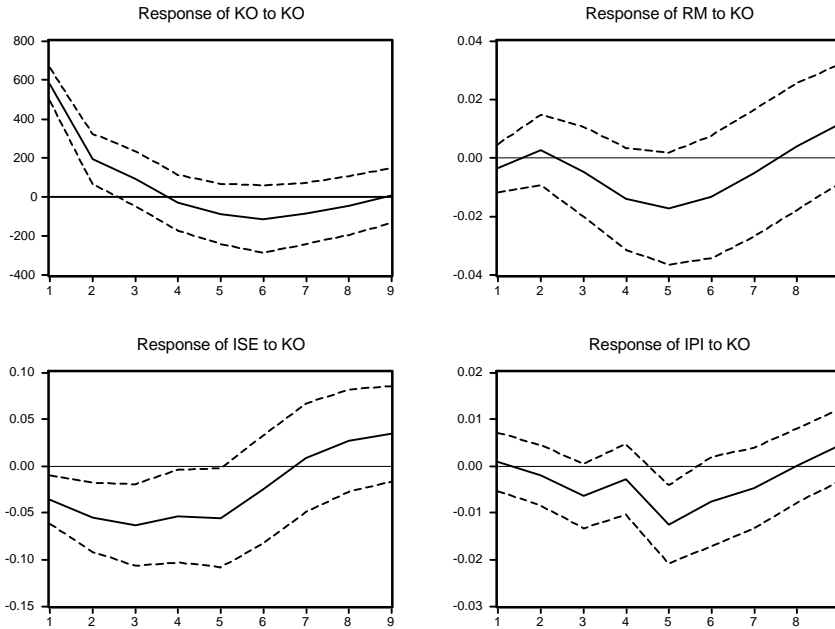
An unanticipated capital outflow causes further outflows for the next two months. The same shock does not reduce the reserve money significantly below its trend, which is due to the successful sterilization by the central bank after each foreign exchange market intervention following sudden capital outflows. The real interest rate increases significantly above its trend two months after the shock. This increase is because of capital scarcity and the increase in the risk premium. Five months after the shock, the industrial production goes down for two months significantly below its trend.

Figure 3 displays the other prices channel. The variables considered are the capital outflow, the log of the reserve money, the log of the ISE index in U.S. Dollars, and the log of the industrial production index.

<sup>9</sup> Instead of the analytic standard error band, we use Monte Carlo simulations since the sample size is only a hundred, and hence asymptotic properties may not apply well.

The Transmission of a Sudden Capital Outflow  
via the Other Asset Prices Channel  
(KO --- RM --- ISE --- IPI)

Response to One S.D. Innovations  $\pm 2$  S.E.



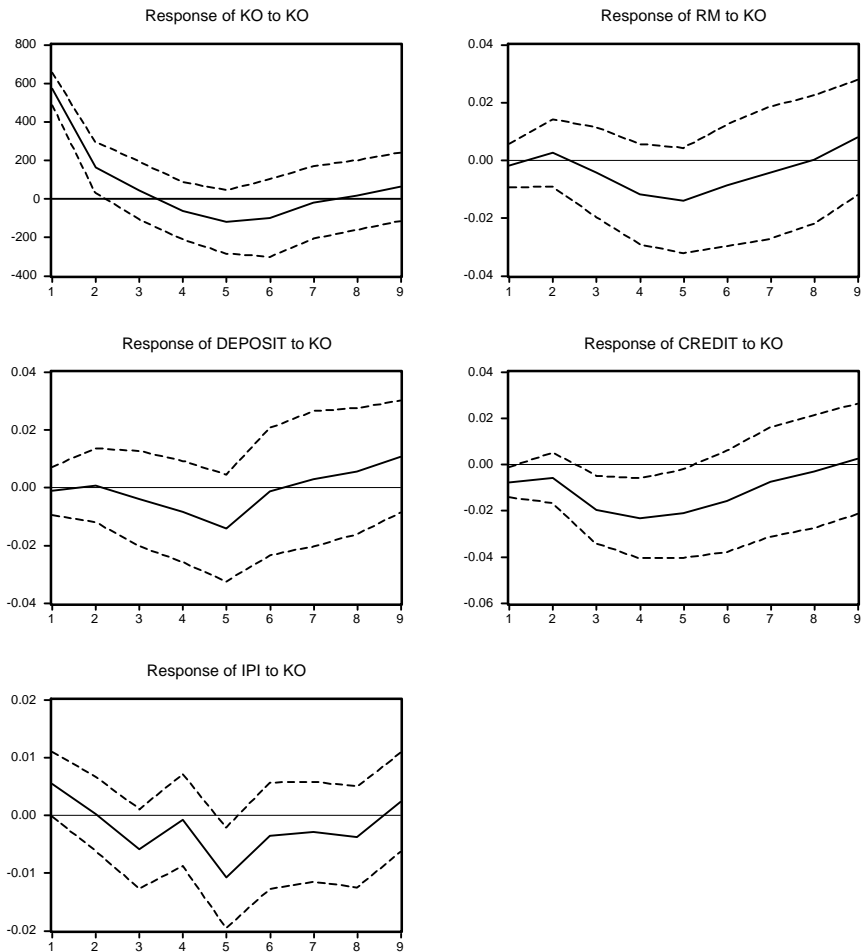
**Figure 3**

An unanticipated capital outflow again causes further outflows for the next two months. The effect of the shock on the reserve money is successfully sterilized by the central bank. The flight of the foreign capital reduces the ISE index for five months. Industrial production index again falls five months after the initial capital outflow shock.

A reduction in the equity prices affects output through two different channels: The “Tobin's  $q$  effect” on investment and the “wealth effect” on consumption. The total market capitalization of firms is approximately 20 percent of the Turkish GNP, and approximately a third of the total capitalization is traded in the ISE. Based on these figures, one can claim that the investment channel is more effective in Turkey than the wealth channel.

The Transmission of a Sudden Capital Outflow  
via the Credit Channel  
(KO --- RM --- DEPOSIT --- CREDIT --- IPI)

Response to One S.D. Innovations  $\pm$  2 S.E.



**Figure 4**

Finally, Figure 4 gives results concerning the bank credit channel. The variables considered are the capital outflow, the log of the reserve money, the log of the bank deposits, the log of the deposit bank credits to the private sector, and the log of the industrial production index.

An unanticipated capital outflow causes further outflows for the next two months. The shock does not reduce the reserve money. As expected, the successful sterilization by the central bank keeps the currency in circulation constant, and hence deposits of the banks remain unchanged. However, during the first five months after the shock, bank credits to the private sector contracts. This contraction is not due to reduction in deposits but is probably due to the lack of foreign funds and the recalled syndicated loans. Industrial production index again falls five months after the initial capital outflow shock.

## V. Conclusion

Understanding the effects of financial crises and the channels through which they operate on the real output is crucial in answering broad ranges of policy questions. In the paper, first the real effects of sudden capital outflows during the four episodes of financial crises were investigated. Findings obtained from the application of the narrative approach show that the real output losses of the financial crises are more pronounced for the 1994 domestic crisis and the 1998 Russian crisis. The cumulative real effects peaked five months after the crises, and declined afterwards. It was also observed that the exchange rate did not depreciate significantly after the crises and that the real reserve money remained constant during the crises. These findings suggest that the central bank intervened in the foreign exchange markets to protect the value of the TL and at the same time it sterilized the repercussions of this intervention on the reserve money.

The paper also examined the channels through which a sudden capital outflow affected the Turkish economy during 1990's. In particular, transmission of the financial crises through the interest rate, the other asset prices and credit channels were ventured to identify by a VAR methodology. The results indicated that all these three transmission channels were effective. The VAR analysis also showed that during the financial crises the reserve money and the exchange rate were successfully stabilized by the central bank. Had it not been for the intervention of the central bank in the foreign exchange markets, there would have been further contraction in output. Similarly, if the central bank had not sterilized the effect of the sale of foreign exchange, the reserve money would have declined and the real interest rates would have risen further. Thus, one can conclude that during the periods of unanticipated capital outflow, the policy responses of the central bank were effective. The contraction in the output and the rise in real interest rates were mainly as a result of factors beyond the control of monetary authority, such as the lack of capital available to the economy, financial panic, herd behavior, pessimistic investor sentiment and a generalized increase in risk aversion.

To conclude, not all financial crises affected the Turkish economy alike, and the effects of transmission of sudden capital outflows seem to have been cushioned by the accurate policies of the central bank.

## References

- Agenor, P. R. and J. Aizenman (1997). "Contagion and Volatility with Imperfect Credit Markets", IMF Working Papers No: 97/127.
- Alper, C. E. and M. Ucer (1998). "Some Observations on Turkish Inflation: A 'Random Walk' Down the Past Decade", Bogazici Journal Review of Social, Economic and Administrative Studies, Vol. 12, pp. 7-38.
- Binay, S. and F. Salman (1998). "The Global Crisis and the Turkish Economy: New Policy Challenges and Expectations for Near Future", Research Department, The Central Bank of The Republic of Turkey, Research Publications, No: 98/1.
- Calvo, G. A. (1998). "Capital Flows and Capital Market Crises: The Simple Economics of Sudden Stops", Journal of Applied Economics, Vol. 1, pp. 35-54.
- Chari, V. V. and P. J. Kehoe (1996). "Hot Money", Federal Reserve Bank of Minneapolis Research Department Staff Reports, No: 228.
- Corsetti, G., Pesenti, P. and N. Roubini (1998). "What Caused the Asian Currency and Financial Crisis Part I: A Macroeconomic Overview", <http://www.stern.nyu.edu/~roubini>
- Demircioglu, K. (1999). "Effects of Real Interest Rate on Investment in Turkey: (1988-1998)", Mimeo, Bogazici University.
- Domac, I. and G. Ferri (1998). "The Real Impact of Financial Shocks: Evidence from Korea", World Bank Working Papers 2010.
- Dornbusch, R. (1998). "After Asia: New Directions for The International Financial System", <http://www.mit.edu/people/rudi/papers.html>.
- Eichengreen, B. and A. K. Rose (1997). "The Empirics of Currency and Banking Crises", <http://haas.berkeley.edu/~rose>
- Fiore, F. D. (1998). "The Transmission of Monetary Policy in Israel", IMF Working Papers, No: 98/14.
- Frankel, J. A. and A. J. K. Rose (1996). "Currency Crashes in Emerging Markets: An Empirical Treatment", Journal of International Economics, Vol. 41, pp. 351-366.
- Friedman, M. and A. Schwartz (1963). "A Monetary History of the United States, 1867-1960", Princeton University Press.
- Economic Report of the President (1999). "International Capital Flows, Their Causes, and the Risk of Financial Crisis" Chapter: 6, United States Government Printing Office, Washington, 1999.
- Kaminsky, G. L. (1998). "Currency and Banking Crises. The Early Warnings of Distress" Board of Governors of the Federal Reserve System International Finance Discussion Papers No: 629.
- Kaminsky, G., and C. Reinhart (1998). "On Crises, Contagion and Confusion", mimeo, <http://www.puaf.umd.edu/papers/reinhart/cont.pdf>.
- Levy, J and I. Halikias (1997). "Aspects of the Monetary Transmission Mechanism Under Exchange Rate Targeting: The Case of France", IMF Working Papers, No: 97/44.
- MESS Isveren Gazetesi, (Mart 1999). "Kriz Etkileri, Onlemleri ve Yonetimi", pp. 8-12.
- Mishkin, F. S. (1995). "Symposium on the Monetary Transmission Mechanism", Journal of Economic Perspectives, Vol. 9, No: 4, pp. 3-10.
- Ozatay, F. (1996). "The Lessons from the 1994 Crisis in Turkey: Public Debt (Mis)management and Confidence Crisis", Yapi Kredi Economic Review, Vol. 7.
- Rodrik, D. and A. Velasco (1999). "Short-Term Capital Flows", Mimeo, <http://www.ksg.harvard.edu/rodrik/stcapflows.pdf>.
- Sims, C.A. (1980). "Macroeconomics and Reality", Econometrica, 48, pp. 1-48.