

# Measuring the Impact of Full Coverage Deposit Insurance Policy in a Probit Model: A Study of the Privately Owned Commercial Banks in Turkey

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## Abstract

This study analyzes the impact of full coverage deposit insurance policy as well as bank specific factors and macro economic conditions on bank failure over a sample of 35 privately owned commercial banks in Turkey for the period 1991-1998. The model predicts a high probability of bank failure associated with full coverage deposit insurance policy.

*JEL Classification:* G28; G21; E44; E53

*Keywords:* Bank failure; Deposit insurance

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## 1. Introduction

Banks are very important financial intermediaries since they help bridge the gap between the collection and the use of resources. Limited resources can be made available to investors through this banking channel. Reliability is the key factor in this relationship; the bank is not supposed to be a risky institution for its depositors. If depositors lose their confidence in the banking system, this will damage all economic activities as the link between the real and the financial sectors of the economy is interrupted, since bank crises are contagious. For this reason, some countries have put security measures into place to help reduce this systemic risk (Demirguc-Kunt and Detragiache, 1998, 2000). The most common security measures are minimum limit for capital adequacy ratio, the ceiling for interest rates, and the restrictions for the ownership of a bank. However, international experiences

show that most of these precautions do not prevent some banks from going out of business.

Consequently, another instrument called deposit insurance has been developed as a precautionary measure to protect depositors against bank runs. This instrument has one explicit and two implicit targets. The explicit target is to protect depositors. The implicit targets are to reduce the unpleasant macroeconomic consequences of bank failures and to prevent contagious effects of panics during crises in the financial sector.

Deposit insurance has different regulations across countries, ranging from full to partial coverage, from explicit to implicit appliance, from being compulsory to non compulsory. Deposit insurance may also differ in terms of premium implementation.

It has been argued that extending deposit insurance coverage to 100 % of bank deposits would enhance the stability of the banking system. For example, Humphrey (1976, p.97) claimed that “By reducing the likelihood that a ‘problem’ bank will be pushed into a serious liquidity squeeze through a run by large depositors who withdraw funds or CD holders who fail to roll-over their certificates, 100 % deposit insurance would decrease the probability that manageable problems will suddenly become unmanageable and lead to bank failure or insolvency. Informed market regulation, to the extent it exists, will depend solely on the participants in the equity and federal funds markets”.

On the other hand, some economists such as Garcia (1994), Thakor and Greenbaum (1995), Gonzalez-Hermosillo (1996), and Demirguc-Kunt, and Detragiache (1998) argue that the most evident danger of full coverage application is the moral hazard problem that makes depositors less careful initially in the selection of their bank and, later discourages them from moving their funds to safer banks. Garcia points out that “The bank owners and managers of the insured bank, knowing that runs are unlikely, may take on additional risk in their asset portfolios, reduce the amount of capital and liquid reserves they hold to enable them to weather shocks”(Garcia 1994, p.6).

In Turkey, the Savings Deposits Insurance Fund (SDIF) was founded in 1985 as an independent legal entity although it is managed by the Central Bank of Turkey. According to Bank Acts of 1985, saving deposits will be insured by the SDIF. Since the membership of the SDIF is mandatory for all banks, they all have to pay a

premium into the fund. Coverage limits and premium criteria have changed several times in line with changes in the economic and financial environment.

In 1994, the Turkish economy experienced a serious currency crisis, causing the biggest output loss in the history of the Turkish Republic, severely deteriorated financial statements and three more bank runs. In May 5 1994, immediately after the financial crisis, the Council of Ministers issued a decree ordering massive changes in deposit insurance regulations, requiring 100% coverage for deposit accounts both in Turkish lira and foreign exchange. According to previous regulations, the maximum coverage for deposit insurance was 150 million Turkish lira, corresponding to USD 4,150 in May 4, 1994. The aim was to support the banking sector and improve its financial condition by preventing 'deposit withdrawal panic'. Full coverage application remained unchanged after 1994, but some financial conditions of the banks worsened. One bank in 1997, one bank in 1998, and six banks in 1999 were transferred to the SDIF. In other words, what was suggested as a remedy created additional problems in the long run, such as putting upward pressure on interest rates, raising the amount of non-performing loans, increasing banks' default risks, and discouraging depositors from monitoring their banks.

The main purpose of this study is to measure the effects of extended deposit insurance coverage on the financial strength of banks in Turkey.

## **2. The Banking Sector In Turkey, 1991-1998**

The banking sector is one of the most rapidly growing sectors despite the economic and political instability in Turkey. By the end of 1998, the Turkish banking sector consisted of 42 commercial banks (4 of which are state-owned), 15 investment and development banks (3 of which are state-owned), and 18 foreign banks.

Although the Turkish economy has suffered from chronic high inflation, huge budget deficits and crises in other countries, the Turkish banking sector has been a strong impetus in Turkey's development. As stated by Denizer (1997, p.1), "Until 1980, Turkish financial system has developed under an umbrella of monetary and regulatory policies aimed at supporting the state orchestrated development strategy."

Since 1980 there has been movement towards financial liberalization. Reforms initiated were expected to make the financial system more competitive, more efficient and more capable of encouraging an increasingly outward-oriented economy. These reforms were mostly achieved through the deregulation process, while eliminating interest rate ceilings on deposits and loans, introducing new types of financial instruments and institutions, and easing market entry. Reforms were successful in attracting entry into the banking system, resulting in an increase in the number of banks from 43 to 66 between 1980-1990 (Denizer, 1997).

Economic and political developments in both the national and international arenas have affected the Turkish banking sector. However, economic policy efforts helped the financial system stay away from the systemic risk. In terms of the ratio of its total assets to GNP, the Turkish banking sector has continued to grow since 1991. The ratio reached 70 % in 1998, up from 46 % in 1991 (Table 1).

**Table 1**  
**The Ratio of Bank Assets to GNP**

	1991	1992	1993	1994	1995	1996	1997	1998
Ratio	46.4	49.9	52.5	51.3	51.8	59.8	65.3	70.0

Source: The Banks Association of Turkey, Banks in Turkey 1998.

Table 2 provides the asset share of each group in the sector. The banking sector's total assets increased by 103 % from 1991 to 1998. In 1998, privately owned commercial banks held the largest portion of total assets with 59 %. The second largest share (37 %) was held by the four state-owned commercial banks, representing the leading role of public banks in the sector.

**Table 2**  
**The Asset Share of Commercial Banks in Total Assets**

	ASSETS		
	SBA/TBA	FBA/TBA	PBA/TBA
1991	46	3	50
1992	46	4	50
1993	40	4	56
1994	43	3	54
1995	41	3	56
1996	41	3	56
1997	37	5	59
1998	37	5	59

Source: The Banks Association of Turkey, Banks in Turkey 1998.

SBA: STATE-OWNED COM.BANKS ASSETS

TBA: TOTAL COMMERCIAL BANKS ASSETS

FBA: FOREIGN COMMERCIAL BANKS ASSETS

PBA: PRIVATELY OWNED COM. BANKS ASSETS

One of the most important characteristics of the Turkish banking sector is its strong relationship with the government. The ratio of total T-bills and government bonds to liquid assets is the most helpful criterion to understand this relationship. Since the public sector borrowing requirement is compensated by domestic borrowing, the share of T-bills and government bonds in liquid assets increased to 33 % in 1998 (Table 3).

**Table 3**  
**The Comparison of T-Bills, Government Bonds and Liquid Assets (Million USD)**

	1991	1992	1993	1994	1995	1996	1997	1998
Liquid Assets	20,568	24,732	29,893	20,396	25,246	30,347	31,683	38,074
T-bill	2,170	1,138	667	1,764	2,052	3,681	3,419	5,365
Govt. Bond	3,661	4,684	5,886	2,359	2,804	4,159	6,030	7,212

Source: The Banks Association of Turkey, Banks in Turkey 1998.

The other important characteristic of the Turkish banking sector is its weakening relationship with the real sector. Loans represent this relationship fairly well. The ratio of total loans to total assets has decreased since 1991, except for 1995 and 1997. While privately owned commercial banks sustained their loan levels at around 40 %, the ratio for the state-owned banks decreased to 31.3% in 1998. State-owned banks' resources were mostly used to finance the budget deficit and for agricultural subsidies in particular (Table 4). The Governor of the Central Bank of Turkey, Gazi Ercel, (April 1997) emphasized that the main obstacle to the functioning of the financial markets is the public sector borrowing requirement, which crowds out other demands for financing. Ercel states that, "The inability of domestic resources to cover the financing needs of the public sector has kept real interest rates very high for over a decade (Ercel, 1997, p.2).

**Table 4**  
**The Ratio of Total Loans to Total Assets**

	1991	1992	1993	1994	1995	1996	1997	1998
SECTOR	43.9	41.8	41.4	39.1	42.5	43.1	45.5	38.2
COMMERCIAL BANKS	42.3	40.2	39.9	37.4	40.8	41.3	44.1	36.5
State-Owned	44.8	41.1	39.9	37.6	44.2	39.5	45.6	31.3
Privately-owned	39.8	39.8	40.5	38.0	39.1	43.6	44.7	40.6
Foreign	44.0	34.5	30.9	23.8	27.9	25.3	26.3	25.6

Source: The Banks Association of Turkey, Banks in Turkey 1998.

On the asset side, banks' credit performance worsened significantly in 1998. During the last decade, the ratio of non-performing loans to total loans increased from 4.9 % to 7.2 %. The higher level of credit allocation in 1997 was followed by a higher level of non-performing loans in 1998. Table 5 indicates that foreign banks are the most successful banks in terms of selecting credit customers, since they have had the lowest ratio of non-performing loans to total loans.

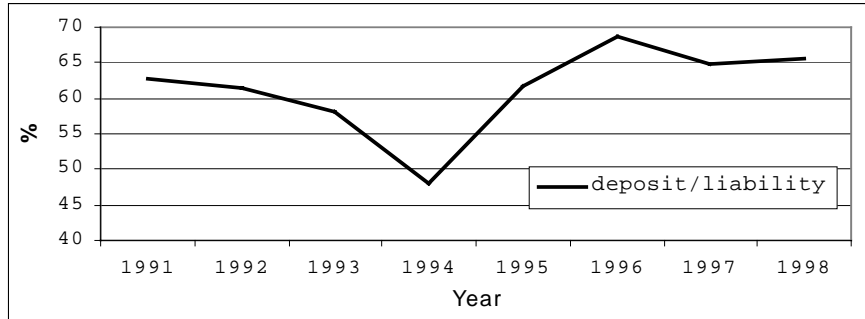
**Table 5**  
**The Ratio of Non-Performing Loans to Total Loans**

	1991	1992	1993	1994	1995	1996	1997	1998
SECTOR	4.9	3.4	3.1	4.1	2.8	2.0	2.1	7.2
COMMERCIAL BANKS	4.9	3.2	2.9	3.4	2.3	1.9	2.2	7.7
State-Owned	7.2	4.1	4.5	4.0	3.0	2.4	2.5	5.5
Privately-owned	2.7	2.3	1.8	2.6	1.8	1.6	2.0	9.0
Foreign	2.4	2.9	2.9	11.1	3.1	2.4	1.3	1.3

Source: The Banks Association of Turkey, Banks in Turkey 1998.

On the liability side, the ratio of deposit accounts to total liabilities for commercial banks reached a high level of 66 % in 1998. Although the ratio of deposits to liabilities for commercial banks was around 55%, on average between the period 1991 and 1998, it decreased to 48 % during the financial crisis of 1994 (Figure 1). The full coverage on deposits, whether denominated in Turkish lira or foreign currencies, was introduced immediately after the crisis and then remained unchanged.

**Fig. 1. The Ratio of Deposits to Liabilities for Commercial Banks.**



Source: The Banks Association of Turkey, Banks in Turkey 1998.

The bank panic and 1994 crisis are further illustrated through an examination of diversification of deposits according to currency types. Since the confidence in the economy and the financial system fell after the currency crisis, the

share of foreign exchange deposits in total deposits exceeded more than the share of TL deposits both in 1994 and 1995. Table 6 shows this dollarization process in Turkey.

**Table 6**  
**The Diversification of Deposits (%)**

	1991	1992	1993	1994	1995	1996	1997	1998
TL	67.86	63.17	60.56	48.20	48.68	53.61	52.81	55.27
FX	32.14	36.83	39.44	51.80	51.32	46.39	47.19	44.73

Source: The Banks Association of Turkey, Banks in Turkey 1998.

With regard to deposit accounts, another interesting development is in the diversification of time and demand deposits (Table 7). While 29 % of total deposits were demand deposits in 1991, this proportion decreased to 19 % by 1998; thus, the proportion of time deposits increased to 81 % in 1998 due to higher real interest rates.

**Table 7**  
**Time and Demand Deposits (million USD)**

	TIME				DEMAND				TOTAL
	State-owned	Privately-owned	Foreign banks	TOTAL	State-owned	Privately-owned	Foreign banks	TOTAL	
1991	10,861	11,808	391	23,060	4,231	5,063	261	9,555	32,615
1992	12,661	11,958	313	24,932	4,996	5,295	303	10,594	35,526
1993	11,386	14,715	326	26,427	4,949	5,862	268	11,079	37,506
1994	10,951	12,678	305	23,934	3,432	5,106	324	8,862	32,796
1995	15,073	17,496	685	33,254	4,155	6,499	522	11,176	44,430
1996	17,599	23,475	1,037	42,111	7,586	7,051	417	15,054	57,165
1997	19,282	27,293	1,618	48,193	5,146	7,459	474	13,079	61,272
1998	25,327	35,522	1,735	62,584	6,034	8,147	333	14,514	77,098

Source: The Banks Association of Turkey, Banks in Turkey 1998.

Despite the dollarization process and adverse diversification of deposit accounts, Table 8 shows that Turkish banks are highly profitable banks. In his article in *Euromoney*, Shirreff (1997, p.57) notes “Turkey’s banks are among the most profitable in the world. Why? Because the government rewards them royally for getting Turkish citizens to pay for its debts.”

**Table 8**  
**Banking Sector Profits in Selected OECD Countries (Pre-Tax Profits Scaled By Average Assets)**

	1994-1996 *
Turkey **	3.00
Austria	0.89
Germany	0.96
U.K.	1.43
Czech Republic	1.79
Korea	1.69
Mexico	2.58
Poland	3.70

Source: Turkey: Selected Issues and Statistical Appendix, *IMF Staff Country Report*, 2000, No.14, p.38.

\* Average for 1994-1996

\*\* Average for 1997 and 1998, after monetary correction

Data in Table 9 indicate that the most profitable group of commercial banks is foreign commercial banks. The group has the largest ratio. Furthermore, privately owned commercial banks were almost three times more profitable than the state-owned commercial banks in 1998. Indeed, it can be surmised that it is mainly high real interest rates that keep the Turkish banks' profitability at a high level.

**Table 9**  
**Return On Average Assets (%)**

	1991	1992	1993	1994	1995	1996	1997	1998
SECTOR	2.4	2.8	3.5	2.2	3.4	3.9	3.4	2.8
COMMERCIAL BANKS	2.5	2.9	3.6	2.5	3.5	3.8	3.4	2.6
State-Owned	0.7	2.1	3.1	-0.1	0.2	0.9	0.8	1.1
Privately-owned	3.9	3.1	3.9	3.8	5.7	5.8	4.8	3.2
Foreign	7.1	8.0	5.2	12.1	7.5	6.9	6.8	7.1

Source: The Banks Association of Turkey, *Banks in Turkey 1998*.

The ratio of securities to total assets is very useful for the evaluation of the profitability of banks. As seen in Table 10 and 11, foreign commercial banks invested in T-bills and government bonds more than the other banks and became the most profitable banks in the sector.



**Table 10**  
**Security Structure of Commercial Banks**

	SECURITIES			SECURITIES/TOTAL ASSETS		
	SBS/TBS	FBS/TBS	PBS/TBS	SBS/TBA	FBS/TBA	PBS/TBA
1991	45	5	51	12	17	13
1992	50	5	45	13	15	11
1993	55	4	41	16	12	9
1994	48	4	47	13	15	10
1995	38	4	58	10	13	12
1996	43	5	52	17	24	15
1997	29	6	65	11	17	15
1998	27	7	66	11	23	16

Source: The Banks Association of Turkey, Banks in Turkey 1998.

SBS: STATE-OWNED COMMERCIAL BANKS SECURITIES

TBS: TOTAL COMMERCIAL BANKS' SECURITIES

PBS: PRIVATELY OWNED COMMERCIAL BANKS SECURITIES

FBS: FOREIGN COMMERCIAL BANKS SECURITIES

TBA: TOTAL COMMERCIAL BANKS ASSETS

**Table 11**  
**Profitability Ratios (%)**

		1991	1992	1993	1994	1995	1996	1997	1998
<b>Net</b>									
<b>Income(Loss)/Average</b>									
<b>Total Assets</b>	<b>Total Commercial Banks</b>	2	2.3	2.9	1.6	3	3.1	2.6	2.1
	State-Owned Banks	0.5	1.7	2.4	0	0.2	0.7	0.6	0.7
	Foreign Banks	5.7	6.6	4.2	7.3	6.4	5.5	5.7	6
	Privatey-Owned Banks	3.1	2.5	3.2	2.4	4.9	4.6	3.8	2.7
<b>Net</b>									
<b>Income(Loss)/Average</b>									
<b>Shareholders' Equity</b>	<b>Total Commercial Banks</b>	27.6	36.8	47.4	24.3	47	50.9	43.8	36.4
	State-Owned Banks	9.2	38.5	48.9	-0.8	3.3	17.6	14.2	16.2
	Foreign Banks	68.4	81.5	59.6	103.6	80	63.6	78.1	90.2
	Privatey-Owned Banks	37.4	32.5	45.6	34.5	66	63.8	54.1	39.9
<b>Net</b>									
<b>Income(Loss)/Average</b>									
<b>Share Capital</b>	<b>Total Commercial Banks</b>	46.3	54.8	76.2	43.8	89	98.4	69.8	49
	State-Owned Banks	14.3	44.7	70.3	-1.5	6.9	40.9	27.5	27.9
	Foreign Banks	86.2	104.4	77.1	136.2	125.5	91.8	98.1	116.6
	Privatey-Owned Banks	67.8	57.7	80.2	60.3	120.7	117.9	81.7	49.7

Source: The Banks Association of Turkey, Banks in Turkey 1998.

On the other hand, in terms of capital adequacy, private-owned commercial banks have a significant advantage over state-owned commercial banks. Also, income-expenditure structure of banks is in compliance with profitability ratios. The more the banks invest in T-bills and government bonds, the more profit they make.

An evaluation of the main characteristics of the Turkish banking sector indicates that Turkish banks are highly exposed to banking risks such as credit risk, interest rate risk, and foreign exchange risk. Dollarization process and uncertainty in the financial markets due to persistent high inflation are among the basic problems that make the banks more vulnerable to these risks. During the last two decades, the Turkish banking sector has made remarkable progress towards liberalization. But still, structural reforms are needed to reduce the share of state owned commercial banks in the sector.

### **3. Empirical Study**

This study analyzes the impact of full coverage deposit insurance application on bank failure in Turkey. To be able to measure this impact, first the factors that are associated with the degree of bank soundness should be analyzed. The proposed approach is to estimate the probability of a bank failure using probit estimation over a sample of 35 privately owned commercial banks for the period 1991-1998. The model tests empirically the proposition that bank failure in Turkey is determined by bank specific factors, macroeconomic conditions, and full coverage deposit insurance application. For more details on the probit model approaches, see Greene (1997), Ramanathan (1998).

#### **3.1. Research Hypotheses**

The main hypothesis in this thesis is the proposition that there is a positive and significant correlation between full coverage application of deposit insurance and a bank's failure in Turkey. The hypotheses are summarized below.

1. Full coverage deposit insurance application is an important contributory factor in bank failure in Turkey. It increases banking system vulnerability and creates a moral hazard problem so that a bank has the incentive to take on higher risk.
2. Stabilization programs aimed at reducing the inflation rate may increase the probability of bank failure.
3. Lack of risk free and high return liquid assets increases the likelihood of bank failure.
4. There is a strong and positive relation between the level of non-performing loans and bank failure.

5. Freezing loans may not prevent bank failure.
6. Increase in the ratio of foreign currency short position to shareholder's equity increases the probability of bank failure.
7. Bank failure is driven by lack of shareholders' equity.
8. Depreciation of the Turkish lira against the US Dollar may increase the probability of bank failure.
9. Change in interest rates increases the likelihood of bank failure via higher interest rate risk.
10. Capital account developments might affect bank failure.
11. Developments in the Turkish economy in 1998 due to Russian and Asia crises may increase the probability of bank failure.
12. A bank's size might be an important factor in bank failure.

### **3.2. Data**

Bank specific data used in this study were obtained from the Banks Association of Turkey. The sample includes privately owned commercial banks. State owned commercial banks are excluded from the sample because they are treated as reliable banks in terms of default risk. Investment and development banks are also excluded from the sample to maintain homogeneity of the sample. There are eight years of data on 35 individual banks constituting 280 observations in the panel data set. Annual macroeconomic data were collected from the State Planning Organization and the Central Bank of Turkey, covering the period of 1991-1998 in annual frequency.

### **3.3. The Model**

As stated by Demirguc-Kunt and Detragiache (1999) the econometric study of bank failure is a relatively new field of study. In this study, the first step in our analysis is to develop an econometric model with which to estimate the probability of owned bank failure for banks between 1991 and 1998. The model focuses on the

factors that likely play significant roles in bank failure and the role of full coverage deposit insurance application in this result.

The dependent variable,  $Y$ , is a measure of bank failure in discrete form, taking the value of 1 for failure of a bank and 0 otherwise. When a bank fails, this variable takes the value of 1, starting from the previous year that the bank is owned by the Saving Deposit Insurance Fund (SDIF). This is appropriate for our estimation, since the SDIF's decision is based on the last financial statements that were announced to the public by the bank. Additionally, SDIF owns the failed bank until its financial condition improves. Thus, our independent variable takes the value of 1 as long as a bank is owned by SDIF.

The probability of a bank failure is hypothesized to be a function of a vector of  $n$  explanatory variables. The pooled regression model assumes that the regression parameters do not differ across banks.

$$Y = F(X_1, X_2, X_3, \dots, X_n)$$

$$\text{Prob}(I = 1) = \Phi F(\beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n) \text{ and,}$$

$$\text{Prob}(I = 0) = 1 - \Phi F(\beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + \dots + \beta_n \chi_n)$$

where  $F$  is the standard normal cumulative density function, and  $\Phi$  is the notation for the standard normal distribution function.

The explanatory variables capturing macroeconomic conditions and bank-specific indicators are defined below.

DUM = 0 for the years before 1994,

= 1 for the years after 1994 (including 1994);

INF = The rate of inflation measured as the wholesale price index;

R1 = Liquid Assets / (Deposits + Non-deposit Funds), where

Liquid Assets = Cash + Securities (Treasury Bills, Government Bonds) + Reserve Requirements, and

Non-deposit Funds = Inter-bank Funds + Funds borrowed from Central Bank of Turkey or abroad;

R2 = Non-performing loans in million USD;

R3 = Total Loans / Total Assets;

R4 = Short Position in Foreign Currency / Shareholders' Equity;

R5 = Shareholder's Equity in million USD; where

Shareholder's Equity = Share Capital + Reserves - Provision for Losses (for current and previous years) + Revaluation Funds;

FX = The rate of depreciation of Turkish Lira against the US Dollar; and

CTLINTRATE = Change in the interest rate for annual deposit accounts. Our choice of explanatory variables comes from economics and finance theories. Specific reasons for this selection are summarized below.

CCACNT = Change in capital account

DUM98 = 0 for the years before 1998,

= 1 for the year 1998;

LNASSET = Log of assets.

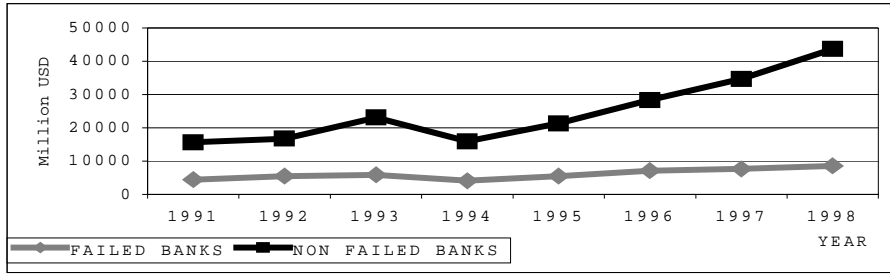
With regard to deposit insurance application in Turkey, a new Decree came into effect in 1994, and all bank deposits, whether in the form of Turkish Lira or foreign currencies, were fully insured by the SDIF. Since the full coverage deposit insurance scheme creates a moral hazard problem in the form of the willingness of banks to take on greater risk, insurance is represented by a dummy variable, taking the value of zero for observations with partial coverage, and the value of one for observations with full coverage.

Inflation is introduced as an explanatory variable since it is likely to be associated with macroeconomic management quality. While reduction in the inflation rate provides stability in financial markets, the Turkish experience suggests that the stabilization process may put the profitability of banks at risk. Demirci-Kunt and Detragiache (1998, p.87) note that, "Chronic high inflation tends to be associated with overblown financial sector, as financial intermediaries profit from the float on payments. When inflation is drastically reduced, banks see one of their main sources of revenue disappear, and generalized banking sector problems may follow." Recent banking sector difficulties in Brazil and Russia have been explained by a sharp reduction in inflation rate. Thus, in our model the expected sign for the coefficient on the inflation rate is ambiguous.

Huge government deficits are mostly financed by government bonds and Treasury Bills. Since the government has been in financial difficulties during the

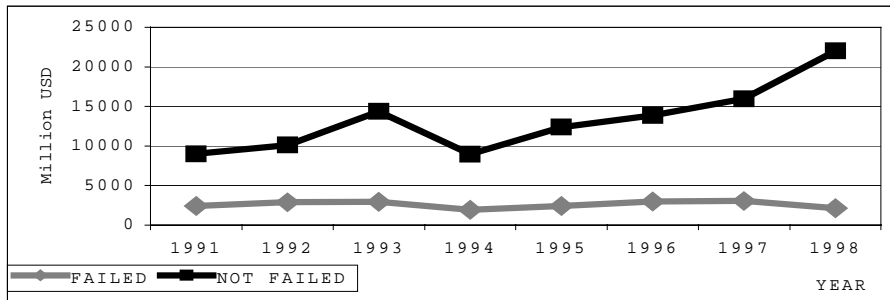
last decade, the rate of return for these instruments is higher than the deposit interest rate. A well-developed second market makes these instruments as liquid as cash. Furthermore, as observed in Figure 2, the total of deposit and non-deposit funds remained almost the same for failed banks for the last 3 years. It is the change in total liquid assets that decreased the ratio R1. Thus, it is expected that lack of risk free and high-return liquid assets (illustrated in Figure 3 and Figure 4) reduces banks profitability and constitutes an important factor in their failure. Variable R1 captures this expectation and tests the relevant hypothesis.

**Fig. 2. Deposits and Non-Deposits Funds for Failed and Non-Failed Banks**



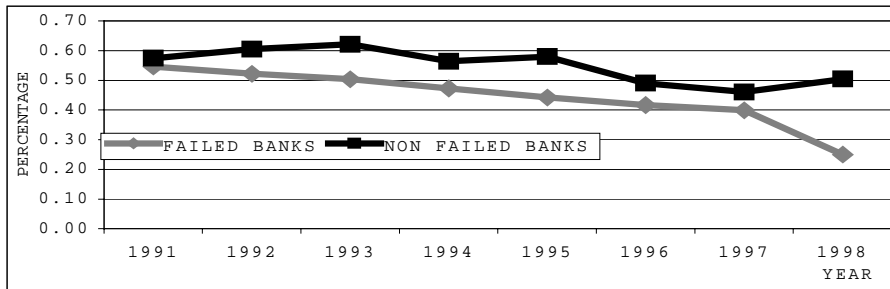
Source: The Banks Association of Turkey, Banks in Turkey 1998.

**Fig. 3. Liquid Assets of Failed and Non-Failed Banks**



Source: The Banks Association of Turkey, Banks in Turkey 1998.

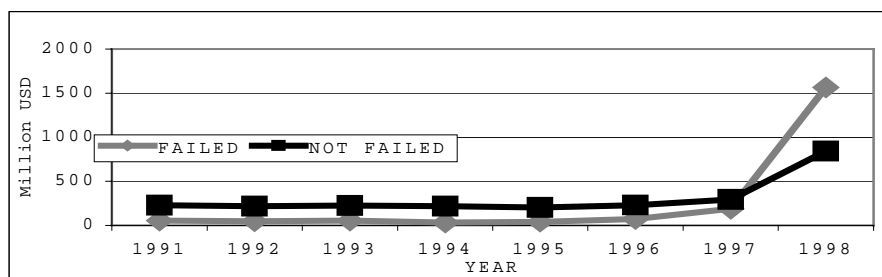
**Fig. 4. The Ratio of Total Liquid Assets to Deposits and Non-Deposit Funds for Failed and Non-Failed banks**



Source: The Banks Association of Turkey, Banks in Turkey 1998

Asset quality of banks is mainly based on the quality of their credit evaluation. Credit risk primarily corresponds to non-performing loans. Information contained in Figure 5 indicates that bank crises in Turkey are associated with a rise in non-performing loans. Thus, a high level of non-performing loans is expected to be positively correlated with the probability of bank failure. The role of non-performing loans in bank failure is captured by explanatory variable, R2.

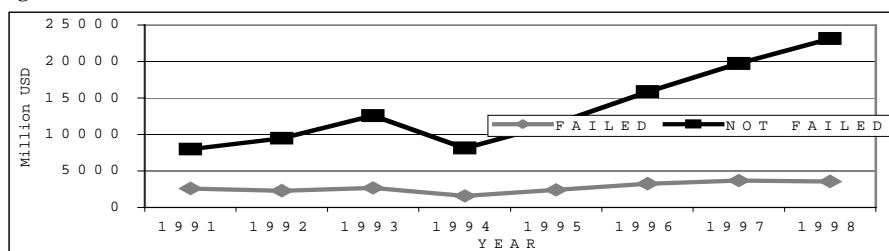
**Fig. 5. Non-Performing Loans for Failed and Non-Failed Banks**



Source: The Banks Association of Turkey, Banks in Turkey 1998.

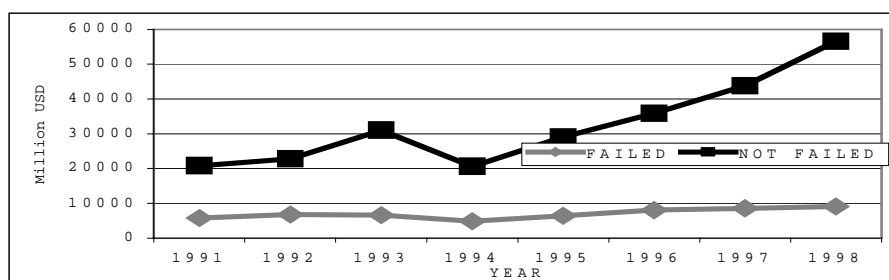
Total loans and total assets of failed banks have remained approximately constant during the last three years (Figures 6, 7). The ratio of loan to total assets has been decreasing since 1997 (Figure 8). R3 is included in our regression to test whether the policy of freezing loans played an important role in bank failure or not.

**Fig. 6. Loans for Failed and Non-Failed Banks**

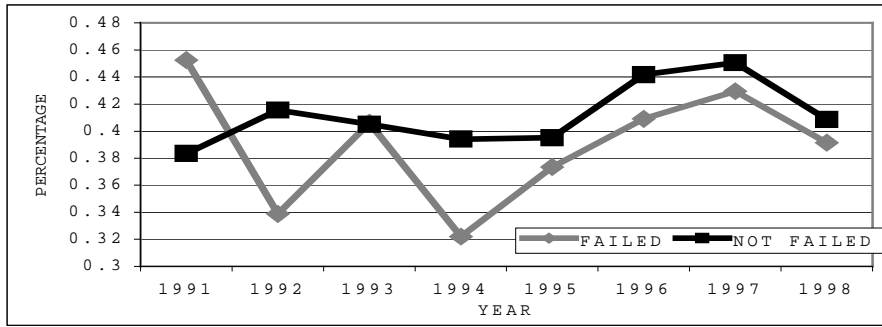


Source: The Banks Association of Turkey, Banks in Turkey 1998.

**Fig. 7 Total Assets For Failed And Non-Failed Banks**



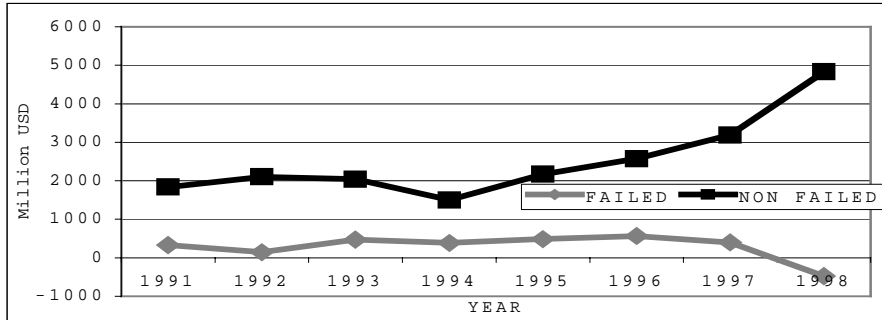
Source: The Banks Association of Turkey, Banks in Turkey 1998.

**Fig. 8. The Ratio of Loans to Total Assets for Failed and Non-Failed Banks**

Source: The banks association of turkey, banks in turkey 1998.

R4 examines whether changes in the ratio of foreign currency short position to shareholder's equity affects the probability of banks' failure.

Shareholders' equity is captured by R5 and is used to test whether a high level of shareholder equity is negatively correlated with the probability of failure (Figure 9).

**Fig. 9. Equity Structure of Failed and Non-Failed Banks**

Source: The banks association of Turkey, banks in Turkey 1998.

The rate of depreciation of the Turkish lira is added to the regression to test the hypothesis that bank failure may be driven by foreign exchange risk.

Since frequent interest rate changes occur in Turkey, "change in interest rate for annual deposit accounts" is used as an explanatory variable in order to test the hypothesis that changes in interest rates increase the likelihood of bank failure via higher interest risk.

Frequent change in capital account is included in the model to test whether it played an important role in bank failure or not.



On the other hand, the Russian and Asian crises might contribute to bank failure in Turkey. A dummy variable for 1998 captures the effects of these crises in the Turkish banking sector.

Finally, the banking sector increased in size over time, as the number of failures increased. The size of the bank, in terms of assets, is used to assess whether relatively large banks are more likely to survive because, “too large to fail” may extend the survival time of larger banks.

#### **4. Empirical Results**

This chapter presents data detailing the findings from the estimation of eight models. Table 12 summarizes these empirical results.

For the evaluation of statistical significance, the level of significance for each coefficient is reported at the bottom of Table 12. Two-tailed t tests are used to evaluate the significance of the coefficients of INF, FX, R3, CCACNT, DUM98, and LNASSET; one-tail t tests are applied to evaluate the other coefficients.

Individually, all coefficients are significantly different from zero at the 10 % level except for CCACNT, DUM98, and LNASSET, implying that the independent variables explain some of the variation in the dependent variable. Additionally, the signs of any of the other coefficients are not affected by the exclusion of some variables from the models. The excluded variables are R4, FX, R5, CCAPTACT, DUM98, and LNASSET. In other words, the signs on the coefficients remain the same in all specifications, implying the robustness of the effects of independent variables on the dependent variable.

The adequacy of the specification of the models is assessed by three criteria: Akaike’s information criteria (AIC), classification (prediction) accuracy, and the F statistic.

The AIC compares models with different degrees of freedom and penalizes the model specification when irrelevant explanatory variables are added into the regression. As is known, a model with a lower value of AIC is judged to be preferable. In this study, regression results indicate that AIC is very small in all models, ranging from 0.1368 to 0.17.

TABLE 12- PROBIT ESTIMATION RESULTS (1991 – 1998)

Independent Variables	Dependent Variable: Bank Failure Dummy							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CONSTANT	8.2183 (1.485)	9.0258 (1.603)	24.3600 (1.890)*	13.7431 (1.668)*	9.4730 (1.668)*	7.2625 (1.096)	16.2597 (1.535)*	4.9626 (0.582)
DUM	7.9581 (1.833)**	8.1504 (1.908)**	17.9070 (2.119)**	19.2530 (2.130)**	8.2851 (2.041)**	7.1070 (1.290)*	11.5901 (1.779)**	9.5377 (1.619)*
INF	-0.1093 (-2.167)**	-0.1087 (-2.078)**	-0.3863 (-2.049)**	-0.2378 (-2.206)**	-0.1300 (-2.194)**	-0.0829 (-1.162)	-0.2262 (-1.850)*	-0.1336 (-2.226)**
R1	-0.1116 (-3.187)***	-0.1293 (-3.171)***	-0.2732 (-2.539)***	-0.2058 (-2.715)***	-0.1252 (-2.853)***	-0.1246 (-2.844)***	-0.1571 (-2.470)***	-0.1264 (-2.740)***
R2	0.0104 (1.810)**	0.0178 (2.423)***	0.0263 (2.467)***	0.0221 (2.457)***	0.0244 (2.408)***	0.0227 (2.235)**	0.0274 (2.402)***	0.0228 (2.160)**
R3	-0.1158 (-3.018)***	-0.1507 (-2.956)***	-0.3101 (-2.509)***	-0.2379 (-2.674)***	-0.1228 (-2.333)**	-0.1272 (0.023)**	-0.1552 (-2.256)**	-0.1239 (-2.258)**
R4	-	0.0043 (2.349)***	0.0073 (2.471)***	0.0058 (2.447)***	0.0040 (2.210)**	0.0040 (0.035)**	0.0048 (2.222)**	0.0040 (2.030)**
R5	-	-	-	-	-0.0032 (-1.342)*	-0.0030 (-1.266)	-0.0034 (-1.266)	-0.0052 (-1.374)*
FX	-	-	0.1031 (1.848)*	-	-	-	-	-
CTLINRATE	-	-	-	0.3040 (1.838)**	-	-	-	-
CCACNT	-	-	-	-	-	-0.0036 (-0.816)	-1.1222 (-0.982)	-
DUM98	-	-	-	-	-	-	-	0.5529 (0.797)
LNASSET	-	-	-	-	-	-	-	-
Prediction	97.08	97.81	98.18	97.81	97.81	97.95	98.54	97.81
Accuracy %	0.17	0.1530	0.1368	0.1440	0.1516	0.17	0.15	0.16
AIC	2.5923**	2.2469**	1.2419	1.5088	1.8423*	1.6227	1.3281	1.511

Figures in parenthesis are t – values

\* Significant at 10% level,

\*\* Significant at 5% level,

\*\*\* Significant at 1% level

Considering the expectations and formation of hypothesis, two-tail t-statistics test is used for variables, INF, FX and R3 and one-tail t- statistics test is applied for the others.

In order to evaluate the prediction accuracy of our models, the overall expectation-prediction (classification) results are analyzed in Table 12, with a prediction cutoff value of 50%. Correct classifications are obtained when the estimated probability is less than or equal to 0.5 and the observed Y is equal to zero, or when the estimated probability is greater than 0.5 and the observed Y is equal to one. Overall, the estimated models correctly predict between 97.08 and 98.18 % of the 280 observations. The prediction power of the models is high.

F tests were performed to test the joint significance of the explanatory variables by comparing each model to a model with only the intercept. As shown in Table 12, the hypothesis that the coefficients on the independent variables are not jointly significantly different from zero is rejected at the %6 significance level or less for equations (1), (2) and (5).

Following is a discussion of the interpretation of each estimator used in the probit models (Table 13). First, it is noteworthy that all explanatory variables have the expected effects in all models.

**Table 13**  
**Expected and Estimated Signs for Statistically Significant Coefficients and Their Average Marginal Effects**

Variable	Expected Sign	Estimated Sign	Average Marginal Effect*
DUM	+	+	0.092549
INF	-/+	-	-0.004309
R1	-	-	-0.004153
R2	+	+	0.000809
R3	-/+	-	-0.004073
R4	+	+	0.000134
R5	-	-	-0.00106
FX	-/+	+	-
CINT	+	+	-

\* The calculation of the average marginal effect is based on the fifth model.

According to the results, the coefficient on the dummy variable is always positive and significant at 5% level in 6 of the equations and significant at 10% level in 2 of the equations, supporting the hypothesis that full coverage deposit insurance application is a significant contributory factor in bank failure in Turkey. As shown in Table 13, on average its effect on bank failure is larger than the effects of any of the other variables in the models.

With respect to bank specific variables, the higher value of non-performing loans as well as the ratio of foreign currency short position to shareholder's equity is associated with a higher probability of bank failure. In other words, banks with fewer non-performing loans, a shorter position in foreign currency, and with more capital are less likely to fail in Turkey.

In contrast, the higher value of risk free and high return liquid assets, shareholder's equity as well as the ratio of loans to total assets for each bank lowers the likelihood of bank failure. Additionally, the coefficient on LNASSET was insignificant in Model 8, implying that bank failure in Turkey is not associated with the size of banks.

When considering the macroeconomic variables, stabilization programs aimed at reducing inflation rate, depreciation of the Turkish lira against the US Dollar, and changes in interest rates are highly and positively correlated with a higher probability of bank failure. The coefficient on the inflation rate suggests that stability programs create an unfavorable climate for the banking sector.

Besides, the empirical results suggest that frequent change in the capital account and economic developments in 1998 do not play significant roles in the probability of bank failure. The coefficients on these variables (CCACNT, DUM98) were statistically insignificant in models 6 and 7. In other words, bank failure in Turkey cannot be correlated with the Asian and Russian crises.

To summarize, full coverage deposit insurance had a negative impact on bank soundness in Turkey. In order to be able to evaluate the role of deposit insurance policy in the banking sector, other possible factors were considered that may effect a bank's financial position. In brief, the results suggest that bank-specific and macroeconomic variables, and also the application of full coverage of deposit insurance policy, are significant determinants of bank failure in Turkey.

## **5. Conclusions and Policy Recommendations**

This study argues that full coverage deposit insurance application deteriorated the financial condition of banks in Turkey. This impact is measured after controlling for the other bank-specific and macroeconomic factors affecting the degree of bank soundness. The probability of bank failure was analyzed using a probit model on 35 privately owned commercial banks for the period, 1991-1998.

Overall, the five estimated models correctly predict bank failure or survival 97 % - 98 % of the time. This implies that the variables we choose for our models are very important determinants of bank failure, and that the model performs well.

Estimation results uniformly suggest that full coverage deposit insurance application makes bank failure more likely in Turkey. Current deposit insurance policy is an important contributory factor in bank failure. It increases a bank's fragility and creates a moral hazard problem in the form of higher risk taking. As a policy recommendation, we suggest that the Turkish government should change the full coverage policy as soon as possible.

There are several ways to get the best results from deposit insurance. According to Garcia (1994), *"The best practice of deposit insurance should:*

*Avoid incentive problems,*

*Define the system explicitly, in law and regulation,*

*Give the system supervisor a system of prompt remedial actions,*

*Ensure that the supervisor resolves failed depository institutions promptly,*

*Provide low coverage,*

*Make membership compulsory,*

*Pay deposits quickly,*

*Ensure adequate sources of funding to avoid insolvency,*

*Risk-adjust premiums,*

*Organize good information,*

*Make appropriate disclosure,*

*Create an independent, but accountable Deposit Insurance System (DIS) agency,*

*Have bankers on an advisory, not the main board,*

*Ensure close relations with the Lender of last resort and the supervisor,*

*Begin an explicit, limited DIS when the banking system is sound.*

*Consequently, inclusion should be open only to those classes of depository institutions that are well regulated and supervised." (Garcia, 1994, p.10)*

The empirical results show that stabilization programs aimed at reducing the inflation rate create an unfavorable climate for the banking sector. At this point, the government should pursue an explicit inflation targeting policy to prevent banks from having to respond to unexpected changes in the inflation rate. A supervisory agency should also monitor banks more frequently during the application of these programs.

Lack of risk free and high return liquid assets also increases the likelihood of bank failure. The relevant coefficient is always negative and significant, implying that the regulatory agency should apply a liquidity ratio diversification policy for banks with different financial conditions. More specifically, it should require a higher liquidity ratio for banks whose financial conditions are worsening.

On the other hand, a strong and positive relationship between the level of non-performing loans and bank failure should always be kept in mind. Empirical findings also suggest that freezing credit does not prevent banks from failure. The policy should be to increase the quality of loans rather than freezing them to strengthen a bank's financial position.

Furthermore, change in the ratio of foreign currency short position to shareholder's equity definitely increases the probability of bank failure. This empirical result is consistent with the other empirical result that depreciation of the Turkish Lira against the US Dollar worsens a bank's financial condition. The more short position in foreign currency that banks take, the greater the probability is that they will fail.

Similarly, it is found that an increase in the interest rate increases the likelihood of a bank failure. Thus, the supervisory agency should pay close attention to both exchange rate risk and interest rate risk in their evaluations.

The empirical results also point out that bank failure is primarily driven by lack of shareholders' equity. The minimum required level of shareholder equity should be differentiated according to the bank's financial conditions. Financially distressed banks should be required to have more equity than other banks.

On the other hand, the reason why the SDIF owned the 8 banks but not the other banks has been argued over the last two years in Turkey. Among the sample of 35 privately owned commercial banks, whether a bank is going to fail at a particular time between 1991 and 1998 is predicted with accuracy for 97 % and 98 % of 280 observations. Our findings do not contradict the decision of the SDIF. Each of our

alternative models suggests that the SDIF is consistent in its decision to evaluate banks' conditions. However, it should be kept in mind that one drawback of this study may be the poor quality of data due to misleading records in the banks' financial statements.

The best practice of deposit insurance policy including proper risk-adjust premiums and deposit coverage limit for Turkey is left for future work.

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