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Market Reaction to Risky Banks: Did Generous Deposit Guarantee Change It?

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Summary. — Turkey experienced a massive banking crisis in February 2001, resulting in the loss of more than a thousand managerial jobs and the closure of 21% of all bank branches in the market. In this paper, we study the behavior of the market and the banks in Turkey before the crisis, from 1988 to 2000, which includes the period of full deposit insurance. The empirical results showed that not only depositors but also borrowers reacted negatively to risky banks and punished them even more during the period of generous government guarantee. However, in the same period, banks were found to increase their moral hazard behavior significantly. Although the International Monetary Fund and the World Bank recommend explicit deposit insurance for developing countries, the findings of this paper suggest that deposit insurance may not be an effective policy tool to improve market confidence, and it does not guarantee a stable economic environment even when the market reacts negatively to the moral hazard behavior of banks.

Key words — deposit insurance, market discipline, moral hazard, Turkey

1. INTRODUCTION

Governments have historically intervened extensively in the banking sector to promote financial stability. Often, their intervention policies have blocked some natural mechanisms and have resulted in undesired outcomes. One of those policies, government-sponsored deposit insurance, aims to maintain financial stability by minimizing the likelihood of bank runs. However, recent empirical evidence showed that explicit government guarantees reduced the market participation of depositors and adversely affected bank stability (Barth, Caprio, & Levine, 2004; Demirguc-Kunt & Detragiache, 2002; Demirguc-Kunt & Huizinga, 2004).

In this paper, we present contrary empirical evidence of declining market participation under explicit government guarantee to depositors. In volatile political and macroeconomic environments with insufficient regulations and poor supervision, the governments may lose their credibility. It can be argued that this loss of confidence in government motivates bank stakeholders [1] to be more involved in disciplining risky banks, even under full insurance. Toward this end, we analyzed the behavior of the market and the banks in Turkey for the period during 1988–2000. Turkey's explicit deposit insurance was established in 1983 and expanded to full coverage after the economic crisis in 1994. After eleven years of an explicit limited-coverage scheme, the transition from implicit blanket guarantee back to limited coverage took another seven years. Rapid political turnover and the involvement of the business and public communities in the distorted banking system of Turkey added to the corruption and significantly impaired the credibility of the incumbent governments (Chhibber, 2004). This environment might encourage stakeholders to react strongly to excessive risk-taking by banks. To our knowledge, previous empirical studies in the literature have not examined the long sub-periods that might erode the credibility of the insurance system.

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We examine the reactions of two important stakeholders—depositors and borrowers—toward the risky behavior of banks before and after a period of extensive government guarantee. The reaction of small savers or depositors against bank risk-taking has been studied extensively, but there has been a paucity of research on the interests of borrowers at risk. Kim, Kliger, and Vale (2003) demonstrated empirically that significant switching costs in the banking sector increased the inclination of borrowers to choose banks that were able to extend the line of credit or provide new loans on demand. Following this argument, we investigate the possibility that borrowers would lessen their relationship with risky banks in order to avoid possible switching costs incurred in the event of bank failures.

Our empirical results showed that bank depositors and borrowers reacted negatively to risky banks and punished them even more during the period of generous government guarantee, controlling for some bank characteristics, macroeconomic conditions, and yearly effects. Although depositors and borrowers lessened their relationship with risky banks, these banks were found to increase their moral hazard behavior significantly, especially after the introduction of 100% deposit insurance. Knowing that Turkey experienced a massive financial crisis in 2001, the results of this study reinforce previous evidence that market reaction would not prevent the fragility of the banking system, unless banks manage risk effectively and the government maintains sound supervision of banks and a stable macroeconomic environment.

This study contributes to the existing literature in two respects. First, we study how market participants' reactions changed with the introduction of generous government guarantee. Second, we examine the disciplining role of borrowers in addition to the role of depositors. To the best of our knowledge, there is only one empirical study that shows the significance of the role played by borrowers in disciplining banks (Kim, Kristiansen, & Vale, 2005 demonstrated with Norwegian banks).

This paper is organized as follows. The next section provides information about the Turkish banking system and the development of deposit insurance in Turkey. Section 3 contains a brief review of the literature on market reaction, the empirical models, and the data. The estimated results are reported and interpreted in Section 4. The paper concludes in Section 5.

2. BACKGROUND

(a) *The banking sector in Turkey*

The banking sector constitutes a large part of the Turkish financial system. Denizer, Gultekin and Gultekin (2000) stated that the financial system and the banking system are synonymous in Turkey. Banks have dominated every aspect of financial activity and have been responsible for the expansion of the financial system in the country. However, the size of the banking sector is relatively small, compared to other upper-middle-income countries. For example, the ratio of bank deposits to the nominal GDP was 37.70% in Turkey in 2000, whereas the average of this ratio for the upper-middle-income countries was 43.50%. Moreover, the private credits provided by deposit money banks and other financial institutions constituted, on average, 43.9% of the GDP in these countries, but it was only 18.77% of the GDP in Turkey in 2000. [2]

The deregulation of banking and other financial services started in 1980 in order to develop a competitive and efficient financial system. The initial reforms eliminated interest rate restrictions on deposits and loans, facilitated the entry of new banks into the system, and introduced new financial instruments and institutions. As a result, there was an increase in the number of banks. For example, the number of banks was 37 in 1980, 64 in 1990, and 81 in 2000. These reforms resulted in fierce competition in the banking sector and high interest rates. Furthermore, the emergence of money brokers called "bankers" caused interest rates on savings to increase significantly via Ponzi financing methods (see, for example, Akyuz & Boratav, 2003). However, the financial distress in the real sector and unhealthy competition in banking resulted in the failure of six banks in total during 1983–84. These collapses caused the Central Bank to regulate the interest rates on deposits and to introduce the deposit insurance system in order to prevent potential bank runs. The Central Bank continued to regulate deposit rates until 1988 for the sake of maintaining positive rates of return (Denizer, 1997). Even though banks behaved competitively [3] in terms of determining price for deposits and bank loans throughout the period of analysis (1988–2000), regulatory and supervisory mechanisms in the Turkish banking sector have arguably been lagging behind the deregulation of the finan-

cial sector (see, e.g., Soral, Iscan, & Hebb, 2006).

On the other hand, the corporations have not changed their financial behavior according to the reforms (Akyuz, 1990). The government has kept its control over the economy. As a result, the weak and fragile Turkish economy experienced three serious crises in 1994, 1998–99, and 2000–01. The economy collapsed after these crises and was partially stabilized only after IMF intervention and the accompanying rescue packages (Demir, 2004). As a result of these crises, three banks were closed in 1994, and 17 banks failed in the four year period during 1998–2001.

The crisis in the first half of the 1980s illustrated the importance of the regulation of the banking system. A new bank act was enacted in 1985 in order to improve the structural weaknesses of the Turkish banking system. This act gave the responsibility to both the Treasury and the Central Bank for the regulation and supervision of banks. The sworn bank auditors associated with the Treasury were authorized to examine the legal compliance and financial standing of banks, whereas the Central Bank was responsible for off-site supervision, because banks are periodically required to provide their financial statements to the Central Bank.

Although rules and regulations for the needs of a liberalized banking system had been constructed in the second half of the 1980s, it is widely acknowledged that the official authorities in Turkey behaved less proactively in regulating banks during the 1990s than had been the case. Ersel (1999) emphasized that the work of the banking sector was plagued by the political authorities: ''The political authority, instead of allocating funds from the budget, chose to rely on these banks' resources. The central government either accumulated huge amounts of debts owed to state-owned banks or paid its debts with not so-liquid government debt instruments. This practice created insurmountable problems for the state-owned banks. In order to reduce the burden inflicted by the government on state-owned banks, these banks were treated as if they were subject, *de facto*, to softer regulatory constraints. This discrimination in favor of state-owned banks led to distortions in the financial markets. Private banks (rightly, from their points of view) complained about ''unfair competition'' stemming from state-owned banks. This environment, obviously, was not conductive for the Undersecretariat of the Treasury to carry out its supervision function as desired.'' The principal objective of the Treasury was to solve the cash budget problem of the government. Hence, ineffective implementation of these rules created a moral hazard and a more vulnerable banking system. It also compelled the authorities to introduce a new set of regulations in 1999 with a new bank act. This act established an independent Banking Regulatory and Supervisory Agency (BRSA) to supervise and regulate the Turkish banking sector. The formation of this agency was highlighted in a letter of intent signed by the IMF, which required the strengthening and regulation of the banking sector in Turkey. This new agency took over these functions from the Treasury in September 2000.

Cizre and Yeldan (2005) pointed out that in Turkey, the first-generation reform phase did not go far enough, because of the involvement of economic bureaucrats and politicians and of their supporters in economic interest groups on banking sector activities. Similarly, Alper and Onis (2002) argued that ''...the authorities made limited or no attempt to deal with the pervasive problem of connected lending associated with strong organic links characterizing the relationship between the banks and holding companies. It is recognized that ceilings on connected bank lending are not restrictive enough by international standards and even these levels tend to have been weakly enforced. Not surprisingly, the problem of nonperforming loans has emerged as an endemic problem in the Turkish context.'' In addition to the weak implementation of the regulations, for various reasons (including political interventions until 1999), the IMF's new structural reform program ignored the fragility of the financial markets and institutions and caused further loss of confidence in the banking sector. In particular, due to the IMF's design failure, the Central Bank's ability to implement implicit mechanisms such as ''lender of last resort'' in addition to the fiscal authorities' use of their traditional tools of austerity made the economy powerless against speculative attacks (see Akyuz & Boratav, 2003; Alper & Onis, 2002; Cizre & Yeldan, 2005). Considering all, in this paper, we argue that in quite a lax regulatory environment, the market—depositors and borrowers—might have an incentive to protect their stakes from various risks in the banking system.

(b) *The deposit insurance system in Turkey*

The Turkish Deposit Insurance Fund was established in 1983. Since its establishment, the coverage of deposit insurance has changed many times. Initially, the maximum coverage was 3 million Turkish Lira (TL) (or $29,000) worth of deposit belonging to one person in one bank. In 1986, the insurance was limited to initial deposits excluding the earned interest in domestic branches of all banks operating in Turkey. In the late 1980s and early 1990s, high inflation and depreciation of the TL accelerated the expansion of foreign currency (FX) denominated deposits. [4] As a result, FX deposits were also taken under partial government guarantee in 1992, but deposits in off-shore branches were excluded. Although the coverage was increased to 75 million TL ($9,000), only two-thirds of this amount (50 million TL) was fully insured; the remaining (25 million TL) was only 60% insured.

The failure of three private banks in 1994, growing uncertainty in the economy, and the resulting economic crisis in 1994 increased the expectations of bank runs in Turkey. These developments led to the establishment of full deposit insurance in 1994 to cover both TL and FX denominated deposits. With this extension, all deposit liabilities in the domestic and off-shore branches of local and foreign banks operating in Turkey were placed under full government guarantee. After pursuing explicit deposit insurance for seven years, another economic crisis in 2000 compelled the introduction of further insurance: the blanket guarantee. Within a short period, by 2001, this blanket guarantee was removed, and deposit insurance coverage was limited to 50 billion TL ($75,000). Although a 100% deposit insurance scheme was conceived of as a temporary measure to prevent possible bank panic in 1994, due to the lack of political will, it took a while to remove such an ill-designed safety net. According to Pazarbasioglu (2002), the cost of the failure of private banks during the 2000–01 banking crisis was 11.9% of the GDP. When the cost of the non-performing loans of the state banks is included, the cost increases to 19.3% of the GDP. [5]

(c) *A brief literature review on market discipline*

Strengthening market reaction to discipline banks or to reduce the moral hazard faced by banks has been a major policy issue for almost two decades (Basel Committee on Bank Supervision, 2001). The literature on market discipline has evaluated the reaction of depositors against bank risk-taking by analyzing two measures: the growth rate of deposits and the interest rate on deposits. There are few studies on the change in the quantity of bank deposits as it relates to the apparent default risk of a bank. For example, Park (1995) and Park and Peristiani (1998) provided significant evidence that riskier US thrifts experienced smaller deposit growth during the 1980s. On the contrary, there is ample evidence for the market's ability to recognize default risk in bank obligations based on the second measure of market discipline. Early works showed that riskier banks usually paid higher interest rates on large certificates of deposits (Baer & Brewer, 1986; Cargill, 1989; Ellis & Flannery, 1992; Hannan & Hanweck, 1988) and on subordinated notes and debentures (Flannery & Sorescu, 1996; Sironi, 2003). Despite a few studies that found no evidence of the pricing of risk in banking (see Avery, Belton, & Goldberg, 1988; Gorton & Santomero, 1990), most of the studies in the developed economies indicated significant reaction to banks' risk-taking.

The findings of the studies examining market discipline in developing countries have been consistent with those in developed countries. For example, Barajas and Steiner (2000) found that in Colombia, banks with strong fundamentals provided lower interest rates to depositors but still had high deposit growth rates. Calomiris and Powell (2001) presented a significant relationship in Argentina between deposit interest rate and deposit growth on the one hand, and bank fundamentals on the other. Similarly, Martinez-Peria and Schmukler (2001) showed that depositors punished risky banks by withdrawing their deposits and by requiring higher interest rates in Argentina, Chile, and Mexico during the 1980s and 1990s.

3. METHODOLOGY

(a) *A model for depositor and borrower discipline*

In the first part of this paper, the disciplinary roles of both depositors and borrowers are modeled using a loanable-funds framework for two types of contracts issued by banks: deposit and loan contracts. Because the characteristics of these contracts differ, each has its own demand and supply, in which the interest rates

and the amount of loanable funds are determined at the equilibrium.

An increase in the interest rate on deposits makes depositors willing to supply more funds to banks, all else being equal. On the other hand, banks (demanders of the loanable funds) seek more funds when deposit interest rates are low. In equilibrium, the quantity of loanable funds or deposits supplied by the depositors equals the amount of deposits demanded by the banks. In this simple framework, if banks undertake more risk, the depositors will reduce their supply of loanable funds at all levels of interest rates on deposits (i.e., the supply curve of loanable funds shifts to the left), and in equilibrium, deposit interest rates increase with the contraction of bank deposits. Thus, when the depositors observe risk-taking behavior in banks, they may penalize them by withdrawing their deposits (thus reducing the supply of loanable funds) and/or requiring higher interest rates. This is the first aspect of the market discipline using deposit contracts.

A similar framework is used to explain the role of borrowers in disciplining banks. Loanable funds are redefined as the funds that change hands between the bank and the borrowers; the bank is the supplier of these funds, and the borrowers are the demanders. In equilibrium, there is a loan rate in which the loan demand equals the amount of funds supplied by a bank. When the bank is perceived to be risky, the demand for its loanable funds will decline at all levels of interest rates (i.e., the demand curve for the bank's loans will shift to the left), and in equilibrium, the amount of loan provided by the risky bank will decrease.

In this context, the following reduced-form model with time-fixed effects is used to study the existence of market reaction:

$$Reaction_{i,t} = f(PFAIL_{i,t}, BANK_{i,t}, YEAR_t), \qquad (1)$$

where $Reaction_{i,t}$ represents a vector of variables that are used as proxies for reactions of depositors and borrowers to bank i in year t. The growth rate of real deposits (*GDEPR*) and the implicit interest rate on deposits (*IDEP*) [6] are the traditional measures to evaluate market discipline. The growth rate of real credits (*GCRER*) is the other dependent variable that measures the reaction of borrowers. In theory, because both the demand and supply of loanable funds decline at the same time that the riskiness of banks increases, the direction of the change in the interest rate on credits cannot be predicted and depends on the amount of shift in the supply and demand schedules for loanable funds. Therefore, we did not study the interest rate on credits as an indicator of borrower reaction. $PFAIL_{i,t}$ represents the risk of bank i at time t. $BANK_{i,t}$ and $YEAR_t$ are the vectors of variables representing bank characteristics and year dummy variables, respectively.

The bank risk is proxied with the predicted probability of failure of a bank, *PFAIL*. It is assumed that bank clients are rational and able to predict the probability of insolvency using publicly available information. $PFAIL_{i,t}$, is estimated by using the following logit model:

$$FAIL_{i,t} = f(X_{i,t-1}, E_{t-1}, TREND_t), \qquad (2)$$

where $FAIL_{i,t}$ takes a value of 1 if bank i fails in year t and 0 otherwise. $X_{i,t-1}$ and E_{t-1} represent the vectors of variables for bank characteristics and economic conditions in year $t-1$ respectively. Two economic variables are included in the model: the growth rate in industrial production (*GROWTH-IP*) and a crisis dummy (*CRISIS*) variable. The dummy variable takes a value of 1 in 1991, 1994, and 2000 [7] and 0 in other years. In Eqn. (2), we use a linear-time trend variable (*TREND*) in order to control for changes in the banking sector over the sample period that may not be captured by other control variables.

We examine various bank characteristics, $X_{i,t-1}$. These are a capital asset ratio (*CARATIO*) for assessing the insolvency risk of an individual bank, the ratio of non-performing loans to total capital (*BADTK*) as a proxy to the quality of loans, a liquid assets to total deposits ratio (*LIQDEP*) for liquidity risk, the share of short-term credits in total assets (*SHCREA*) to reflect the maturity of loans and borrowers' confidence in the bank, a before-tax return on assets (*ROA*) and expense ratio (*EXPENSE*) to consider the profitability of a bank, and the difference between implied interest rates on credits and deposits (*SPREAD*) to measure interest rate risk. Similar indicators are used by Park and Peristiani (1998), Barajas and Steiner (2000), and Martinez-Peria and Schmukler (2001). Rojas-Suarez (2001) found that banks that hold more loans in their portfolio relative to other banks are riskier, and that spread is another indicator of risky banks in developing countries. In calculating the capital–asset ratio, total capital is defined as a summation of paid-in capital,

retained earnings, and net income for that year. Because of high inflation in Turkey, companies are allowed to revalue their fixed assets. Because of revaluation, the increase in assets side of the balance sheet is reported as a revaluation fund in equity, which artificially increases total capital. This item is not included when calculating the capital of a bank. The growth rate of credits for bank i over the mean credit growth rate for the whole banking sector in year t ($GCRE_{i,t}$) is also included in the model as a proxy for credit risk. The size of the bank, *SHASSET*, measured by the contribution of each bank to the total assets in the banking sector, is also controlled in the model. Thus, the probability of failure in year t is forecasted using the position of the bank in year $t-1$.

It is hypothesized that as risk—that is, predicted probability of failure—changes, all of the market reaction measures will be unaffected. [8] However, if a market punishes risky banks, it is expected that the interest rate on deposits (*IDEP*) increases but that the growth rates of real deposits (*GDEPR*) and real credits (*GCRER*) decrease.

Other bank characteristics, $BANK_{i,t}$, that are controlled for in the empirical model specified in Eqn. (1) are bank size (*SIZE*), ownership type (*FOREIGN*, *STATE*), [9] the listing status of the bank on the Istanbul Stock Exchange (*LISTING*), the years since the establishment of a bank (*AGE*), and the number of bank branches (*BRANCH*). The last three variables can be considered to be proxies for the banks' visibility. The visible banks are expected to collect more deposits and give more loans.

In order to control for the events during the years of study, such as crises, and earthquakes, we included a vector of dummy variables, $YEAR_t$, in the model. Each year, the dummy variable takes a value of 1 in year t and 0 otherwise, $t = 1989, \ldots, 2000$.

The model with time-fixed effects does not allow us to examine how the market reaction variables have changed during the full deposit insurance period. Therefore, the model specified in Eqn. (1) is modified by controlling for economic characteristics, instead of for time-fixed effects:

$$Reaction_{i,t} = f(PFAIL_{i,t}, DI_t, BANK_{i,t}, E_t), \qquad (3)$$

where DI_t is a dummy variable that has a value of 1 for the full insurance period (1994–2000) and 0 otherwise; and E_t represents economic variables. Economic conditions (E_t) must be controlled in the analysis in order to eliminate the effects of the state of the economy on the deposit and credit markets. E_t represents three variables: the growth rate in real domestic output (*CYCLE*), the crisis dummy variable (*CRISIS*), and the real interest rates on Turkish government bonds (*REALINT*).

During the analysis period (1988–2000), it can be argued that the public sector had a direct impact on the banks' balance sheets. The interest rate on public debt contracts increased significantly higher than other debt contracts; private commercial banks have been the main buyers of public debt instruments. For example, the average monthly interest rate was around 6%, which was compounded to over 100% annually in 1999, when the inflation rate was 68.8%. In order to consider the effects of the opportunity cost of private loan provisions by banks and the opportunity cost of investing in banks by depositors, we incorporate into the model the real interest rates on Turkish government bonds (*REALINT*). It is hypothesized that increasing the interest rate on government bonds would cause both credit provisions and deposit demand to decrease. Hence, the equilibrium growth rate in deposits and credits would negatively relate to *REALINT*.

In a recent study, Demirguc-Kunt and Huizinga (2004) examined different deposit insurance schemes over 50 countries and found that explicit deposit insurance lessened but did not eliminate the market's reaction to risk-taking. On the contrary, we argue that political and economic uncertainties undermine the credibility of the promises of governments to depositors, and, hence, market reaction strengthens significantly. To examine how market reaction changed during the full deposit insurance period, the sample period is divided into two: before full insurance period (1988–93) and after full insurance period (1994–2000). The model specified in Eqn. (1) is estimated for these two sub-periods. We expect to observe a negative coefficient on the bank risk variable (*PFAIL*) in the models—thus explaining the growth rate of real deposits (*GDEPR*) and the growth rate of real bank credits (*GCRER*)—and a positive coefficient in the interest rate on deposits (*IDEP*) in the model in the second sub-period. The definitions of all of the variables are presented in the Appendix (Table A1).

(b) *A model for moral hazard*

In the second part of the study, we examine the moral hazard behavior of commercial banks in Turkey and explore how it changed with the introduction of full deposit insurance. The moral hazard behavior of banks is measured by four variables: capital-to-assets ratio (*CARATIO*) as a measure of capital adequacy; the ratio of past due loans to total loans (*BADLOANS*) as a measure of delinquency risk or as an asset quality indicator; the ratio of liquid assets to total deposits (*LIQDEP*) as an indication of liquidity risk; and, finally, the difference between implicit interest rates on credits and deposits (*SPREAD*) as a measure of credit and interest rate risk. The first three measures are well-known indicators of possible bank failure. In the recent empirical and theoretical studies, it has been found that the riskiness of a bank is related to the net interest rate margin (*SPREAD*). For example, Wong (1997) theoretically showed that the optimal interest margin was positively associated with the default and interest rate risks. Likewise, Angbazo (1997) and Rojas-Suarez (2001) provided empirical evidence for the positive and significant relationship between the net interest margin and the credit and interest rate risk of banks both in the USA and in several developing economies.

Size, [10] ownership type, listing status, and the age of the bank are the factors that might affect the risk-taking behavior of banks and must be controlled for in analyzing the moral hazard behavior of banks. In particular, large banks are expected to take greater risks than other banks because of "too-big-to-fail" protection. The age variable is used both to capture the impact of the experience of banks and to control for the quality of loans that have a longer credit history. Because the firms listed in the Istanbul Stock Exchange (ISE) are exposed to more regulations and are monitored by existing and potential investors, they may be more careful about taking risk than would be the non-listed firms. If the non-listed firms are tightly held by only a few owners, they may also be less reluctant to take risk.

The following reduced-form model is estimated to examine the moral hazard behavior of banks:

$$Risk_{i,t} = f(DI_t, BANK_{i,t}, E_t), \tag{4}$$

where $Risk_{i,t}$ represents a vector with variables *CARATIO*, *BADLOANS*, *LIQDEP*, and *SPREAD*. The independent variables are the same as those explained in the market reaction model (DI_t, $BANK_{i,t}$, and E_t).

It is hypothesized that banks take greater risks during the generous government guarantee period. *BADLOANS*, *LIQDEP*, and *SPREAD* are expected to be higher in the explicit full deposit insurance period than in the partial insurance period. On the contrary, banks are expected to have a lower *CARATIO* in the full insurance period, if moral hazard increases with generous guarantee. All of these models specified in Eqns. (1), (3), and (4) are estimated using the ordinary least squares, but standard errors are adjusted because of autocorrelation and heteroscasticity. [11]

(c) *Data and sample*

The market reaction and moral hazard behavior of banks in the Turkish banking system are analyzed for the sample period during 1988–2000. The beginning of this period is determined by the electronic availability of bank data. We ended our sample in 2000, because in 2001, deposit insurance coverage changed from full to limited, and the new supervisory authority, the Banking Regulation and Supervision Agency, was established to supervise the banking sector. The data were obtained from the Yearbooks of the Turkish Banking Association (TBA). Every year, the TBA provides the audited financial statements of domestic and foreign banks operating in Turkey.

Only commercial banks are considered in the analysis. Table 1 shows the number of banks included in the sample over time. [12] Twenty-three banks failed during this period, with the majority of failures occurring around the crisis periods, especially in 2001. The number of banks differed over the sample period because of the entrance of new banks and the failure of existing ones. Table A2 in the Appendix lists all of the banks included in the sample.

Table 2 presents the mean and standard deviation of variables for the whole period and for the sub-periods before and after the introduction of full deposit insurance. The equality of the variables in the two sub-periods is tested with a t-statistic. Except for the real growth rate of deposits (*GDEPR*), none of the mean values of market reaction variables is found to change significantly after 1994.

The mean values of all risk measures before and after full deposit insurance were

Table 1. *Distribution of banks for the period 1988–2001*[a]

Years	1988–90[b]	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total	42	43	45	46	41	44	43	45	43	37	36	27
Failed	0	0	2	0	3	0	0	1	1	4	2	10

[a] Although the sample period used in our analysis is during 1988–2000, the failed banks in 2001 were used to predict the probability of failure.
[b] During 1988–90, there was no change in the number of commercial banks.

Table 2. *Summary statistics of variables*

	1988–2000		1988–93		1994–2000	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Market reaction						
GDEPR	0.5277	1.7639	0.3055	0.8545	0.6639	2.1285
IDEP	0.1986	0.1347	0.1961	0.1337	0.2006	0.1356
GCRER	0.4105	2.1681	0.2519	0.4813	0.5077	2.7252
Risk measures						
CARATIO	0.0964	0.1417	0.1097	0.0755	0.0862	0.1758
BADLOAN	0.0763	0.2685	0.0484	0.0752	0.0976	0.3495
LIQDEP	1.1919	2.7347	1.5464	3.8800	0.9202	1.2385
SPREAD	0.1738	0.1988	0.1480	0.1705	0.1936	0.2162
PFAIL	0.0545	0.1379	0.0054	0.0064	0.0922	0.1741
Control variables						
SHASSET	0.0250	0.0384	0.0267	0.0413	0.0238	0.0361
TOTAL ASSETS[a]	1540.84	2539.97	1109.95	1711.31	1871.05	2986.36
BADTK	0.1383	1.6030	0.2338	0.4868	0.0652	2.0861
SHCREA	0.3077	0.1461	0.3405	0.1440	0.2826	0.1429
EXPENSE	0.2185	0.2260	0.1244	0.0693	0.2906	0.2733
GCRE	3.38	40.43	1.14	1.35	5.09	53.70
FOREIGN	0.1420	0.3494	0.1659	0.3728	0.1237	0.3298
STATE	0.1362	0.3433	0.1659	0.3728	0.1134	0.3176
LISTING	0.2471	0.4317	0.2063	0.4055	0.2784	0.4490
BRANCH	1.6212	2.7381	1.6983	2.8677	1.5621	2.6379
AGE	40.75	34.15	41.45	33.73	40.22	34.51
Economic variables						
CYCLE	0.0384	0.0470	0.0467	0.0351	0.0320	0.0536
CRISIS	0.2257	0.4184	0.1704	0.3768	0.2680	0.4437
REALINT	0.1301	0.1889	0.0693	0.1174	0.1767	0.2181

[a] In billion TL in terms of 1987 prices.

statistically significantly different, as hypothesized in the case in which banks undertook moral hazard behavior with full deposit insurance. We observed that the mean capital–asset ratio (*CARATIO*) and liquid assets-to-deposits ratio (*LIQDEP*) decreased in the second part of the sample period, indicating an increase in risk. Similarly, the ratio of non-performing loans (*BADLOAN*), the predicted probability of failure (*PFAIL*), and the interest rate margin (*SPREAD*) increased significantly during the full insurance period of 1994–2000 (see Table A3 in the Appendix for pairwise correlations of variables).

The mean values indicate that the share of short-term credits (*SHCREA*) declined and that the total assets in terms of 1987 prices (*TOTAL ASSETS*) and the expense ratio (*EXPENSE*) increased significantly in the second sub-period. The increase in the growth rates of real deposits and credits explains the increase in total assets. More banks were listed on the ISE after 1994, although some of the listed banks failed in the full insurance period. The

number of foreign and state banks in Turkey decreased in the second sub-period. The decline in the number of state banks can be attributed to privatization and mergers.

4. EMPIRICAL RESULTS

(a) *Predicting the probability of failure*

The results of the logit model for the 1988–2000 period are presented in Table 3. Although all of the variables have expected signs, only three variables, *TREND*, *SHASSET*, and *LIQDEP* are found to be significant. It seems that the probability of failure for the banks in Turkey increased significantly over time. In terms of bank characteristics, larger and liquid banks are considered to be less risky during the analysis period. Although only few variables are found to be significant, the logit model accurately classifies almost 90% of the observed responses (the concordant ratio = 87.8%).

(b) *Market reaction*

The empirical results of the market reaction models with time-fixed effects as specified in Eqn. (1) are presented in Table 4. First, the reaction of the Turkish depositors toward riskiness [13] was found to be consistent with the market discipline hypothesis, controlling for some bank characteristics and year effects. It is observed that as the riskiness increased, the interest rate on deposits increased significantly. Although the bank's growth rate on real deposits is found to decline, the coefficient is not significant. More precisely, a 10% increase in the predicted probability of failure of a bank is expected to result in a 4.85% decrease in the growth rate of deposits; in order to attract depositors, risky banks offer a 1.69% higher interest rate.

A similar reaction is observed in the credit market. We found that banks' expected probability of failure has a strong negative impact on the growth rate of credit provisions. The growth rate of credits declines by 1.55%, as the predicted probability of failure increases by 1%. The banking sector that has almost no possibility of a bank run might provide contractual flexibility to convince borrowers to borrow more; however, borrowers preferred to keep their lending relationship with the banks with lower failure risk. [14]

In the last column of Table 4, we presented the results of a model that controls for the growth rate of deposits. If a bank has a low growth rate of deposits, it may have to reduce its lending; hence, the growth rate of credits should depend on the growth rate of deposits. As expected, the coefficient on this variable is found to be significant and positive. However, it did not affect the significance of the coefficient on the PFAIL variable. Moreover, the explanatory power of our model increased from 1.47% to 54.60%.

The results about the size of a bank suggest that savers and borrowers do not seem to believe in "too-big-to-fail" protection. As banks grew, the deposit interest rate they offered increased significantly. State banks are found to offer a 4.34% higher interest rate than non-state banks during the analysis period. However, a significantly high pricing strategy on deposits by banks owned by the government (*STATE*) did not help them to improve their growth rate on deposits significantly. The banks listed in the stock market offered a 5.13% lower interest rate than unlisted banks and held almost a 10% lower growth rate on deposits and an approximately 4–5% lower growth rate on credits. Controlling for other bank characteristics and year effects, as the age of a bank increases, its

Table 3. *Logit estimates for the probability of bank failure (PFAIL)*

	Estimated coefficient	Standard error
INTERCEPT	−4.4972**	2.0377
TREND	0.3486***	0.1038
SHASSET	−31.6706*	16.9861
CARATIO	−1.9193	3.9053
BADTK	0.2238	0.3348
LIQDEP	−2.0461*	1.2087
SHCREA	0.1093	2.4107
RETURN	−4.4800	4.9404
EXPENSE	−0.4490	1.1476
SPREAD	1.3547	1.2783
GCRE	−0.0512	0.1277
GROWTH-IP	0.2954	4.8925
CRISIS	0.6804	0.5928
Log likelihood	−61.8975	
χ^2	63.5167***	
Concordant ratio (%)	87.8	
Discordant ratio (%)	11.5	

Note: *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively. The mean (median) values of *PFAIL* are 3.32% (0.96%) and 29.91% (16.41%) for non-failed and failed banks.

Table 4. *Market reaction with time-fixed effects*

	Deposit market		Credit market	
	GDEPR	*IDEP*	*GCRER*	
PFAIL	−0.4852	0.1694***	−1.5506***	−1.1079***
	(0.3287)	(0.0351)	(0.4147)	(0.1897)
SIZE	0.0044	0.0149***	−0.0692	−0.0732
	(0.0460)	(0.0055)	(0.0698)	(0.0545)
LISTING	−0.0946	−0.0513***	−0.0368	0.0495
	(0.1369)	(0.0172)	(0.1643)	(0.1060)
BRANCH	−0.0519*	0.0026	−0.0772	−0.0299
	(0.0310)	(0.0028)	(0.0532)	(0.0298)
AGE	−0.0055**	0.0002	0.0003	0.0053**
	(0.0023)	(0.0003)	(0.0033)	(0.0025)
STATE	0.3491	0.0434*	0.6556	0.3372
	(0.3532)	(0.0256)	(0.6846)	(0.3550)
FOREIGN	0.5291	0.0702*	−0.0078	−0.4905*
	(0.3795)	(0.0379)	(0.4311)	(0.2727)
GDEPR				0.9123***
				(0.2365)
Adj. R^2	0.0297	0.0580	0.0084	0.5419
N	463	514	463	463

Notes: Newey–West heteroscedasticity and autocorrelation consistent standard errors are presented in parentheses. *,**, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

deposit growth rate is found to decline significantly, but its credit growth rate is found to increase significantly. This result suggests that creditors prefer to work with the old banks rather than making new connections with young banks. In order to attract depositors, foreign banks are found to offer a 7% higher interest rate than domestic banks.

Table 5 reports the results of the model, examining the impacts of risk and full deposit insurance on market reaction variables, controlling for economic conditions instead of year dummy variables. The results are similar to those reported in Table 4. The significant impact of risk is also observed for all of the market reaction variables: As the predicted probability of a bank increases by 10%, the growth rate of deposits decreases by 6.79%, banks increase their interest rates by 12.41%, and the growth rate in real credits declines by 16.7%. Moreover, the results indicate that the growth rates of deposits and credits were significantly higher during this period than during the partial and no insurance periods, and banks paid an almost 1% higher deposit interest rate during this sub-period. It is found that the growth rate of credits (deposits) during the full insurance period is 0.58% (0.38%) higher than in the period without generous guarantee.

During the 1988–2000 period, real output growth (*CYCLE*) significantly improved the growth rate of real credit provisions by banks. During expansionary episodes, although banks reduced the real interest rates on deposits, the growth rate on real deposits was not affected significantly. In the periods of crisis (*CRISIS*), we found that the real interest rate on deposits (*IDEP*) declined 1.6%, controlling for economic growth and some bank characteristics. Typically, macroeconomic shocks cause nominal prices, including interest rates, to increase significantly. In Turkey, we observed that the inflation rate grew faster than the nominal interest rate on deposits and lowered the real returns on deposits, *IDEP*. However, the effect of economic uncertainties during the crisis substantially increased risk premiums on nominal loan rates. Especially, the declining net worth of the companies, that is, the market value of the collateral of the firms increases the risk premium on loan rates during the crisis periods. Hence, these results confirm our expectations that during the crisis, the growth rate of real credits, *GCRER* declined significantly. When government securities provide high and real return, growth in deposits increases, and the growth rate on credits decreases. Because the real interest rates on T-bills will be high when

Table 5. *Market reaction controlling for economic conditions*

	Deposit market		Credit market	
	GDEPR	*IDEP*	*GCRER*	
INTERCEPT	0.5345**	0.2419***	0.6692**	0.1816
	(0.2480)	(0.0351)	(0.2824)	(0.2394)
PFAIL	−0.6793*	0.1241***	−1.6703***	−1.0506***
	(0.3488)	(0.0318)	(0.4808)	(0.1868)
DI	0.3829**	0.0071	0.5802***	0.2309**
	(0.1807)	(0.0198)	(0.2202)	(0.1097)
SIZE	0.0031	−0.0121*	−0.0629	−0.0657
	(0.0482)	(0.0069)	(0.0620)	(0.0537)
LISTING	−0.0992	−0.0304**	−0.0482	0.0423
	(0.1407)	(0.0146)	(0.1701)	(0.1064)
BRANCH	−0.0544	0.0076**	−0.0798	−0.0302
	(0.0331)	(0.0029)	(0.0549)	(0.0301)
AGE	−0.0053**	0.0004	0.0003	0.0051**
	(0.0022)	(0.0003)	(0.0030)	(0.0024)
STATE	0.3503	0.0633***	0.6466	0.3271
	(0.3610)	(0.0235)	(0.6872)	(0.3503)
FOREIGN	0.5288	0.0451	−0.0148	−0.4971*
	(0.3751)	(0.0382)	(0.4240)	(0.2638)
CYCLE	−0.7908	−0.2458***	2.7606**	3.4819***
	(1.1300)	(0.0729)	(1.0694)	(0.7637)
CRISIS	−0.1685	−0.0160	−0.3849***	−0.2312*
	(0.1525)	(0.0130)	(0.1463)	(0.1341)
REAL_INT	0.4754	−0.0080	−0.6102	−1.0439***
	(0.3906)	(0.0311)	(0.5453)	(0.3709)
GDEPR				0.9122***
				(0.2347)
Adj R2	0.0349	0.0986	0.0154	0.5460
N	463	514	463	463

Notes: Newey–West heteroscedasticity and autocorrelation consistent standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

there is high uncertainty in the economy, individuals prefer to invest in bank deposits, the lowest-risk investment alternative. Moreover, because of the increase in uncertainty, the credit market reduces in size.

To study whether market reaction changed significantly with the introduction of full insurance in 1994, the model with time-fixed effects specified in Eqn. (1) was re-estimated for two sub-periods: 1988–93 and 1994–2000. The results are reported in Table 6. It was found that depositors reacted negatively to bank risk-taking after the introduction of a generous guarantee. Although no significant reaction to risk by the depositors was found in the first sub-period, they seemed to avoid the risky banks during the full insurance period. This result suggests that depositors did not trust the government guarantee. As emphasized by Cull, Senbet, and Sorge (2002), institutional development and government integrity are important for the credibility of the explicit deposit insurance scheme. It seems that the existence of a generous guarantee opened the eyes of depositors, and they punished risky banks either by withdrawing their deposits or by requesting higher interest rates on deposits. Although the coefficient on risk in the *GDEPR* model is not statistically significant, it is found that a 10% increase in bank risk is found to result in a 4.06% decrease in the growth rate on deposits. Moreover, the impact of risk on deposit interest rate is significant. For example, if *PFAIL* increases by 10%, the deposit interest rate will increase by 1.57%.

From the borrowers' side, a negative impact of risk on the growth rate of real credits was observed in both sub-periods, but it became

Table 6. *Market reaction with time-fixed effects before and during full deposit insurance period*

	Deposit market				Credit market	
	GDEPR		*IDEP*		*GCRER*	
	1988–93	1994–2000	1988–93	1994–2000	1988–93	1994–2000
PFAIL	21.3909	−0.4062	2.0009	0.1572***	−1.7921	−1.6585***
	(16.0472)	(0.3952)	(2.5016)	(0.0329)	(7.0890)	(0.5568)
SIZE	0.1014	−0.0137	0.0254***	−0.0085	0.0270	−0.0972
	(0.1149)	(0.0746)	(0.0050)	(0.0100)	(0.0503)	(0.0928)
LISTING	0.1275	−0.1564	−0.0605 **	−0.0288	0.0083	0.0047
	(0.2466)	(0.1507)	(0.0297)	(0.0193)	(0.1086)	(0.2439)
BRANCH	−0.0457	−0.0718	−0.0005	0.0081*	−0.0307	−0.1629
	(0.0464)	(0.0732)	(0.0038)	(0.0046)	(0.0201)	(0.1224)
AGE	−0.0065*	−0.0063*	0.0000	0.0004	−0.0016	0.0010
	(0.0039)	(0.0038)	(0.0005)	(0.0004)	(0.0018)	(0.0054)
STATE	−0.0203	0.7559	0.0191	0.0773	−0.2335	1.6367
	(0.1735)	(0.7159)	(0.0225)	(0.0498)	(0.1416)	(1.2783)
FOREIGN	−0.2539	1.2355**	0.1060 **	0.0315	−0.3405***	0.2477
	(0.2324)	(0.5554)	(0.0491)	(0.0569)	(0.1045)	(0.7646)
Adj. R^2	0.0927	0.0461	−0.0061	0.1323	0.1237	0.0157
N	176	287	223	291	176	287

Notes: Newey–West heteroscedasticity and autocorrelation consistent standard errors are presented in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

significant during the generous guarantee period. These results suggest that borrowers carefully chose their banks from the beginning and build a lending relationship with their incumbent banks. It can be argued that borrowers would anticipate the possibility of increased agency costs during the generous guarantee period and act more cautiously in the full insurance period, because increasing the moral hazard by banks would have a significant impact on borrowers. For example, the failure of the credit relationship with a primary bank would cause either more costly funding of the investments or complete termination. Hence, as expected, creditors act more disciplinary in the second sub-period. Even though the possibility of a bank run was theoretically eliminated, in practice, the political turmoil after 1994 significantly undermined the credibility of the incumbent government and the generous guarantee system. [15]

Although interest rates offered by state banks were 7.73% higher than those offered by private banks in the second sub-period, high pricing strategies by state banks failed to achieve significant growth in deposit collections after 1994. In Turkey, the reactions of the depositors and borrowers against state banks may be explained by the fact that loanable funds collected by state banks were mostly used to lend—as their "duty"—to a favored sector at a price below the market interest rates. In 1999, the losses of the state banks reached 30% of their total assets. Our findings suggest that, over time, the worsening health of the surviving state banks might be more evident, so that, although these banks offered higher deposit rates, they could not achieve higher deposit growth. Moreover, although foreign banks offered higher interest rates than private banks in each sub-period, their growth rates on deposits and credits were lower in the first sub-period but higher in the second sub-period. These findings suggest that foreign banks increased their involvement in both credit and deposit markets.

(c) *Was it market punishment or the effect of crisis?*

It can be argued that our empirical findings about deposit and credit markets can be explained by the three financial crises in Turkey during our sample period [16] rather than by the significant reaction of borrowers and depositors toward risk. For example, Calomiris and Powell (2001) found similar reactions of depositors in Argentina during a financial crisis. To explore this possibility, we performed robustness checks and summarized the results in Table 7. [17] In the analysis, two different models

were estimated. The first one (Model I) is the same model reported in Table 5. The second model (Model II) includes an interaction variable between *DI* and *PFAIL* to examine whether or not the impact of a bank's expected probability of solvency on market reaction variables changed with the introduction of the generous guarantee in 1994.

In the first robustness check (Panel A in Table 7), the models were estimated by excluding the crisis years from the sample. The results are similar for the whole sample and for the sub-period with the generous government guarantee. Although there was no change in the sign of the risk coefficient (*PFAIL*), the impact of risk was found to be significant for the whole period (Model I) for all of the measures of market reaction. As banks undertook more risk in the second period, they faced a significant decline in their deposit growth rate, while they significantly increased their interest rate on deposits. Moreover, there was a significant decline in the growth rate on real credits in the second sub-period. These results indicate that the impact of risk on market reaction variables cannot be attributed only to crises and that risky banks are being punished by depositors and borrowers. Our findings imply that both depositors and borrowers did not trust the government guarantee and reacted significantly when there was full deposit insurance.

In the second robustness check, the two-step estimation is applied (Panel B in Table 7). In the first step, all of the independent variables except *PFAIL* were regressed against the measures of market reaction. Then, in the second step, residuals obtained from the first stage were regressed against *PFAIL* and against the

Table 7. *Robustness tests: is it market reaction of the effect of crisis?*

	GDEPR		*IDEP*		*GCRER*	
	Model I	*Model II*	*Model I*	*Model II*	*Model I*	*Model II*
Panel A: Without 1991, 1994, and 2000						
PFAIL	−0.7660*	15.8269	0.2016***	0.5290	−2.2618***	−5.7335
	(0.3983)	(18.2441)	(0.0564)	(2.7226)	(0.5299)	(16.1945)
*PFAIL*DI*		−16.5975		−0.3276		3.4727
		(18.2684)		(2.7406)		(16.2231)
PFAIL(1994–2000)		−0.7706*		0.2013 ***		−2.2608***
		(3.70)		(12.36)		(18.14)
Adj R^2	0.0297	0.0279	0.1154	0.1131	0.0099	0.0070
N	351	351	398	398	351	351
Panel B: Two-step estimation						
PFAIL	−0.5282*	13.5496	0.1446 ***	3.2086**	−1.2986 ***	−1.4680
	(0.3012)	(12.0073)	(0.0286)	(1.3343)	(0.3603)	(12.3648)
*PFAIL*DI*		−14.0053		−3.0483**		0.1685
		(11.8216)		(1.3199)		(12.1237)
PFAIL(1994–2000)		−0.4557		0.1603***		−1.2995 ***
		(1.92)		(30.77)		(10.83)
Adj, R^2	−0.0002	−0.0007	0.0402	0.0624	0.0055	0.0034
N	463	463	514	514	463	463

Notes: The model that controls for economic conditions (GDP growth rate, real interest rate on T-bills and crisis dummy variable) in addition to bank characteristics is estimated first. *PFAIL* rows represent the estimated coefficient on the risk variable with their Newey–West heteroscedasticity and autocorrelation consistent standard errors in parentheses. Then, another model is estimated by including an interaction variable between deposit insurance dummy variable, *DI*, and risk measure, *PFAIL*. The second row *PFAIL*DI* presents the estimated coefficients on the interaction variable in the second model with their standard errors in parentheses. The third row, *PFAIL(1994–2000)* shows the estimated coefficient for the generous insurance period, and χ^2 statistics are reported in parentheses with the results of a Wald test. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively. Panel A shows the estimates when the crisis years 1991, 1994, and 2000 are excluded from the sample. Panel B shows the results of the two-step estimation. In the first step, the market reaction measures are regressed against all of the variables except *PFAIL*. In the second stage, the residuals obtained from the first stage are regressed against risk and interaction variables.

interaction variable between *PFAIL* and the *DI* dummy variable. The results are similar: market reaction was strengthened during the full insurance period.

All of these findings suggest that financial crises in Turkey were not the only reasons for the impact of risk on market reaction measures. The market seems to react significantly in order to punish those banks that are perceived to be risky.

(d) *Moral hazard*

Table 8 summarizes the results of the model for the moral hazard behavior of banks during the whole sample period, 1988–2000. As expected, there are significant indications that generous deposit insurance created moral hazard: the capital-to-assets ratio decreased by 1.63%, the proportion of non-performing loans increased by 11.80%, and the ratio of liquid assets to deposits decreased by 43.29%. Furthermore, after 1994, the spread widens, even though it is not found to be statistically significant. These findings can be interpreted to mean that banks undertook significant risks during the generous deposit insurance period in Turkey.

Large banks behaved more conservatively during the full deposit insurance period. They increased their liquidity and reduced non-performing loans and their spread. All of the banks show results that are statistically significant, controlling for bank characteristics and economic conditions. However, believing in the "too-big-to-fail" argument, large banks seem to have decreased their capital adequacy. By coupling the narrow spread with the previous finding of declining deposit rates (see Table 4), we can conclude that large banks were able to provide loans to borrowers with less default risk, from 1988 to 2000.

Banks whose stocks are traded on the ISE are found to have significantly fewer non-performing loans than non-listed banks. This fact can be explained both by the regulations imposed by the Capital Markets Board and by the coercion of current and potential investors in the ISE. The coefficients on the *AGE* variable suggest that banks with a long history held less

Table 8. *Moral hazard estimates*

	CARATIO	*BADLOAN*	*LIQDEP*	*SPREAD*
INTERCEPT	0.1637***	0.0528*	1.4039***	0.1961***
	(0.0076)	(0.0271)	(0.1967)	(0.0242)
DI	−0.0163**	0.1180**	−0.4329**	0.0110
	(0.0081)	(0.0486)	(0.1853)	(0.0200)
SHASSET	−0.3363**	−0.4901	1.3100	−0.0493
	(0.1453)	(0.3907)	(0.9534)	(0.2801)
LISTING	−0.0361***	−0.0959**	−0.0860	−0.0085
	(0.0073)	(0.0485)	(0.0692)	(0.0105)
AGE	−0.0005***	0.0003	−0.0097***	−0.0002
	(0.0001)	(0.0005)	(0.0022)	(0.0002)
STATE	−0.0344*	−0.0465	−0.1876**	−0.1273***
	(0.0182)	(0.0306)	(0.0777)	(0.0203)
FOREIGN	−0.0328***	−0.0147	2.1965***	−0.0953***
	(0.0065)	(0.0637)	(0.7187)	(0.0327)
CYCLE	−0.0014	0.4790	2.4209	−0.5086***
	(0.0757)	(0.5231)	(1.9659)	(0.1563)
CRISIS	0.0203*	0.1043	−0.1231	0.0615**
	(0.0122)	(0.0666)	(0.1725)	(0.0246)
REALINT	0.0413***	−0.2525*	0.2105	0.1339***
	(0.0149)	(0.1347)	(0.4828)	(0.0439)
Adj R^2	0.1247	0.0110	0.1199	0.1174
N	527	542	542	532

Notes: Newey–West heteroscedasticity and autocorrelation consistent standard errors are presented in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively. We excluded the economic variables in the estimation of the model of probability of failure, as these variables were already used in the estimation of *PFAIL*.

capital and kept fewer liquid assets relative to their deposits. Both state and foreign banks had a significantly narrower spread. Moreover, during the same period, foreign banks had more liquid assets, but state banks had less. As expected, spread increased significantly in the crisis period. [18] The widening of the interest margins indicates a greater exposure of banks to credit risk, thus increasing their probability of failure.

5. CONCLUSION

This study examines the ways in which two major stakeholders of banks reacted to the risk-taking behavior of banks in Turkey. The results show that both depositors and borrowers reacted significantly and tried to punish risky banks. Moreover, the introduction of complete guarantee was found to significantly strengthen the market reaction in Turkey. Hence, depositors and borrowers showed their reaction either by decreasing their involvement with risky banks or by asking for a higher price on their savings at risk. Nonetheless, bank managers continued to undertake risky behavior, especially in the period with full government guarantee on deposits, implying that generous coverage undermines market confidence. The findings of this paper and the results of the recent massive banking crisis in 2001 suggest that market reaction in Turkey was ineffective to reduce the moral hazard in the banking sector. Our results support the findings of Opiela (2004) that encouraging market monitoring is ineffective in eliminating banks' risk-taking. Moreover, although the IMF and the World Bank recommend that developing countries adopt explicit deposit insurance (Demirguc-Kunt, Kane & Laeven, 2007), it does not eliminate a banking crisis: even a market reacts to the moral hazard behavior of banks.

Several factors might explain why the market was not successful in disciplining banks in Turkey. First, the deposit insurance system is ill-designed. The Savings Deposit Insurance Fund paid for all the obligations of three failed, mid-sized private banks in 1994, although the coverage was partial. Since then, the system in Turkey has been considered to be an implicit blanket guarantee. The perception that the system is completely insured encouraged bank managers to engage in excessively risky activities. Eichengreen (2001) pointed out this issue by saying that "a number of mid-sized banks [that] had taken highly-leveraged positions in anticipation of continued declines in interest rates. Banks ignored the standard rules for risk management."

A second factor is the lack of effective supervision in Turkey, which makes the system dysfunctional. Chhibber (2004) has a striking statement on how the system in Turkey is not working: "The Treasury (on site supervision) and Central Bank (off-site supervision) both reported to the Economy Minister (a politician) and shared the supervision of a corrupted banking system riddled with cronyism." Furthermore, the governance mechanism in the Turkish banking system extensively permitted related lending. Because these credits are not monitored effectively, most of them also become non-performing loans.

The third explanation for observing ineffective market discipline in Turkey during the sample period may be related to the misguidance of external institutions (e.g., the IMF and the World Bank) and of internal politics in customizing the rules and regulations for the Turkish banking sector. Several studies, such as that of Alper and Onis (2002) emphasize the role of external institutions in promoting banking sector reforms, including the rehabilitation of the deposit insurance system in Turkey. The mismanagement of the priorities of macroeconomic adjustment programs, such as the one designed by the IMF in 1999 prevented the market from being disciplinary toward banks. Akyuz and Boratav (2003) state that "A better diagnosis of the conditions in the Turkish banking system together with a proper understanding of the dynamics of the exchange rate-based stabilization programs could have alerted policymakers to the risks entailed by a rapid decline in interest rates as well as to the vulnerability of the economy to boom-bust cycles in capital flows... In Turkey, overhauling the banking system before launching the stabilization program would have helped to avoid many of the subsequent difficulties..." Moreover, the long duration of explicit deposit insurance permitted some insolvent banks to continue to operate and to allocate credits in the pursuit of favored economic and non-economic objectives of the government. Although the market reacted strongly to banks with a higher probability of failure, the lax regulatory environment prevented effective forbearance.

In a banking system, many stakeholders are expected to monitor and to take action for

effective market discipline (Llewellyn & Mayes, 2003). In this paper, we studied the behavior of only a few of them. However, as in most emerging economies, the involvement of several stakeholders, such as supervisory agencies, rating agencies, and boards of directors, cannot be examined due to the scarcity of reliable information. When these data become available, further investigation of the reaction of other participants would strengthen findings on the effectiveness of market reaction under generously protected systems. Moreover, the investigation of the political economy framework of the deposit insurance system would contribute considerably to the paper. In this way, we can identify the roles of domestic and/or external institutions on the prevention of market discipline. However, due to lack of micro level data for the Turkish banks, the identification of the political influences was not possible.

NOTES

1. Llewellyn and Mayes (2003) identified ten stakeholders that are expected to monitor banks: depositors, managers, borrowers, supervisory agencies, rating agencies, market traders, shareholders, boards of directors, debt-holders, and employees.

2. According to the World Bank, Turkey is among the upper-middle-income countries. In 2000, the average bank-deposits-to-GDP ratio was 14.47%, 36.01%, and 84.90% in the low-income, lower-middle income, and high-income countries respectively. Private credit provided by deposit money banks and other financial institutions was, on average, 13.6%, 31.1%, and 95.5% of the GDP in the low-income, lower-middle-income, and high-income countries, respectively. These figures are calculated using the data provided by Levine www.econ.brown.edu/fac/Ross_Levine/Publications.htm.

3. See Denizer (1997) for the imperfections in competition in the Turkish banking system.

4. The average annual inflation and the appreciation of the US Dollar against the TL were 69.1% and 72.6% respectively, in the period during 1988–94.

5. Source: http://www.bddk.org.tr/turkce/yayinlarveraporlar/sunumlar/22.

6. Because of the unavailability of interest rates on deposits, an implicit interest rate, *IDEP*, is calculated by dividing the total interest paid on deposits by the total bank deposits.

7. These years are defined as crisis years in Turkey by Demirguc-Kunt and Detragiache (2002). These crises are considered to be mini-crises, as their impact persisted for only a short period (Chhibber, 2004).

8. In our analysis, we use a generated regressor (*PFAIL*). Including *PFAIL* as an explanatory variable in regression can cause reported standard errors to be incorrect. However, Pagan (1984) shows that standard errors are consistent if the generated regressor is obtained from a least-squares regression. DeYoung, Flannery, Lang, and Sorescu (2001) report that the same logic is applied when the logit model is used in the estimation. Therefore, we did not implement any correction here.

9. There are three different types of banks operating in Turkey: state-owned, private, and foreign banks. State banks support a variety of government-subsidized lending programs, such as credits to agriculture, small- and medium-sized enterprises, and public foundations in Turkey. The largest bank, Ziraat Bank, is state owned. In 2000, 34.3% of the assets of the banking system was controlled by state-owned banks, whereas 49.5% was owned by private banks.

10. Because of multicollinearity between the other control variables and the absolute measure of size (logarithm of total assets), we used the share of the bank's assets in the total assets of the banking sector, *SHASSET*, to control for the size of the bank.

11. To check if the results are robust to potential endogeneity, we use generalized method of moments (GMM) estimates, combining variables in levels and first differences. The results from the alternative estimates are similar to the ones reported in the paper.

12. Although Imar Bank, a private bank did not fail during our sample period, it is excluded from the sample because of a recent disclosure about the possible manipulation of its accounts.

13. We also estimated our models with different measures of bank risk, instead of *PFAIL*, in order to test whether our results depend on the measure of risk as in Demirguc-Kunt and Huizinga (2004). We examine capital adequacy (capital-to-asset ratio), liquidity risk (liquid

assets-to-total assets ratio), and delinquency risk (non-performing loans-to-total loans ratio). It is found that as the capital adequacy of the bank (capital-to-asset ratio) increases, the interest rate on deposits declines, and the growth rate in credits increases. When delinquency risk (non-performing loans-to-total loans ratio) increases, the growth rate in credits declines significantly. When bank liquidity (liquid assets-to-total assets ratio) increases, the growth rate in deposits and credits increases significantly, and the interest rate on deposits decline. All of these findings support our findings about market discipline. Among these measures of bank risk, the predicted probability of failure has the highest correlation with the actual probability of failure. The correlation coefficient between actual failure and *PFAIL* is 0.53; the correlation coefficient between actual failure and the capital adequacy ratio is −0.18; the correlation coefficient between actual failure and delinquency risk is 0.05; and the correlation coefficient between actual failure and liquidity risk is −0.05. Therefore, we reported only the results with this measure of risk. The other results are available from the authors upon request.

14. The inferences from this model (*GCRER*) about market discipline should be made cautiously, because of low R^2. This low value can be explained by the distortion of the credit market by the government: the single most important borrower of commercial banks.

15. During the second sub-period 1994–2000, eight incumbent coalition governments were formed in Turkey.

16. It can be argued that the dummy variable *CRISIS* is not an appropriate proxy to measure the effect of a crisis. The Turkish Lira (TL) was devalued tremendously in the crisis years. The average annual devaluation rate of the TL against the US dollar was 39.28% over the sample period 1988–2000. It was 42.32%, 62.37%, 53.34%, and 11.93% in 1991, 1994, 1999, and 2000 respectively. Therefore, the devaluation rate (*DEVAL*) was included in the model instead of a dummy variable *CRISIS*, and estimations were obtained. It was found that as the riskiness of a bank increased, all of the market reaction measures were significantly affected: the growth rates in real deposits and real credits declined, and the real interest rate on deposits increased, controlling for other bank characteristics and the real growth rate. Moreover, similar impacts of risk on growth and deposit rates were observed during the generous guarantee period. We also estimated the models by interacting all variables with *CRISIS*. Most of the interacted variables are found to be insignificant. Unexpectedly, during the crisis period, as the riskiness of banks increased, their growth rate on real credits increased significantly, but the overall impact of risk was still negative. Such loan growth during financial breakdowns might be explained by the increased demand for loans when the cash flows of private and public companies dried up during the crisis periods. Borrowers might be able to acquire bank financing through their political connections with certain state banks or their affiliation with related banks in Turkey.

17. Only the coefficients on the risk measure *PFAIL*, on an interaction variable between *PFAIL* and a full deposit insurance dummy variable (*DI*), and on the calculated coefficient on *PFAIL* for the full insurance period are reported in Table 7, in order to save space. The complete estimates are available from the authors upon request.

18. As previously mentioned, banks may act differently during crises. Therefore, we estimated the models by interacting all variables with *CRISIS*. Most of the coefficients on these interaction variables were found to be insignificant. However, it was found that in the crisis period, as size increased, banks held significantly less liquid assets. Moreover, when there was deposit insurance, banks increased their spread and their holding of non-performing loans during the crises.

REFERENCES

Akyuz, Y. (1990). Financial system and policies in Turkey in the 1980s. In T. Aricanli, & D. Rodnik (Eds.), *The political economy of Turkey*. London: Macmillan.

Akyuz, Y., & Boratav, K. (2003). The making of the Turkish financial crisis. *World Development, 31*(9), 1549–1566.

Alper, C. E. & Onis, Z. (2002). Soft budget constraints, government ownership of banks and regulatory failure: The political economy of the Turkish banking system in the post-capital account liberalization era. Bogazici University Economics Working Paper ISS/EC 02-02.

Angbazo, L. (1997). Commercial bank net interest margins, default risk, interest rate risk and off-balance sheet banking. *Journal of Banking and Finance*, (1), 55–58.

Avery, R. B., Belton, T. M., & Goldberg, M. A. (1988). Market discipline regulating bank risk: Evidence from the capital markets. *Journal of Money, Credit and Banking, 20*(4), 597–610.

Baer, H., & Brewer, E. (1986). Uninsured deposits as a source of market discipline: Some new evidence. *Federal Reserve Bank of Chicago Economic Perspectives, 20*(September/October), 23–31.

Barajas, A. & Steiner, R. (2000). Depositor behavior and market discipline in Colombia. International Monetary Fund, Working Paper No. 214.

Barth, J. R., Caprio, G., Jr., & Levine, R. (2004). Bank regulation and supervision: What works best? *Journal of Financial Intermediation, 13*(2), 205–248.

Basel Committee on Banking Supervision (2001). The new basel capital accord, consultative document, January.

Calomiris, C. W., & Powell, A. (2001). Can emerging market bank regulators establish credible discipline? The case of Argentine, 1992–1999. In F. S. Mishkin (Ed.), *Prudential supervision: What works and what doesn't*. Chicago, IL: University of Chicago Press.

Cargill, T. F. (1989). CAMEL ratings and the CD market. *Journal of Financial Services Research, 3*(4), 347–358.

Chhibber, A. (2004). The economic policy reform of Turkey. <http://scid.stanford.edu/events/AChhiber%20Paper.pdf>.

Cizre, U., & Yeldan, E. (2005). The Turkish encounter with neo-liberalism: Economics and politics in the 2000/2001 crises. *Review of International Political Economy, 12*(3), 387–408.

Cull, R., Senbet, L. W., & Sorge, M. (2002). The effect of deposit insurance on financial depth: a cross-country analysis. *Quarterly Review of Economics and Finance, 42*(4), 673–694.

Demir, F. (2004). A failure story: Politics and financial liberalization in turkey, revisiting the revolving door hypothesis. *World Development, 32*(5), 851–869.

Demirguc-Kunt, A., & Detragiache, E. (2002). Does deposit insurance increase banking system stability? An empirical investigation. *Journal of Monetary Economics, 49*(7), 1373–1406.

Demirguc-Kunt, A., & Huizinga, H. (2004). Market discipline and deposit insurance. *Journal of Monetary Economics, 51*(2), 375–399.

Demirguc-Kunt, A., Kane, E. J. & Laeven, L. (2007). Determinants of deposit-insurance adoption and design. NBER Working Paper Series, No. 12862.

Denizer, C. (1997). The effects of financial liberalization and new bank entry on market structure and competition in Turkey. The World Bank Policy Research Working Paper No. 1839.

Denizer, C. A, Gultekin, M. A. & Gultekin N. B. (2000). Distorted incentives and financial development in Turkey. World Bank Financial Structure and Economic Development Conference Papers.

DeYoung, R., Flannery, M. J., Lang, W. W., & Sorescu, S. M. (2001). The information content of bank exam ratings and subordinated debt prices. *Journal of Money, Credit and Banking, 33*(4), 900–925.

Eichengreen, B. 2001. Crisis prevention and management: Any new lessons from argentina and Turkey? Background paper for the World Bank's Global Development Finance 2002. <http://info.worldbank.org/etools/docs/library/154927/financeforum2002/pdf/eichengreen_argentina.pdf>.

Ellis, D., & Flannery, M. J. (1992). Does the debt market assess large banks' risk? *Journal of Monetary Economics, 30*(3), 481–502.

Ersel, H. (1999). Managing financial liberalization in Turkey: Consistent banking regulation mimeographed, Yapi Kredi Bank, Istanbul, Turkey. <http://www.worldbank.org/wbi/mdf/mdf3/papers/finance/Ersel.pdf>.

Flannery, M. J., & Sorescu, S. M. (1996). Evidence of bank market discipline in subordinated debenture yields: 1983–1991. *The Journal of Finance, 51*(4), 1347–1377.

Gorton, G., & Santomero, A. (1990). Market discipline and bank subordinated debt. *Journal of Money, Credit, and Banking, 22*(1), 119–128.

Hannan, T. H., & Hanweck, G. A. (1988). Bank insolvency risk and the market for large certificates of deposit. *Journal of Money Credit and Banking, 20*(2), 203–211.

Kim, M., Kliger, D., & Vale, B. (2003). Estimating switching costs: The case of banking. *Journal of Financial Intermediation, 12*(1), 25–56.

Kim, M., Kristiansen, E. G., & Vale, B. (2005). Endogenous product differentiation in credit markets: What do borrowers pay for? *Journal of Banking and Finance, 29*(3), 681–699.

Llewellyn, D. T. & Mayes, D. G. (2003). The role of market discipline in handling problem banks. Bank of Finland Discussion Paper No. 21.

Martinez-Peria, M. S., & Schmukler, S. L. (2001). Do depositors punish banks for bad behavior? Market discipline, deposit insurance and banking crises. *The Journal of Finance, 56*(3), 497–514.

Opiela, T. (2004). Was there an implicit full guarantee at financial institutions in Thailand? Evidence of risk pricing by depositors. *Journal of Comparative Economics, 32*(3), 519–541.

Pagan, A. (1984). Econometric issues in the analysis of regressions with generated regressors. *International Economic Review, 25*(1), 221–247.

Park, S. (1995). Market discipline by depositors evidence from reduced form equations. *Quarterly Review of Economics and Finance, 35*, 497–514.

Park, S., & Peristiani, S. (1998). Market discipline by thrift depositors. *Journal of Money, Credit, and Banking, 30*(3), 347–364.

Pazarbasioglu, C. (2002). Turk Bankacilik Sektorundeki Son Gelismeler: BDDK'nin Rolu. <http://www.bddk.org.tr/turkce/yayinlarveraporlar/yayinlarveraporlar.htm#6>.

Rojas-Suarez, L. (2001). Rating banks in emerging markets: What credit rating agencies should learn from financial indicators. Peterson Institute for International Economics, Working Paper Series, No. WP01-6.

Sironi, A. (2003). Testing for market discipline in the european banking industry: Evidence from subordinated debt issues. *Journal of Money, Credit, and Banking, 35*(3), 443–472.

Soral, H. B., Iscan, T. B., & Hebb, G. (2006). Fraud, banking crisis, and regulatory enforcement: Evidence from micro-level transactions data. *European Journal of Law and Economics, 21*(2), 179–197.

Wong, K. P. (1997). On the determinants of bank interest margins under credit and interest rate risks. *Journal of Banking and Finance, 21*(2), 251–271.

APPENDIX

Table A1. *Definition of variables used in the estimations*

Variables	Definition of variables
Market reaction	
GDEPR	Percentage change in the real total deposits of a bank
IDEP	Imputed interest rate on deposits, calculated by dividing total interest paid on deposits by total deposits of a bank
GCRER	Percentage change in the real total credits of a bank
Risk measures	
CARATIO	Total capital to total assets ratio
BADLOAN	Non-performing loans to total credits ratio
LIQDEP	Total liquid assets to total deposits
SPREAD	The difference between imputed interest rates on deposits and credits
PFAIL	The predicted probability of failure of a bank using the model specified in Table 3
Control variables	
DI	A dummy variable taking a value of 1 for the full deposit insurance period, 1994–2000; 0 otherwise
SHASSET	Total assets of a bank divided by total assets of banking sector in that year
SIZE	Natural Logarithm of total assets of a bank expressed in terms of 1987 prices
BADTK	Non-performing loans to total credits ratio
SHCREA	Short-term credits to total assets ratio
EXPENSE	Total expenses to total assets ratio
GCRE	The credit growth rate of a bank divided by the mean credit growth rate in the banking sector in that year
FOREIGN	Dummy variable that takes a value of 1 for foreign banks; 0 for others
STATE	Dummy variable that takes a value of 1 for state banks; 0 for others
LISTING	Dummy variable that takes a value of 1 for banks whose stocks are traded in the Istanbul Stock Exchange; 0 for others
BRANCH	Number of branches/100
AGE	Age of a bank
Economic variables	
CYCLE	Growth rate in real GDP
CRISIS	A dummy variable taking a value of 1 for the crisis years 1991, 1994 and 2000 as defined by Demirguc-Kunt and Detragiache (2002), and 0 otherwise
REALINT	Real interest rate on Turkish T-bills

Note: In the calculation of the real monetary values, all of the monetary values are expressed in terms of 1987 prices.

(*See Overleaf*)

Table A2. *The list of banks included in the sample*

Name of bank	Period	Name of bank	Period
Adabank	1988–2000	Kocbank	1988–2000
Akbank	1988–2000	Korfez Bankasi	1989–2000
Alternatif Bank	1993–2000	Marmara Bankasi	1991–93
Anadolu Bankasi	1998–2000	Milli Aydin Bankasi	1988–2000
ArapTurk Bankasi	1988–2000	MNG Bank	1992–2000
Bank Ekspress	1993–98	Ogretmenler Bankasi	1988–90
Bank Kapital	1992–99	Osmanli Bankasi	1988–2000
Bayindir Bank	1993–2000	Oyakbank	1991–2000
Bnp Ak	1990–2000	Pamukbank	1988–2000
Demirbank	1988–2000	Sekerbank	1988–2000
Denizbank	1998–2000	Sitebank	1991–2000
Denizcilik Bankasi	1988–91	Sumerbank	1988–99
Dis Ticaret Bankasi	1988–2000	TEB	1988–2000
Egebank	1988–99	Tekstilbank	1988–2000
EGS Bank	1997–2000	TIIB	1988–93
Emlak Bankasi	1988–2000	Toprakbank	1993–2000
Eskisehir Bankasi	1988–99	Turkish Bank	1992–2000
Etibank	1988–2000	Turk Ticaret Bankasi	1988–97
Fibabank	1989–2000	Tutunbank	1988–98
Finansbank	1988–2000	TYT Bank	1989–93
Garanti Bankasi	1988–2000	Ulusal Bank	1990–2000
Halk Bankasi	1988–2000	Vakiflar Bankasi	1988–2000
Interbank	1989–97	Yapi Kredi Bankasi	1988–2000
Iktisat Bankasi	1988–2000	Yurtbank	1994–98
Is Bankasi	1988–2000	Ziraat Bankasi	1988–2000
Kentbank	1993–2000		

Table A3. *Correlation coefficients*

	SIZE	*SHASSET*	*CARATIO*	*BADLOAN*	*LIQDEP*	*SPREAD*	*PFAIL*	*DI*	*LISTING*	*BRANCH*	*AGE*	*STATE*	*FOREIGN*
SHASSET	0.741												
CARATIO	−0.272	−0.117											
BADLOAN	−0.047	−0.067	−0.305										
LIQDEP	−0.188	−0.127	0.080	−0.034									
SPREAD	−0.121	−0.129	−0.008	0.198	−0.198								
PFAIL	−0.010	−0.159	−0.592	0.548	−0.099	0.211							
DI	0.149	−0.045	−0.081	0.105	−0.116	0.122	0.316						
LISTING	0.341	0.152	−0.029	−0.073	−0.082	0.058	−0.038	0.081					
BRANCH	0.696	0.937	−0.117	−0.037	−0.133	−0.080	−0.109	−0.026	0.146				
AGE	0.526	0.512	−0.201	0.052	−0.165	−0.088	0.030	−0.008	0.003	0.506			
STATE	0.408	0.556	−0.103	−0.041	−0.093	−0.218	−0.072	−0.081	−0.225	0.536	0.306		
FOREIGN	−0.355	−0.219	0.050	0.010	0.337	−0.125	−0.117	−0.066	−0.230	−0.217	−0.108	−0.158	
CYCLE	−0.011	−0.015	0.023	−0.003	0.069	−0.170	0.016	−0.152	0.033	−0.017	−0.006	−0.019	0.038
CRISIS	−0.008	−0.004	−0.001	0.110	−0.045	0.156	0.250	0.128	0.051	0.000	0.006	−0.004	0.000
REALINT	−0.078	−0.023	0.067	−0.093	0.008	0.110	−0.208	0.262	0.043	−0.047	−0.025	−0.058	0.068

Notes: Correlation coefficient between *CYCLE* and *CRISIS* is −0.328; the correlation coefficient between *CYCLE* and *REALINT* is 0.005; the correlation coefficient between *CRISIS* and *REALINT* is −0.108.