

**DEPOSIT INSURANCE, MARKET DISCIPLINE
AND MORAL HAZARD PROBLEM:
THE CASE OF TURKISH BANKING SYSTEM**

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ABSTRACT

This paper analyzes the effects of deposit insurance system on the financial performance of Turkish commercial banks using experimental design approach. The research findings provide support to moral-hazard hypothesis. My findings indicate that domestic private commercial banks show significant increases in credit risk, foreign exchange position risk, liquidity risk, and agency costs relative to their benchmark after introduction of 100 percent deposit insurance system. I relate this excessive risk-taking to the moral-hazard behavior by commercial banks. The smaller commercial banks which are more vulnerable to moral-hazard problem experience significant increases in agency costs. The research results indicate that 100 percent deposit insurance system distorts the incentive structure of commercial banks and thus, prevent proper functioning of market discipline mechanism and lead to the taking excessive risk-taking.

I also analyze the efficiency of market discipline mechanism by examining market reaction to the four failed banks transferred to SDIF. The research findings show that the cumulative abnormal returns of failed banks reflected unfavorable information 45 weeks prior to the beginning of the bank examination and 65 weeks prior to the transfer of the failed bank to SDIF. Thus, the hypothesis that market is inefficient and do not properly react to the increased potential of bankruptcy is not supported

Keywords : Deposit Insurance, Moral Hazard, Market Discipline, Abnormal Returns, Wilcoxon Test

JEL Classification : G21

I. INTRODUCTION

Theoretical models suggest that deposit insurance system causes in multiparty principal-agent problem and generate moral-hazard behavior (Akerlof and Romer, 1993; Scott and Weingast, 1994; Kane, 1995; McKinnon and Pill, 1999; Kane and Demirgüç-Kunt, 2001). Moral-hazard behavior hypothesis implies that deposit insurance removes the constraint of market discipline mechanism over the bank and this allows the bank to be involved in the gambling at the taxpayers' expense.

In this paper, I analyze the impact of 100 percent deposit insurance on the financial performance of commercial banks in Turkish banking system using experimental-design approach. I also examine the efficiency of market discipline mechanism by analyzing the sensitivity of stock returns of failed banks to the potential of transfer to Saving Deposit Insurance Fund (SDIF).

The remainder of the paper is organized as follows. In section II, I examine the effects of the introduction of 100 percent deposit insurance system on the performance of Turkish banking system. Section III analyzes the efficiency of market discipline mechanism. Section IV discusses research findings, and gives a brief conclusion.

II. THE IMPACT OF MORAL-HAZARD BEHAVIOR ON THE FINANCIAL PERFORMANCE OF TURKISH BANKS

2.1. Theoretical Framework

Bank runs occur when many or all of the bank's depositors attempt to withdraw their funds simultaneously. The failure of any single bank may result in a chain reaction (domino effect) and eventually, all remaining banks in the system may face a greater probability of failure. Therefore, the failure of any single bank to meet its obligations makes the whole banking system instable and causes in reduced public confidence in the system as a whole. Considering huge fiscal costs due to the instability in the banking system, financial safety nets are erected to decrease the vulnerability of banking system to the contagion effects of individual bank runs. One of the main elements of these safety nets is deposit insurance system which covers the losses of depositors in case of the bank's bankruptcy.

However, the introduction of deposit insurance system may result in the distorted incentive structure in the banking system, since it causes in the informational asymmetries among contracting parties. Contracting parties consist of bank, depositors, and supervisors in the environment where deposit insurance system doesn't exist. In this case, depositors who benefit from the returns also bear the risk of losing their deposits in case of the bank's bankruptcy. Therefore, they exert market discipline mechanism over the bank by shifting their funds or adjusting their expected rates of return on the basis of the bank's riskiness (Park, 1995; Park and Persistani, 1998; Demirgüç-Kunt and Huizinga, 2000; Baer and Brewer, 1986; Hannan and Hanweck, 1988; Ellis and Flannery, 1992). Consequently, the bank's default risk becomes upperbounded by the constraints of market discipline mechanism.

With the introduction of deposit insurance system, the number of contracting parties increases and consists of bank, depositors, supervisors, politicians, and taxpayers. To put it simply under deposit insurance system *politicians* promise *depositors* that *taxpayers* will pay the bill of their losses if a *bank* will not be able to meet its obligations. This type of deposit insurance design can be viewed as multiparty principal-agent problem and generate moral-hazard behavior (Akerlof and Romer, 1993; Scott and Weingast, 1994; Kane, 1995; McKinnon and Pill, 1999; Kane and Demirgüç-Kunt, 2001).

Moral-hazard behavior implies that distorted incentive structure in the banking system due to the deposit insurance will give an incentive to the banks to go broke for profit at the taxpayers' expense. The depositors have no longer any reason to be concerned with the financial condition of the bank and therefore, they do not constitute the source of the threat for the bank. Consequently, deposit insurance removes depositors' constraint over the bank and the bank may become involved in the gambling at the taxpayers' expense. Moral-hazard behavior also implies that a weak and even insolvent bank can obtain almost unlimited fund from depositors by offering slightly higher interest rates on insured deposits, since insured depositors don't care about the bank's riskiness. Below, I provide a model which shows that banks tend to take higher risks under deposit insurance system.

For every bank, two functions must be defined: the expected profit and the risk level which can also be understood as the likelihood of bankruptcy, denoted by $E(x)$ and $p(x)$, respectively. Common argument x is a policy variable controlled by the bank. Both E and p are either strictly increasing or strictly decreasing functions of x . There are fundamental tradeoff relationship between expected profits and risk as suggested by the market model developed by Sharpe (1964) and Lintner (1965).

The bank's main objective is to maximize expected profits. However, profits are conditional on the default risk upperbounded by a predetermined value p^* ; i.e.,

$$\text{Max } E(x) \quad \text{subject to} \quad p(x) \leq p^*$$

Given the monotonicity of E and p , the optimal value, x^* , to this problem obviously solves $p(x)=p^*$. Then a question arises: how will moral hazard problem will affect the predetermined value of p^* ? p^* is initially determined by depositors' control over banks through market discipline mechanism. However, since depositors loose their incentives to exert market discipline mechanism under deposit insurance system, p^* increases and becomes solely dependent of regulatory restrictions. Therefore, a bank aiming to maximize $E(x)$ are able to take more risks which also increase the likelihood of its bankruptcy.

2.2. Turkish Banking System and Deposit Insurance

Turkish banking system has shown considerable growth since 1980. Total bank assets have grown over 7.2 times in 1980-1999 period, whereas GNP has grown only 2.7 times¹. The banking system has gained dynamic structure and played an important role in the economic development of Turkish economy. However, long-standing economic imbalances, especially, chronically high inflation, huge public sector borrowing requirements and use of generous tax credits and exemptions to enhance the attractiveness of public sector securities over private sector borrowing have severely constrained the growth of banking system. These structural imbalances combined with 100 percent deposit insurance system have distorted the incentive structure of Turkish banking system.

100 percent deposit insurance was introduced in Turkey during severe domestic economic crisis in 1994. After announcement of the bankruptcies of some domestic commercial banks, Turkish authorities fearing contagion effects of these bankruptcies have viewed 100 percent deposit insurance a way to prevent full-scaled bank runs.

To understand the impact of 100 percent deposit insurance on the risk attitude of banking system, it is useful to examine the environment around banking system in 1990s years. In this period, Turkish banks became heavily engaged in investing short-term government papers which offered abnormally high real interest rates. These investments have been primarily financed by deposit growth and foreign borrowing. The introduction of full insurance coverage of deposits under 100 percent deposit insurance system made it easier to raise deposits regardless of the bank's riskiness. Low quality banks became engaged in practices of charging extra-high deposit rates and lending to over-risky projects in hope to grow out of their liquidity and solvency problems (Worldbank, 2000). This excessive risk taking increased default risk of the whole banking system. In order to maintain confidence in the banking system and prevent systemic risk, from 1997 to July 2002, the ownership of the twenty banks was transferred to the Saving Deposit Insurance Fund (SDIF). The direct fiscal

¹ Calculations are made on data from Banks Association of Turkey.

burden of these transfers on economy has exceeded total 15 billions USD². Moreover, banking crisis has caused in the loss of confidence to domestic financial markets and economy has faced the devastating effects of economic crisis in 2000-2001 years. Recognizing adverse effects of 100 percent deposit insurance system on the performance of banking system, a plan for gradual reduction of full deposit insurance was put into operation in June 2000.

2.3. Sample and Data

In this section, I collect financial data of banks operating in Turkey. Table 2 details the specification of banks operating in Turkish banking system.

Table 2: Sample

Bank Specification	Number of Cases
Development and Investment Banks	18
Commercial Banks, <i>of which</i>	61
Foreign-owned Banks	18
Domestic-owned Banks, <i>of which</i>	43
State Banks	4
Private Banks, <i>of which</i>	39
Larger Banks, <i>of which</i>	12
Transferred to SDIF*	2
Smaller Banks, <i>of which</i>	27
Transferred to SDIF*	14

Source: Banking Association of Turkey (31.12.2000)

Since there isn't financial statements data of three banks (Anadolubank, Denizbank and EGS Bank) for pre-1994 period, I exclude them from the analyses. Therefore, total number of domestic-owned private commercial banks analysis is reduced to total 36. The source of the financial data used in this section is Banking Association of Turkey.

² Calculations are made on data from Bank Regulation and Supervision Agency of Turkey.

2.4. Research Design

2.4.1. Research Model and Testable Predictions

The theoretical framework in the previous section states that 100 percent explicit deposit insurance in Turkish banking system may have had adverse effects on market discipline mechanism and led to the moral hazard problem. The moral hazard problem leads to the excessive risk-taking by commercial banks and erosion of bank sources. In this section, I test the hypotheses that moral hazard problem results in

- (1) decrease in capital adequacy,
- (2) increase in credit risk,
- (3) increase in foreign exchange risk,
- (4) increase in liquidity risk,
- (5) higher interest rates for deposits,
- (6) increase in agency costs.

Special attention should be paid to the hypothesis about the liquidity of the banks subject to the moral-hazard behavior. Commercial banks exposed to moral-hazard behavior are expected to reduce their liquidity for investing in profitable assets in order to gain higher rates of returns. However, the most attractive investment option was treasury bills and government bonds in 1990s years in Turkey. Since the liquidity variable used in this study incorporates investments on these securities, I hypothesize that moral-hazard behavior may result in the increases in the liquidity of commercial banks. The increases in the liquidity cause in huge losses when financing costs of these investments exceed their rates of returns.

In addition to the above-stated hypotheses, I also expect that increased risk-taking behavior will also lead to the increased profitability of banks. Table 1 presents my testable predictions and empirical proxies.

Table 1: Summary of Testable Predictions

This table details the economic characteristics I examine for changes after introduction of 100 percent deposit insurance system. I also present and define the empirical proxies employed in the analyses. The index symbols *POST* and *PRE* in the predicted relationship column stand for post 100 percent deposit insurance system and pre 100 percent deposit insurance system, respectively.

Variable	Proxies	Predicted Relationships
Capital Adequacy	<i>Standard Capital Ratio (SCR)</i> = Capital Base / (Risk-weighted Assets, Non-cash Credits and Liabilities)	$SCR_{post} < SCR_{pre}$
Credit Risk	Non Performing Loans / Total Loans (<i>NCR</i>)	$NCR_{post} > NCR_{pre}$
Foreign Exchange Position Risk	(Foreign Ex. Liabilities – Foreign Exch. Assets) / Shareholders' Equity (<i>FXP</i>)	$FXP_{post} > FXP_{pre}$
Liquidity Risk	Liquid Assets/(Deposits + Non-deposit Funds) (<i>LIQ</i>)	$LIQ_{post} > LIQ_{pre}$
Profitability	Income Before Tax / Average Total Assets (<i>INC</i>)	$INC_{post} > INC_{pre}$
Interest Cost	Interest Expenses/Average Non-Profitable Assets (<i>INT</i>)	$IEA_{post} > IEA_{pre}$
Agency Cost	(Salaries and Employee Benefits + Reserve for Retirement) / Total Assets (<i>SAL</i>)	$SAL_{post} > SAL_{pre}$
	Operational Expenses/Total Assets (<i>OPX</i>)	$OPX_{post} > OPX_{pre}$

2.4.2. Performance Benchmark

The measurement of the role of moral-hazard behavior on the financial performance changes of banks is a complex task, since it is obviously impossible to trace all of the financial performance changes after introduction of 100 percent deposit insurance system to the moral hazard problem. Many other factors may affect financial performance changes as well. Therefore, I adopt two-staged experimental design approach and compare the post-1994 financial performance data of banks with the pre-1994 benchmark using raw and industry-adjusted variable values. I use 1994 year as the turning point since 100 percent deposit insurance was introduced in this year.

The establishment of correct performance benchmark requires the identification of banks vulnerable to the 100 percent deposit insurance system. *State banks* are always under the shield of the 100 percent deposit insurance due to their nature. Therefore, the introduction of 100 percent deposit insurance is not expected to affect their financial performances significantly. *Foreign-owned banks* are not subject to the deposit insurance regulations as well and therefore, moral-hazard behavior is not expected from these banks. Since deposit insurance is related with the deposits, *development and investment banks* are not also expected to show moral-hazard behavior. Consequently, it is *domestic*

private commercial banks that are vulnerable to moral-hazard behavior. Considering this vulnerability, I analyze the financial performance data of domestic private commercial banks in both of the analysis stages.

In the first stage, I compare the post-1994 financial performance data of domestic private commercial banks with the pre-1994 benchmark to measure the change in the performance. Some of the adverse changes in the financial performance of post-1994 period can be attributed to the moral-hazard behavior; however, economy- and industry-wide factors also have much effect on these changes. Therefore, the financial performance changes in this analysis will reflect aggregate effects of the moral-hazard behavior, economy- and industry-wide factors.

In order to eliminate the effects of economy- and industry-wide factors on the financial performance changes and get purified effects of moral-hazard behavior on performance changes, I go to the second stage and use *industry-adjusted* performance measures of all domestic private commercial banks. Industry-adjusted performance of domestic private commercial banks is calculated by subtracting the median of state commercial banks from the sample bank value for each year and bank. Industry-adjusted values will eliminate the effects of economy- and industry-wide factors on the financial performance changes and reflect the effects of moral-hazard behavior on the banks' performance.

2.4.3. *Subsample Analysis*

The degree of vulnerability of domestic private commercial banks to moral-hazard behavior may differ according their size. Larger commercial banks are often unwilling to engage in moral-hazard practices and are more concerned with the long-term viability of their banks, whereas smaller banks are more inclined to take excessive risks to make higher profits. Therefore, *smaller domestic private commercial banks* (SDPCB) can be considered as a special subsample that is more inclined to show moral-hazard behavior. This hypothesis is partially supported by the recent evidence from the Turkish banking system: Sixteen banks out of total twenty banks transferred to SDIF pertained to SDPCB subsample³.

In the subsample analysis, I consider the heterogeneity of domestic private commercial banks in terms of their vulnerability to moral-hazard behavior and measure industry-adjusted performance changes of SDPCB subsample. The study of industry-adjusted financial performance changes of

³ In this paper, I use total asset size to classify banks as smaller or larger. If the ratio of total assets of the bank to total assets of the whole banking system does not exceed 1%, the bank is considered as smaller bank, otherwise as larger bank.

SDPCB subsample will make it possible to see the extent of moral-hazard behavior. Industry-adjusted performance of small-scaled domestic private commercial banks is calculated by subtracting the median of larger private commercial banks median from the sample bank value for each year and bank.

2.4.4. Research Methodology

To test the research predictions, I first compute empirical proxies for every bank for a twelve-year period: six years before (1988-1993) through six years after (1995-2000) introduction of 100 percent deposit insurance system. I then calculate the median of each variable for each bank over 1988-1993 and 1995-2000 windows. 1994 year is excluded from the analysis since the variable values for this year bear crossing effects of the existence and non-existence of 100 percent deposit insurance system.

Having computed pre- and post-1994 medians, I use the nonparametric Wilcoxon signed-rank test as my principal method of testing for significant changes in the variables. Since financial ratios do not follow normal distribution, the interpretation of the findings of parametric analysis becomes difficult. The small sample sizes also lead to the selection of nonparametric tests as a suitable method of testing financial performance changes.

I base my conclusions on the standardized test statistic Z , which for samples of at least 10 follows approximately a standard normal distribution. In addition to the Wilcoxon test, I use a (binomial) proportion test to determine whether the proportion (p) of banks experiencing changes in a given direction is greater than would be expected by chance (typically testing whether $p = 0.5$). The finding that an overwhelming proportion of banks changed performance in the same direction may be at least as informative as a finding concerning the median change in performance.

2.5. Empirical Results

In this section I present and discuss my empirical results for the two stages of the analysis and one subsample. I first present and discuss my empirical results (in Table 3 and 4) for the raw and industry-adjusted values of domestic private commercial banks. Then I present and discuss (in Table 5) my results for the industry-adjusted values of smaller domestic private commercial banks subsample. For each of these analysis stages, I examine and report (in the text and in Tables 3 to 5)

whether banks experience significant changes in the variable values after introduction of 100 percent deposit insurance.

2.5.1. Full Sample Analysis

2.5.1.1. Capital Adequacy

Standard capital ratio of domestic private commercial banks has increased on average (median) 3 percentage points (4 percent) after introduction of 100 percent deposit insurance system and 80 percent of all banks experienced increasing standard capital ratio (Table 3). The Wilcoxon and proportion test statistics are significant at 5 percent level. However, industry-adjusted values of domestic private commercial banks do not show significant changes after introduction of 100 percent deposit insurance system (Table 4).

Therefore, the significant increases in capital adequacy of commercial banks are due to the economy and industry-wide effects rather than moral-hazard behavior. After 1994 banking crisis, banks in Turkey are required to maintain 8 percent minimum capital adequacy ratio and report their capital adequacy position quarterly. This restriction has prevented further declines in the capital adequacy of commercial banks.

2.5.1.2. Credit Risk

The credit risk of domestic private commercial banks measured by non-performing loans/total loans ratio (*NCR*) doesn't show significant changes after introduction of 100 percent deposit insurance system (Table 3). However, the industry-adjusted *NCR* ratio increases on average (median) 8.5 percentage points (2.9 percent) and 78 percent of all domestic private commercial banks experience increasing variable values. The proportion and Wilcoxon test statistics are significant at 1 percent level (Table 4).

Table 3
The Analysis of Financial Performance Changes After Introduction of 100 percent Deposit Insurance System in 1994:
Summary of Results from Tests of Predictions for the Domestic Private Commercial Banks

This table presents empirical results for the domestic private commercial banks. For each empirical proxy I give the number of usable observation, the mean and median values, standard deviation of the proxy for the six-year periods prior and subsequent to introduction of deposit insurance, the mean and median change in the proxy's value for post-1994 period versus pre-1994 period, and a test of significance of the change in median values. The final two columns detail the percentage of firms whose proxy values change as predicted, as well as a test of significance of this change.

<i>Variables</i>	<i>N</i>	<i>Pre-1994 Mean (Median)</i>	<i>Pre-1994 Standard Deviation</i>	<i>Post-1994 Mean (Median)</i>	<i>Post-1994 Standard Deviation</i>	<i>Mean Change (Median)</i>	<i>Z-Statistics for Difference in Medians (Pre- and post- 1994)</i>	<i>Percentage of Firms that Changed as Predicted</i>	<i>Z-Statistics for Significance of Proportion Change</i>
<i>Capital Adequacy</i>									
Standard Capital Ratio (<i>SCP</i>)	20	0.11 (0.09)	0.07	0.14 (0.13)	0.07	0.03 (0.04)	2.44**	0.20	2.46**
<i>Credit Risk</i>									
Non Performing Loans / Total Loans (<i>NCR</i>)	36	0.04 (0.01)	0.07	0.11 (0.02)	0.33	0.07 (0.01)	1.54	0.64	1.83*
<i>Foreign Exchange Position Risk</i>									
(Foreign Ex. Liabilities – Foreign Exch. Assets) / Shareholders' Equity (<i>FXP</i>)	36	1.13 (0.77)	1.08	1.75 (1.32)	1.86	0.62 (0.55)	2.89***	0.75	3.17***
<i>Liquidity Risk</i>									
Liquid Assets / (Deposits + Non- deposit Funds) (<i>LIQ</i>)	36	1.00 (0.61)	2.25	0.54 (0.52)	0.21	-0.46 (-0.09)	2.33**	0.67	2.17**
<i>Profitability</i>									
Income Before Tax / Average Total Assets (<i>INC</i>)	36	0.06 (0.05)	0.04	0.07 (0.07)	0.05	0.01 (0.02)	1.60	0.64	1.83*
<i>Interest Cost</i>									
Interest Expenses/Average Non- Profitable Assets (<i>INT</i>)	36	0.21 (0.21)	0.11	0.25 (0.22)	0.11	0.04 (0.01)	2.34**	0.67	2.17**
<i>Agency Cost</i>									
(Salaries and Employee Benefits + Reserve for Retirement) / Total Assets (<i>SAL</i>)	36	0.026 (0.025)	0.015	0.025 (0.023)	0.014	-0.001 (-0.002)	1.90*	0.28	2.50**
Operational Expenses/Total Assets (<i>OPX</i>)	36	0.032 (0.031)	0.016	0.033 (0.030)	0.019	0.001 (-0.001)	1.51	0.31	2.17**

*, **, *** indicates significance at 10, 5, and 1% significance levels respectively using two-tailed test.

Table 4

**The Analysis of Financial Performance Changes After Introduction of 100 percent Deposit Insurance System in 1994:
Summary of Results from Tests of Predictions for the Industry-Adjusted Values of Domestic Private Commercial Banks**

This table presents empirical results for the industry-adjusted values of domestic private commercial banks. For each empirical proxy I give the number of usable observation, the mean and median values, standard deviation of the proxy for the six-year periods prior and subsequent to introduction of deposit insurance, the mean and median change in the proxy's value for post-1994 period versus pre-1994 period, and a test of significance of the change in median values. The final two columns detail the percentage of firms whose proxy values change as predicted, as well as a test of significance of this change.

<i>Variables</i>	<i>N</i>	<i>Pre-1994 Mean (Median)</i>	<i>Pre-1994 Standard Deviation</i>	<i>Post-1994 Mean (Median)</i>	<i>Post-1994 Standard Deviation</i>	<i>Mean Change (Median)</i>	<i>Z-Statistics for Difference in Medians (Pre- and post- 1994)</i>	<i>Percentage of Firms that Changed as Predicted</i>	<i>Z-Statistics for Significance of Proportion Change</i>
<i>Capital Adequacy</i>									
Standard Capital Ratio (<i>SCP</i>)	20	0.034 (0.012)	0.070	0.026 (0.011)	0.072	-0.008 (-0.001)	1.08	0.60	0.67
<i>Credit Risk</i>									
Non Performing Loans / Total Loans (<i>NCR</i>)	36	-0.019 (-0.046)	0.071	0.066 (-0.017)	0.328	0.085 (0.029)	3.05***	0.78	3.50***
<i>Foreign Exchange Position Risk</i>									
(Foreign Ex. Liabilities – Foreign Exch. Assets) / Shareholders' Equity (<i>FXP</i>)	36	0.786 (0.428)	1.081	1.465 (1.032)	1.862	0.679 (0.604)	3.16***	0.78	3.50***
<i>Liquidity Risk</i>									
Liquid Assets / (Deposits + Non- deposit Funds) (<i>LIQ</i>)	36	0.528 (0.137)	2.258	0.258 (0.234)	0.212	-0.270 (0.097)	2.50**	0.25	3.17***
<i>Profitability</i>									
Income Before Tax / Average Total Assets (<i>INC</i>)	36	0.041 (0.031)	0.039	0.058 (0.050)	0.051	0.017 (0.019)	1.73*	0.64	1.83*
<i>Interest Cost</i>									
Interest Expenses/Average Non- Profitable Assets (<i>INT</i>)	36	-0.071 (-0.072)	0.112	-0.087 (-0.117)	0.113	-0.016 (-0.045)	1.49	0.47	0.50
<i>Agency Cost</i>									
(Salaries and Employee Benefits + Reserve for Retirement) / Total Assets (<i>SAL</i>)	36	-0.005 (-0.007)	0.015	0.007 (0.004)	0.014	0.012 (0.011)	4.24***	0.81	3.83***
Operational Expenses/Total Assets (<i>OPX</i>)	36	-0.001 (-0.004)	0.016	0.013 (0.010)	0.019	0.014 (0.014)	4.43***	0.83	4.17***

*, **, *** indicates significance at 10, 5, and 1% significance levels respectively using two-tailed test.

Table 5

The Analysis of Financial Performance Changes After Introduction of 100 percent Deposit Insurance System in 1994:

Summary of Results from Tests of Predictions for the Industry-Adjusted Values of Smaller Domestic Private Commercial Banks Subsample

This table presents empirical results for the industry-adjusted values of smaller domestic private commercial banks subsample. For each empirical proxy I give the number of usable observation, the mean and median values, standard deviation of the proxy for the six-year periods prior and subsequent to introduction of deposit insurance, the mean and median change in the proxy's value for post-1994 period versus pre-1994 period, and a test of significance of the change in median values. The final two columns detail the percentage of firms whose proxy values change as predicted, as well as a test of significance of this change.

<i>Variables</i>	<i>N</i>	<i>Pre-1994 Mean (Median)</i>	<i>Pre-1994 Standard Deviation</i>	<i>Post-1994 Mean (Median)</i>	<i>Post-1994 Standard Deviation</i>	<i>Mean Change (Median)</i>	<i>Z-Statistics for Difference in Medians (Pre- and post- 1994)</i>	<i>Percentage of Firms that Changed as Predicted</i>	<i>Z-Statistics for Significance of Proportion Change</i>
<i>Capital Adequacy</i>									
Standard Capital Ratio (<i>SCP</i>)	14	0.009 (-0.015)	0.079	-0.008 (-0.028)	0.068	-0.017 (-0.013)	1.51	0.64	1.34
<i>Credit Risk</i>									
Non Performing Loans / Total Loans (<i>NCR</i>)	24	0.032 (-0.003)	0.085	0.056 (0.017)	0.134	0.024 (0.020)	0.74	0.63	1.43
<i>Foreign Exchange Position Risk</i>									
(Foreign Ex. Liabilities – Foreign Exch. Assets) / Shareholders' Equity (<i>FXP</i>)	24	0.453 (0.083)	1.222	0.621 (-0.266)	2.196	0.168 (-0.349)	0.94	0.29	2.25**
<i>Liquidity Risk</i>									
Liquid Assets / (Deposits + Non- deposit Funds) (<i>LIQ</i>)	24	0.630 (0.061)	2.760	0.023 (-0.026)	0.230	-0.607 (-0.087)	0.91	0.58	1.02
<i>Profitability</i>									
Income Before Tax / Average Total Assets (<i>INC</i>)	24	0.003 (-0.009)	0.038	-0.040 (-0.056)	0.056	-0.043 (-0.047)	2.94***	0.29	2.25**
<i>Interest Cost</i>									
Interest Expenses/Average Non- Profitable Assets (<i>INT</i>)	24	0.060 (0.054)	0.130	0.084 (0.080)	0.122	0.024 (0.026)	0.74	0.58	1.02
<i>Agency Cost</i>									
(Salaries and Employee Benefits + Reserve for Retirement) / Total Assets (<i>SAL</i>)	24	0.003 (0.001)	0.017	0.011 (0.008)	0.015	0.008 (0.007)	2.37**	0.79	3.06***
Operational Expenses/Total Assets (<i>OPX</i>)	24	0.002 (-0.001)	0.018	0.015 (0.012)	0.021	0.013 (0.013)	2.71***	0.75	2.65***

*, **, *** indicates significance at 10, 5, and 1% significance levels respectively using two-tailed test.

The significant changes in the industry-adjusted values can be attributed to the moral-hazard behavior, since by definition they are purified from sectoral trends. These results conform to the research predictions. Banks vulnerable to moral-hazard behavior tends to lend recklessly to overrisky projects when they feel themselves free of the restraints imposed by depositors using market discipline mechanism. Though, low propensity of Turkish commercial banks to lend to manufacturing industries (due to abnormally high real interest rates gained by investing government securities) limit the banks' exposure to the default risk of borrowers, the increased credit risk due to moral-hazard behavior constituted problems for individual banks following aggressive growth strategies.

2.5.1.3. Foreign Exchange Position Risk

McKinnon and Pill (1999) shows that deposit insurance system provides incentive to banks to increase foreign borrowing and incur foreign exchange risk. The research findings of the current study approve these insights. *FXP* ratio which is the measure of foreign exchange position risk increases on average (median) 62 percentage points (55 percent) and 75 percent of all domestic private commercial banks experience increasing *FXP* ratio after introduction of 100 percent deposit insurance system (Table 3). The Wilcoxon and proportion test statistics are significant at 1 percent level. Moreover, the industry-adjusted value of *FXP* on average (median) increase 68 percentage points (60 percent) and 78 percent of all domestic private commercial banks experience increasing industry-adjusted *FXP* ratio after introduction of 100 percent deposit insurance system (Table 4). The Wilcoxon and proportion test statistics are significant at 1 percent level again.

The results show that increasing foreign exchange risks of banks can be attributed to the introduction of 100 percent deposit insurance system, since the changes in the foreign exchange position remains significant even after controlling for economy and industry-wide effects. These results could be interpreted as a support to the moral-hazard behavior hypothesis. Banks facing less pressure from the depositors are willing to incur large open foreign-exchange positions. Considering the appeal of high interest rate premiums on government debt securities in recent period, banks became heavily engaged in the overinvestment in government paper and opening their foreign-exchange position. However, this strategy has been one of the reasons of the financial crisis, when domestic currency depreciation has far exceeded the interest rate premiums in 2000-2001 years.

2.5.1.4. Liquidity Risk

The research findings show that the liquidity (measured by *LIQ* ratio) of domestic private commercial banks decreases after the introduction of 100 percent deposit insurance system. *LIQ* ratio has decreased on average (median) 46 percentage points (9 percent) after introduction of 100 percent deposit insurance system and 67 percent of all banks experienced decreasing liquidity (Table 3). The Wilcoxon and proportion test statistics are significant at 5 percent level. However, industry-adjusted *LIQ* ratio values of domestic private commercial banks show significant increases after introduction of 100 percent deposit insurance system. Industry-adjusted *LIQ* ratio values on median increase by 10 percentage points and 75 percent of all firms experience increasing liquidity. The Wilcoxon and proportional test statistics are significant at 5 percent level. These results imply that though, sectoral trend is towards decreasing liquidity, the moral-hazard behavior encourages higher liquidity for domestic private commercial banks.

2.5.1.5. Profitability

The simple market model suggests that expected risk premium varies in direct proportion of its risk. Therefore, it is reasonable to hypothesize higher profitability for banks vulnerable to moral-hazard behavior.

The examination of raw variable value show that *INC* ratio does not experience significant changes after introduction of 100 percent deposit insurance system according to Wilcoxon test statistics. However, proportion test statistics is significant and 64 percent of all domestic private commercial banks experience increasing profitability. There are increasing pattern in the profitability measure of industry-adjusted values of domestic private commercial banks. Industry-adjusted values of *INC* ratio of domestic private commercial banks has increased on average (median) 1.7 percentage points (1.9 percent) after introduction of 100 percent deposit insurance system and 64 percent of all banks experienced increasing profitability (Table 3). The Wilcoxon and proportion test statistics are significant at 10 percent level.

These results indicate that commercial banks gained higher profits by taking excessive risks. This increasing profitability is the reward of the moral-hazard behavior, since the changes in the industry-adjusted values are controlled for economy and industry-wide effects

2.5.1.6. Interest Cost

The raw values of *INT* ratio of domestic private commercial banks do not show significant changes after introduction of 100 percent deposit insurance system. However, there are significant changes in industry-adjusted values of *INT* ratio. *INT* ratio has increased on average (median) 4 percentage points (1 percent) after introduction of 100 percent deposit insurance system and 67 percent of all banks experienced increasing interest cost (Table 3). The Wilcoxon and proportion test statistics are significant at 5 percent level. The results imply that moral-hazard behavior encourages banks to offer higher interest rates to depositors on insured deposits.

2.5.1.7. Agency Cost

Moral-hazard behavior is predicted to increase the agency cost of the commercial banks. Agency cost is measured by two variables in this study: First variable is the (Salaries and Employee Benefits + Reserve for Retirement) / Total Assets (*SAL*) ratio and second variable is the ratio of operational expenses to total assets (*OPX*).

The raw values of agency cost variables show significant changes after introduction of 100 percent deposit insurance system. *SAL* ratio has decreased on average (median) 0.1 percentage points (0.2 percent) after introduction of 100 percent deposit insurance system and 72 percent of all banks experienced increasing interest cost (Table 3). The Wilcoxon test statistics is significant at 10, and proportion test statistics is significant at 5 percent level. The proportion test statistics for *OPX* variable is also significant at 5 percent level; however, Wilcoxon test statistics is not significant at the conventional levels.

Though, the industry-adjusted values of agency cost variables show significant increasing trend. *SAL* ratio has increased on average (median) 1.2 percentage points (1.1 percent) after introduction of 100 percent deposit insurance system and 81 percent of all banks experienced increasing *SAL* ratio (Table 3). The Wilcoxon and proportion test statistics are significant at 1 percent level. The industry-adjusted values of *OPX* variable experience similar pattern: *OPX* ratio has increased on average (median) 1.4 percentage points (1.4 percent) after introduction of 100 percent deposit insurance system and 83 percent of all banks experienced increasing *OPX* ratio (Table 4).

These results indicate that the moral-hazard behavior induces increasing agency costs in commercial banks. These results are in the same line with research predictions.

2.5.2. *Subsample Analysis*

The subsample analysis of SDPCB subsample shows that smaller commercial banks experience significant changes only in profitability and agency costs. The industry-adjusted values of profitability measure (*INC* ratio) has decreased on average (median) 4.3 percentage points (4.7 percent) after introduction of 100 percent deposit insurance system and 71 percent of all banks experienced decreasing *INC* ratio (Table 5). The Wilcoxon test statistics is significant at 1 percent level and proportion test statistics is significant at 5 percent level. The declining profitability of smaller commercial banks may be due to the adverse effects of excessive risk-taking. When economic conditions worsen, excessive risk taking deteriorates the profitability of smaller banks.

SDCPB subsample also experience increasing agency costs. The industry-adjusted values of *SAL* ratio has increased on average (median) 0.8 percentage points (0.7 percent) after introduction of 100 percent deposit insurance system and 79 percent of all banks experienced increasing *SAL* ratio. The Wilcoxon and proportion test statistics are significant at 5 percent level. The industry-adjusted values of *OPX* variable experience similar pattern: *OPX* ratio has increased on average (median) 1.3 percentage points (1.3 percent) after introduction of 100 percent deposit insurance system and 75 percent of all banks experienced increasing *OPX* ratio (Table 4).

Summarizing the results for SDCPB subsample, I do not find any evidence that smaller commercial banks take more risks than larger ones. Though, there are significantly higher operational expenses and salaries, this fact may be attributed to the size factor, rather than moral-hazard behavior.

III. THE EFFICIENCY OF MARKET DISCIPLINE MECHANISM

The moral-hazard behavior hypothesis rests on the assumption of existence of market discipline mechanism in the absence of deposit insurance. In the other words, moral-hazard behavior occurs under deposit insurance system, since depositors loose their incentives to exert their pressures over banks through market discipline mechanism. Market discipline mechanism is reflected in the depositors' withdrawal of their deposits or asking for higher rates of returns if there is an increase in the bank's riskiness.

However, is the market discipline mechanism real and works properly in emerging markets such as Turkey? Since the efficiency of market discipline mechanism is dependent of the informational efficiency of the financial markets, this question is highly interrelated with the market efficiency level of financial markets in the country. If the markets are efficient, then banks will be subject to the

market's control and their default risk will be restrained by the market discipline. However, it is often argued that thinly traded financial markets in the emerging economies lack even weak-form efficiency.

In this section, I will study the efficiency of market discipline mechanism by examining the returns on bank equities which are transferred to SDIF to determine if these returns are sensitive to the potential of transfer. If the market rates of returns are sensitive to the increased transfer threat, it will be possible to claim that market is able to exert market discipline mechanism by selling the shares of the overrisky banks. Considering close links of stock market attendants and depositors, it will be also possible to suggest that if 100 percent deposit insurance system hasn't weakened market discipline mechanism, then depositors would be able to exert similar market discipline mechanism by withdrawing their deposits from banks or asking for higher rates of returns.

For the analysis purposes, I collect a sample of banks transferred to SDIF over the period 1995-2001. The primary database consists of 20 failed banks. From this database, I select the banks whose shares was actively traded in Istanbul Stock Exchange (ISE). This selection criterion reduces my initial sample to 4 banks. These banks are Esbank, Yasarbank, Demirbank, and Toprakbank. The source of the market data used in this study is Istanbul Stock Exchange.

3.1. Research Methodology

The information content of any event is measured as the abnormal common stock return relative to the aggregate market return. To measure the sensitivity of the stock returns to increased potential of transfer to SDIF, I use the methodology of Fama, Fisher, Jensen, and Roll (1969) modified by Pettway (1980) to remove any industry effect. My estimates on the market reaction to the potential of transfer of bank to SDIF are based on the market model prediction errors. Since calculation of the expected returns using failed bank's market estimates do not reflect changes in the risk perceptions and industry effects, I calculate expected returns using returns on benchmark portfolio of nonfailed banks. This method will differentiate the pattern of share prices of failed banks from the pattern of share prices of nonfailed banks.

In this section, I construct equally-weighted benchmark portfolio of the stocks of nonfailed banks using six commercial banks⁴ whose shares are actively traded in Istanbul Stock Exchange and

⁴ There are ten non-failed commercial banks whose shares are actively traded in ISE. Since four of them do not have continuous data over estimation period, my benchmark portfolio is restricted to the stocks of six commercial banks. These stocks are Akbank, Disbank, Finansbank, Garanti Bankasi, Is Bankasi (C Shares), Yapi Kredi Bankasi..

have continuous data over estimation period. Weekly returns on the portfolio are calculated on the Thursday's closing price. I calculate market parameters using market model as in (1)

$$\tilde{R}_{p,t} = \hat{\alpha}_p + \hat{\beta}_p \tilde{R}_{m,t} + \tilde{u}_{p,t} \quad [1]$$

where

$\tilde{R}_{p,t}$ = weekly market return of the benchmark portfolio on week t which is measured by summing Thursday's close price of the equally-weighted portfolio plus dividends per share within the week, divided by the close price of the previous week.

$\hat{\alpha}_p, \hat{\beta}_p$ = market model estimates

$\tilde{R}_{m,t}$ = return on ISE-100 market portfolio on week t

There are two specific dates related with the transfer of the bank to the SDIF. These are the beginning date of the examination which led to the classification on the problem bank list and the date of the transfer of the bank to the SDIF. The time length between the beginning date of the examination and transfer of the bank to the SDIF varies substantially: it is less than month for Demirbank, whereas it took nearly forty-six month for Yasarbank.

Since these dates are of special-interest, I calculated market estimates of $\hat{\alpha}_p$ and $\hat{\beta}_p$ for each bank over the period of - 100 weeks to + 50 weeks relative to the beginning date of the examination and -150 weeks to 0 weeks relative to the transfer of the bank to SDIF. The specific dates, estimation periods, and estimated parameters are provided in Table 6.

Table 6
The Market Model Estimates

Banks	Yasarbank	Esbank	Demirbank	Toprakbank
<i>The Month of the beginning of the examination which led to transfer to SDIF</i>	02/1995	08/1995	11/ 2000	12/2000
<i>Estimating Period</i>	04/02/93 – 01/02/96	05/08/93 – 25/07/96	12/11/98 - 30/11/00	26/11/98 – 29/01/01
$\hat{\alpha}_p$	0.01	0.01	0.01	0.01
$\hat{\beta}_p$	0.74	0.74	0.68	0.70
R^2	0.65	0.66	0.72	0.75
<i>Date of the announcement of transfer to SDIF</i>	22/12/1999	22/12/1999	06/12/2000	30/11/2001
<i>Estimating Period</i>	28/11/96 – 16/12/99	28/11/96 – 16/12/99	06/11/97 - 30/11/00	26/11/98 – 29/11/01

$\hat{\alpha}_p$	0.01	0.01	0.01	0.01
$\hat{\beta}_p$	0.71	0.71	0.74	0.70
R^2	0.79	0.79	0.81	0.75

Expected return of the nonfailed bank portfolio can be calculated using (2) below.

$$\hat{R}_{p,t} = \hat{\alpha}_p + \hat{\beta}_p R_{m,t} \quad [2]$$

where

$\hat{R}_{p,t}$ = expected rate of return on the nonfailed bank portfolio.

$\hat{\alpha}_p, \hat{\beta}_p$ = market model estimates

$\tilde{R}_{m,t}$ = return on ISE-100 market portfolio on week t

Under the assumption of multivariate normality, the abnormal returns (market model prediction errors) to bank i on week t can be written as

$$AR_{i,t} = \tilde{R}_{i,t} - \hat{R}_{p,t} \quad [3]$$

where

$\tilde{R}_{i,t}$ = market return of the security i on week t , which is measured by summing close price at the end of the week plus dividends per share within the week, divided by the close price of the previous week.

$\hat{R}_{p,t}$ = expected rate of return on the benchmark portfolio of nonfailed banks.

Then I calculate the average abnormal returns by using formula (4) and cumulating these average abnormal returns using formula (5) below.

$$AAR_t = \sum_{i=1}^n AR_{i,t} / n \quad [4]$$

$$CAR_T = \sum_{t=1}^T AAR_t \quad [5]$$

where

AAR_t = average abnormal return on week t , over n failed banks.

CAR_T = cumulative abnormal returns at time T .

After calculating cumulative abnormal returns over the period of - 100 weeks to + 50 weeks relative to the beginning date of the examination and -150 weeks to 0 weeks relative to the transfer of the bank to SDIF, I plot and examine them to find out whether there is any information impact on the failed banks' abnormal returns. If markets are efficient, I predict that there will be differences in the perceived risk between the failed and nonfailed banks, and the market will adjust prices to reflect the increased potential of transfer to SDIF.

3.2. Research Findings

In this section, I first examine cumulative abnormal returns around the beginning date of the examination. Then I examine the cumulative abnormal returns around the transfer date of the bank to SDIF.

3.2.1. The Beginning Date of Bank Examination

The examination of cumulative abnormal returns around the beginning date of the examination shows there are random trend around zero for the first 17 weeks (Figure 1). Though it starts to decline from the week -75, it doesn't represent information effect, since recovers in the subsequent weeks. It is apparent that information impact starts on the week - 45. The cumulative abnormal returns continually decline after this week and never recover again. It means that there was a difference in the perceived risk between the failed and nonfailed banks and the market was adjusting prices to reflect potential transfer of these banks to SDIF.

3.2.2. The Transfer Date to SDIF

The cumulative abnormal returns trend around zero for the first 15 weeks (Figure 2). Though, there are nonzero declining trend between week -135 and -68 relative to the date of announcement of the transfer of the failed bank to SDIF, this trend is erratic and unpredictable. Apparently, unfavorable information arrives at the market on week -65. The cumulative abnormal returns become more and more negative. It means that market are aware of the increased bankruptcy riskiness of the banks and starts to respond it more than one year prior to the announcement of the transfer of the failed bank to SDIF.

FIGURE 1
Cumulative abnormal returns for the period around the date of starting of the examination which led to the transfer of the bank to SDIF.

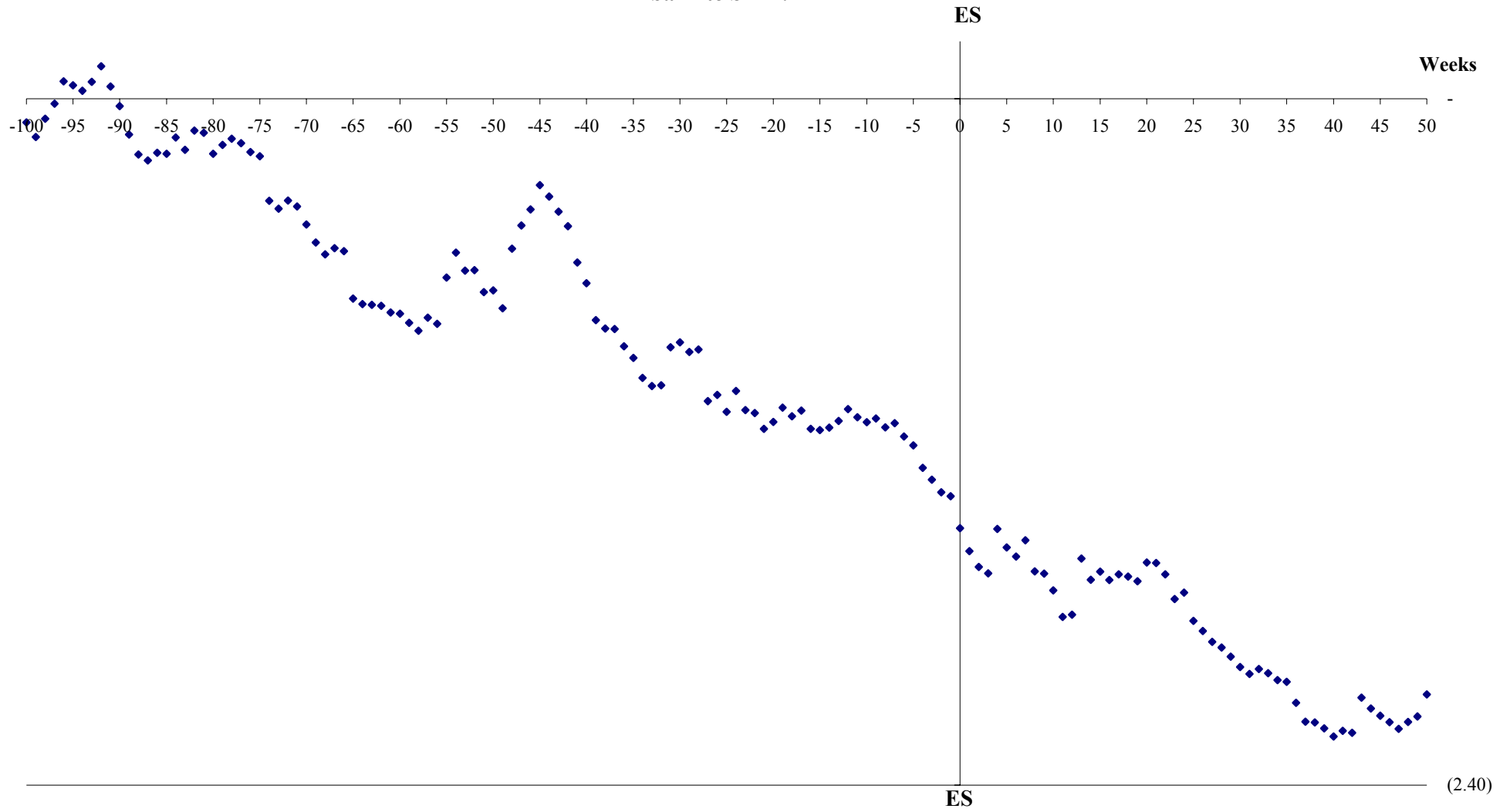
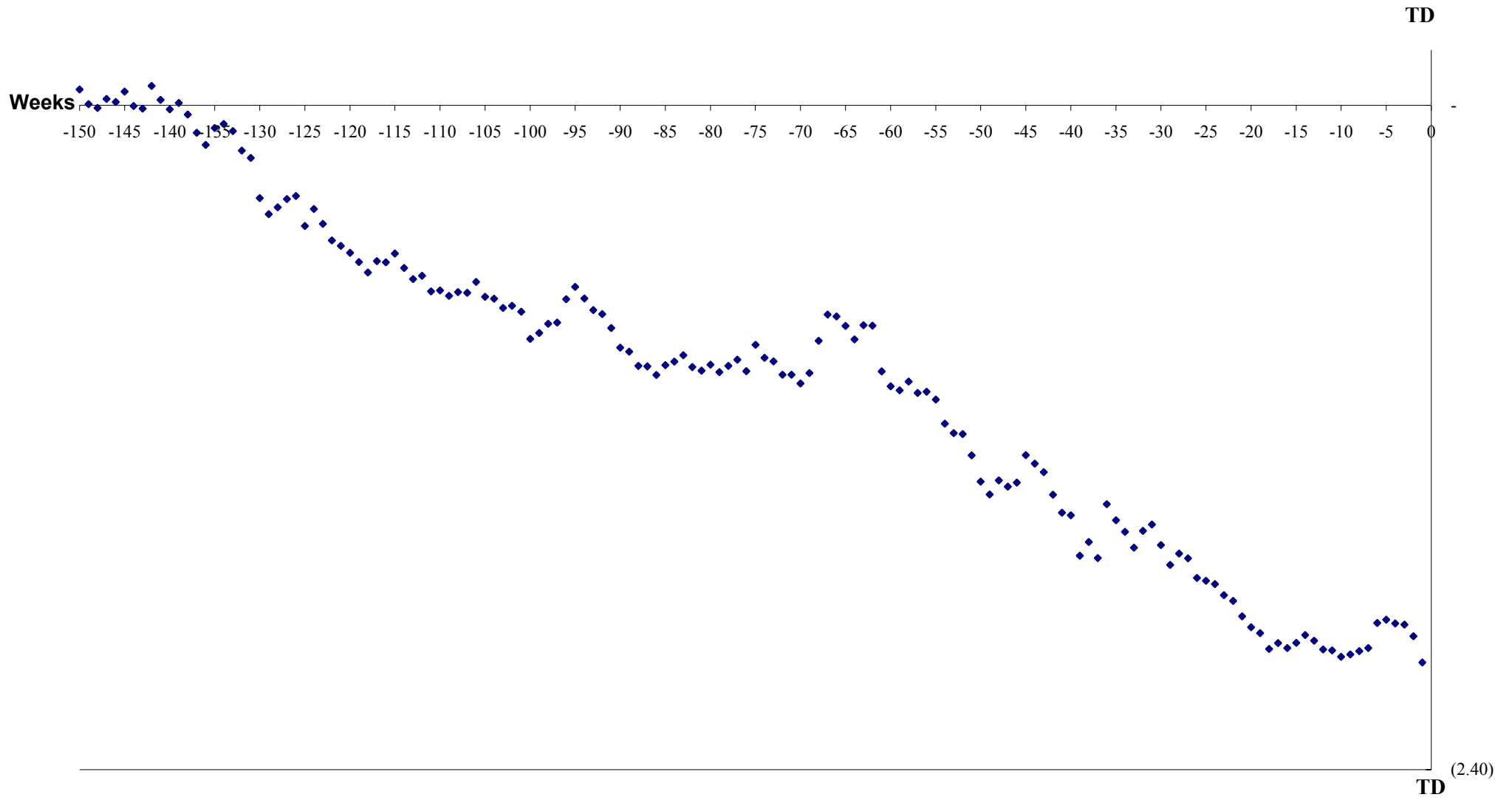


FIGURE 2
Cumulative abnormal returns for the period around the date of transfer of the bank to SDIF.



IV. SUMMARY AND CONCLUSIONS

This paper provides empirical analysis of the effects of deposit insurance system on the financial performance of Turkish commercial banks. For this purpose, I analyzed the financial statements of 36 private commercial banks exploiting experimental-design approach. The industry-adjusted variable values are used in the experimental design approach to remove the effects of economy- and industry-wide factors on financial performance changes.

The research findings provide support to moral-hazard behavior hypothesis. My findings indicate that domestic private commercial banks show significant increases in credit risk, foreign exchange position risk, liquidity risk, and agency costs relative to their benchmark after introduction of 100 percent deposit insurance system. I relate this excessive risk-taking to the moral-hazard behavior by commercial banks. The research results indicate that 100 percent deposit insurance system distorts the incentive structure of commercial banks and thus, prevent proper functioning of market discipline mechanism and lead to the taking excessive risk-taking.

Surprisingly, smaller commercial banks which are hypothesized to be more vulnerable to moral-hazard hypothesis do not show significantly different patterns than larger banks. This result implies that smaller and larger commercial banks have been affected by moral-hazard problem in the similar way.

I also analyze the efficiency of market discipline mechanism. For this purpose, I analyze market reaction to the four failed banks transferred to SDIF. The research findings show that the cumulative abnormal returns of failed banks reflected unfavorable information 45 weeks prior to the beginning of the bank examination and 65 weeks prior to the transfer of the failed bank to SDIF. Thus, the hypothesis that market is inefficient and do not properly react to the increased potential of bankruptcy is not supported. The research findings suggests that due to the close links between money and stock markets, if deposit insurance system haven't weakened the market discipline mechanism, then depositors would have adjusted their reactions properly. Surely, this reaction would have impeded the adverse effects of the moral-hazard behavior on the financial performance of Turkish banking system.

The research findings should be interpreted carefully. Though, it stresses that the market discipline mechanism is essential for the proper-functioning banking, it doesn't claim for the fully abolishment of deposit insurance system. Since deposit insurance system hampers contagion effects of the individual bank runs, the optimal solution for this problem should be based on three pillars:

- (1) Not much distorting the functioning of market discipline mechanism
- (2) Preventing contagion effects of the individual bank-runs

(3) Conducting stronger supervision to compensate for distorted market discipline mechanism.

To compromise first and second pillars, optimal partial deposit insurance system can be designed to prevent sudden outflows of funds and do not much obstruct the proper functioning of market discipline mechanism.

Third pillar requires higher transparency and deterrence. Bank regulators may rate the banks according to their financial strength and publish it regularly. Then banks will be required to contribute to the SDIF according to their rates (i.e., banks with favorable rates contribute less, whereas banks with unfavorable rates contribute more). This system may impose an alternative discipline mechanism on banks and compensate for the adverse effects of the distorted market discipline mechanism.

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