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## Factors That Trigger Financial Crises: The Case of Turkey

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### Abstract

This study aims to identify the macroeconomic factors that may have triggered the financial crises in Turkey between January 1998 and July 2012. A macroeconomic model was established for this purpose. The model's dependent variable is a dummy variable representing the financial crises of November 2000 and February 2001, which occurred in Turkey within the study period, while foreign exchange rate, money supply, growth rate, interest rate, the ISE index, and inflation rate were taken as the independent variables. Model parameters were estimated using the logit model. The logit model has been successful in identifying the explanatory variables for crises in periods involving real-life crisis experiences and in calculating the probability of crises to happen.

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### 1. Introduction

Crisis refers to the fluctuations outside an acceptable limit of change in the prices and amounts in any commodity, service, factor, and foreign exchange market (Kibritçioğlu, 2000:5). A large number of economic crises have occurred in various countries throughout history. Economic crises could be analyzed in two groups: real sector crises and financial crises. Real sector crises are experienced as inflation crises and stagnation crises in commodity and service markets and as unemployment crises in labour markets. The latter more specifically refers to the financial crises due to the problems in money markets (Yücel & Kalyoncu, 2010). A financial crisis could be defined as grave economic problems arising as a result of intense currency fluctuations in foreign exchange and stock markets or an excessive increase in the number of (non-performing) loans not paid back to banks in banking system (Yay, 2001).

A high number of crises occurring during the 1990's resulted in an increase in the number of models attempting to explain crises. According to a classification by Eichengreen, outside the two model frameworks called the first- and second-generation models, there are models that attempt to explain the Asian crisis in particular and link banking and currency crises, as well as others that highlight the importance of the contagion effect and external factors. The models termed as the first-generation models, which were brought forward by Krugman (1979) and improved by Flood & Garber (1984), underline the importance of basic macroeconomic factors that spark crises and perceive currency crises as an unavoidable consequence of unsustainable policies and structural imbalances. This

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group of models argue that deteriorations in macroeconomic fundamentals serve as an indicator of a crisis. These fundamental deteriorations could be classified under high and increasing budget deficits, high rates of money supply increase, high inflation, extreme valuable exchange rate, huge current deficits, decreases in international reserves, and increasing domestic interest rates. The second-generation models (Self-fulfilling or Escape-Clause Models) developed by Obstfeld (1986) assert that the inconsistencies between the goals and objectives of policies and the expectations of economic agents in an environment of uncertainty have such significant impacts that can change economic results. Nevertheless, since these two types of models failed to fully explain the Asian crisis, many other models were later developed, which stress that currency and banking crises (twin crises) are created by certain common factors and phenomena and that the banking and finance sector are the source of problems (Krugman, 1999; Mishkin, 1999, 2000; Radalet & Sachs 1998). Apart from these, another model is the Contagion effect model. As a thesis about the simultaneous crises in different countries, it argues that countries have similar fragilities and therefore are shaken by common shocks (Aziz, 2000). The most intense contagion effect has certainly been observed in Asia. The crisis in Thailand rapidly spread to Indonesia, Malaysia, and the Philippines, and later to South Korea, Hong Kong, Singapore, and Taiwan. Russia was another country that was considerably affected by the crisis (Pesenti & Till, 2000). Another model points out that the crises breaking out in developing countries in particular are mainly caused by external factors. Major economic shifts in industrialized countries (shifts in foreign trade rates, interest rates, and exchange rates), globalization of investments, and integration of capital markets may be the triggering factors for financial crises (Yay, 2001:4-9).

This study aims to identify the macroeconomic factors that may have triggered the financial crises in Turkey between January 1998 and July 2012. A macroeconomic model was established for this purpose. A logit model was developed to estimate the model's parameters. This study is composed of four sections. The second section discusses the financial crises in Turkey that occurred between 1998 and 2012. The third section presents information about the economic method used, which is the Logit model, as well as regression estimates. The final section involves an interpretation of the analysis results and offers suggestions.

## 2. The Economic Crises in Turkey

In the 1980's, Turkey abandoned import substitution industrialization strategies and adopted export-oriented industrialization strategies in an effort to integrate with global economies. Thus, state intervention in markets was reduced and replaced by the economic market mechanism. The 1990's witnessed the liberalization of capital movements and the Turkish Lira was made convertible on 22.3.1990. Along with all these developments, public deficit grew in Turkey's economy between 1991 and 1994, when the funding of public deficits from the Central Bank increased real growth, but also resulted in increased current balance deficits. Interest rates skyrocketed. In order to overcome these unfavorable conditions, a stabilization program was announced on April 5th, 1994, which was, however, not satisfactory enough in its stabilizing effects. Although the economy had an initial recovery period, then the Asian crisis of 1997 struck Turkey's economy (İşler, 2004:25). In the face of the country's enormous public deficits and high debt level in 1999, the policies implemented thus far were no longer sustainable. As a matter of fact, by the end of 1999, the country's economy had shrunk by 6.1 percent, the inflation rate (wholesale price index-TEFE) reached 70%, and budget deficit grew enormously with the average annual compound rate for treasury interest reaching 106% and total outstanding debt amounting to 60% of GDP. Having suffered from two-digit inflation rates for nearly three decades, Turkey now reached an unsustainable point (Eğilmez, 2003). During the second half of 1999, in mid August, the country was shaken by a major earthquake, which also aggravated the economic predicament. On the other hand, banks were in an extremely fragile position in this conjuncture. For all these reasons, the new *Banking Law* was approved in June 1999 and a program to reduce inflation for the year 2000 was outlined in a letter of intent sent to the IMF in December 1999. The second main pillar of the program for fighting against inflation involved the changes in foreign exchange rate and monetary policies and structural reforms and privatization programs made up the last step of the program. However, despite all these measures, the inflation target was not met and interest rates fluctuated. The Turkish lira was overvalued since the actual inflation rate was higher than expected, which decreased the competitive power in exporting by making purchase of imported goods more attractive (Eğilmez & Kumcu, 2002). The rapidly growing current

account deficit could only be sustained through foreign capital inflow. However, due to insufficient foreign capital inflow, there was now a devaluation expectation in the country, as a result of which foreign fund managers cut down on their loans. Thus, about 4 billion 800 million dollars of portfolio investment fled out of the country and a liquidity problem arose in the market when banks increased their demand for foreign currency to close their open positions in expectation of a devaluation. In the face of an increasing demand for liquidity, the Central Bank did not provide liquidity to the market in order to meet objectives of the IMF program prescribing to keep foreign exchange reserves at a minimum level and to increase the monetary base so that it could keep up with the increase in net foreign assets. There was an effort to curb the increasing demand for foreign currency by raising interest rates. On 22 November, overnight interbank overnight interest rate rose up to 110.8%, reaching a maximum value of 210%. The Istanbul Stock Exchange (ISE) 100 index continued to move down and declined to 7329 on December 4 (Törüner, 2001). To clear the air of panic, the Central Bank was forced to pump money into the market in the end. Thus, the crisis of November 2000 was caused by low liquidity rates and troubles in the banking sector. The crisis of November 2000 could only be kept from deepening further by an additional IMF loan of \$7.5 billion and the fact that the people did not convert their liras to foreign currency after all (İşler, 2004:40).

The overall economy did not change after the 2000 crisis. Overvaluation of TL, high inflation rates, and ever-growing outstanding domestic debt created doubts about the sustainability of the currency peg. Private banks sought to reinforce themselves before a possible devaluation by calling back the loans granted to public banks and buy foreign currency with the cash. Public banks were unable to meet such sudden high demand. They requested loans from the Central Bank to fulfil their obligations. Yet, the Central Bank had stopped lending money to the market to protect its reserves, but interest rates skyrocketed to unprecedented levels as the banks' demand for TL did not stop (Gökçen 2001). A serious liquidity crisis arising in February 2001 rapidly depleted the foreign exchange reserves. As a result, the currency was allowed to float on the night of February 21. Interest rate and inflation rate increase and uncertainty grew as foreign currencies were allowed to float. The "Transition to a Stronger Economy" program was introduced in May 2001. The new stabilization program mainly aimed to solve the crisis of trust in the public, to stabilize markets, and to continue with the efforts to lay down the foundation for restructuring of the economy by public government. However, the program did not help the country come out of the uncertainty caused by crises since it failed to set forth clear macroeconomic goals.

The period between 2002 and 2006 witnessed a favorable financial environment. In this period, growth rates increased steadily and the country enjoyed low inflation rates and low real interest rates and benefited from increasing increased stock prices and returns. However, the 2008 crisis, which broke out in 2007 in the US as a mortgage loan crisis and later spread around the globe, did not leave Turkey's economy intact. Growth rates declined and unemployment increased. The most significant impact of this global financial crisis on Turkish business sector was shrinking domestic and foreign demand, which brought about various problems. The increase in the number of the unemployed due to firms' insolvency and layoffs and decreasing purchasing power and demand as a result of increasing unemployment rates were among the newer problems (Danacı & Uluyol, 2010). Still, as opposed to the 1999-2001 crisis, financial markets did not experience ups and downs. In 2009, the slowdown in global trading volume and particularly the dramatic deterioration in the growth performance of the EU countries, which are Turkey's most important trade partners, as well as inadequate demand conditions led to a considerable shrinkage in the country's foreign trade. Nonetheless, Turkey's economy underwent a rapid recovery by achieving a growth rate of 6% during the last quarter of 2009. In fact, its growth rate increased by 11.7% within the first quarter of 2010 in comparison to the same period of the previous year, by 10.3% in the second quarter, and by 5.5% in the third quarter of the year. Turkey's current account deficits showed a rapid increase trend in the wake of the global financial crisis and were financed by portfolio investments and other investments, which presents a risk for the country. In addition, the continued increasing trend of outstanding foreign debt in the post-crisis period and possible unfavorable conditions in foreign conjuncture may also add to the risk perceptions of foreign investors, which might become a significant problem that could interrupt economic growth (Taban, 2011:30).

### 3. Analytical Study

### 3.1. The Logistic Model

To explain the popularity of logistic regression, it is showed here logistic function, which describes the mathematical form on which the logistic model is based. This function, called  $f(Z)$ , is given by 1 over 1 plus e to the minus Z. The values of this function as Z varies from  $-\infty$  to  $+\infty$ .

$$F(Z) = \frac{1}{1 + e^{-Z}}$$

$$F(Z) = \frac{1}{1 + e^{-(\beta_0 + \sum \beta_j x_j)}}$$

The fact that the logistic function  $f(Z)$  ranges between 0 and 1 is the primary reason the logistic model is so popular. The model is designed to describe a probability, which is always some number between 0 and 1. Thus, for the logistic model, we can never get a risk estimate either above 1 or below 0. This is not always true for other possible models, which is why the logistic model is often the first choice when a probability is to be estimated.

To obtain the logistic model from the logistic function, we write Z as the linear sum  $\beta_0$  plus  $\beta_1$  times  $X_1$  plus  $\beta_2$  times  $X_2$ , and so on to  $\beta_j$  times  $X_j$ , where the  $X_j$  are independent variables of interest and  $\beta_0$  and the  $\beta_j$  are constant terms representing unknown parameters (Kleinbaum & Klein, 2010).

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_j X_j \quad (1)$$

### 3.2. Definition of Variables and Application

This study attempts to identify the macroeconomic factors that may have triggered the financial crises in Turkey between January 1998 and July 2012. As is well-known, unfavourable conditions for countries' economies, or various fluctuations in the economy, inflationist environments, and economic uncertainties result in a decline in the purchasing power of firms and consumers and an increase in production costs. This leads to setbacks in the productive capacity of firms and the country in general. Factors causing economic imbalances such as inflation, current account balance, sustainability of domestic and foreign debt, import and export regimes, fluctuations in foreign exchange rates, interest rates, and unemployment problems affect the overall market and may lead to a crisis. This is true for both closed and open economies. The only difference in open economies is that hot money flows postpone crises. However, postponement periods pose a great risk because economic drawbacks can go unnoticed during such periods, when the tendency to consume is higher than the tendency to produce and the postponed crisis is more severe in the end (İşler, 2004:19).

As revealed by an examination of the crisis periods in Turkey, common basic macroeconomic factors triggering crises are inflation rate, non-performing loans, interest rate, and foreign exchange rate. Thus, the variables selected in this study as triggers of financial crises are inflation rate (P), nominal deposit interest rate (IR), foreign exchange rate (ER), the ISE-100 index (MKB), "the ratio of non-performing loans to total loans" (NPL), percentage changes in M2 money supply (M), and unemployment rate (UR). Also, the growth rate (Y) variable was added to the model as it is believed to have a positive impact on crises. We expect that growth rate will have a decreasing effect, while other variables will have an increasing effect on crises. Crises are explained by the dummy variable.

The established model is as follows.

$$Z_t = \beta_0 + \beta_1 Y_t + \beta_2 P_t + \beta_3 MKB_t + \beta_4 UR_t + \beta_5 ER_t + \beta_6 IR_t + \beta_7 NPL_t + \beta_8 M_t + u \quad (2)$$

A dummy variable was defined with a value of 1 for the months from February 1999 to June 2001 and from June 2007 to May 2008 and a value of 0 for the remaining months. The NPL value was obtained from the monthly bulletins of the Banking Regulation and Supervision Agency, while the values for the other variables were obtained from the data distribution systems of the Central Bank of the Republic of Turkey and Turkish Statistical Institute

(TUIK). The Logit model was used and the analysis were performed by EVIEWS 6 software pack. Below is the estimated regression.

Table 1. Results of the Logit Model

Variables	Coefficients	t-statistics	Prob.
P	0.175	3.314	0.0011
ER	1.592	5.73	0.0000
IR	0.167	4.992	0.0000
NPL	0.926	2.102	0.0355
MKB	0.216	2.516	0.0119
M	-0.00649	-1.362	0.1750
UR	0.047	1.675	0.0957
Y	-0.015	-4.145	0.0001
C	1.652	9.21	0.0000
Mc Fadden R <sup>2</sup> =0.5669 F= 27.163			

As seen in Table 1, foreign exchange rate, inflation rate, interest rate, unemployment rate, ISE index, and NPL value increase the possibility of a crisis, while growth rate decreases the possibility. The coefficients of these variables are significant. However, M2 money supply decreases the possibility of a crisis and its coefficient was found to be insignificant.

If we write the logit values (Z) obtained by using the coefficients in Table 1 in the expression below;

$$P_j = E(Y = 1 | X_j) = \frac{1}{1 + e^{-z}}$$

We obtain the following expression for estimation of crisis probabilities.

$$Crisis_j = \frac{1}{1 + \exp^{-(1.652 + 0.175P + 1.592ER + 0.167IR + 0.926NPL + 0.216MKB - 0.00649M + 0.047UR - 0.015Y)}}$$

The following are the values obtained when crisis probability is calculated by applying Expression (2) to the data from previous periods: crisis probability for February 1999 is 93%; crisis probability for November 2000 is 89%; crisis probability for January 2001 is 99%; crisis probability for February 2001 is 99%; and crisis probability for June 2007 is 80%. These values correspond to the 1999, 2000, 2001, and 2007 crises. The crises were accurately estimated by using the Logit model applied.

#### 4. Conclusions and Evaluation

This study aims to identify the macroeconomic factors that may have triggered the financial crises in Turkey between January 1998 and July 2012. For this purpose, inflation rate, interest rate, foreign exchange rate, the ISE-100 index, “the ratio of non-performing loans to total loans”, percentage changes in M2 money supply, and unemployment rate were selected as the variables. The dummy variable representing crisis periods takes the value of 1 for the months from February 1999 to June 2001 and from June 2007 to May 2008 and the value of 0 for the remaining months.

All variables were included in the logit regression model. The money supply variable was found to have an insignificant coefficient, while the rest of variables had significant coefficients. A positive sign for any explanatory variable could be interpreted to mean that the variable in question increases the probability of a crisis (Saraçoğlu & Şahinöz, 2008). Thus, inflation rate, interest rate, foreign exchange rate, the ISE-100 index, “the ratio of non-

performing loans to total loans”, and unemployment rate increase the probability of a crisis, whereas growth rate decreases the probability.

Increases in foreign exchange rate increase the risk of foreign exchange rate for banks, thus leading to an increased crisis probability. On the other hand, currency depreciation adversely affects stock market. In both cases, there is an increased risk of crisis. Furthermore, using interest rates to protect currency (particularly in case of non-performing loans); for instance, lowering interest rates increase the demand for foreign currency, while raising interest rates aggravates the debt burden and exacerbates the predicament of banking sector. In particular, the efforts toward meeting the public deficit and perform loans, as well as high interest rates due to political instability reduce the productivity of investments and thus, risky firms pull out of the market and the balance of the economy is disrupted. As shown by the relations between foreign exchange rate, interest rate, and inflation rate, a negative shift in any of them also affects the others, resulting in an economy-wide crisis. Under such circumstances, non-performing loans also increase the probability of a crisis. Non-performing loans pose a particularly high risk for banks and lead to crises. In the same way, increased unemployment rate also increases the probability of a crisis. Despite all these negative factors, economic growth and the well-being of a country's economy reduces the probability of a crisis. The results of the analysis demonstrate that the increases in money supply decrease the crisis probability and the coefficient of this variable was found to be insignificant. This could be attributed to the fact that ample liquidity prevents crises from occurring. Yet, on the other hand, it should be remembered that ample liquidity might lead to inflation, giving way to crises.

As a consequence, the triggers of financial crises include inflation rate, interest rate, unemployment rate, foreign exchange rate, the ISE-100 index, “the ratio of non-performing loans to total loans”, and growth rate. Furthermore, the crises in the past were accurately estimated by applying the logit model.

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