The Determinants of Bank Capital Structure and the Global Financial Crisis:

The Case of Turkey

Tuncer Gocmen* and Osman Sahin**

Abstract

The purpose of this study is to investigate the capital structure determinants of Turkish deposit banks during the period of 2004-2011. The panel data analysis is applied to thirty banks in Turkey. The overall sample period is divided into two sub-periods: i) the period of 2004-2007 is used to determine capital structure determinants of Turkish deposit banks before the global financial crisis and ii) the period of 2008-2010 is used to study the effects of the crisis on such determinants. The purpose is to see if there is any departure from standard capital structure determinants found by previous studies on financial and non-financial companies. Our findings, overall, support *the pecking order theory,* in that firms follow the pecking order from internal funds to debt, and to equity to finance new investment projects. Since more profitable firms have more internal funds to rely upon, they will use less debt for financing and hence their leverage ratios will be lower. A negative relationship between profitability and leverage ratios also implies that tax benefits from using leverage are not a primary concern for Turkish deposit banks in their capital structure decisions. Additionally, Turkish deposit banks with highly volatile operating income tend to use less leverage before and after the financial crisis. It is also found that larger banks and banks with more growth opportunities use more leverage in their capital structure decisions. This trend did not change during the crisis period.

* Shepherd University, Shepherdstown, WV USA
**Turgut Ozal University, Ankara, Turkey

I. Introduction

Capital structure decisions have been one of the most central issues in corporate finance. According to Modigliani and Miller (1958)'s theory of irrelevance, in the absence of taxes and transactions costs, the total market value of a firm and the weighted average cost of capital are independent of its financing decision. Therefore, financial managers should not worry about mixture of debt and equity in the capital structure. These results do not hold in the real world. For example, when taxes are taken into consideration, the weighted average cost of capital, and therefore market value of the firm, depends on its capital structure decisions (Modigliani and Miller, 1963). A firm, therefore, attempts to find the mix of debt and equity that maximizes its market value. Although there are numerous studies on capital structure determinants of non-financial firms, there are not many studies on what determines the capital structure of financial institutions such as banks, especially banks operating in Turkey.

The objective of this study, therefore, is to empirically answer two important questions about the capital structure determinants of Turkish deposit banks. First, can we apply the standard cross-sectional determinants of non-financial firms' capital structure that are well-documented in the corporate finance literature to the banks in Turkey? Second, is there any change in the direction and importance of these determinants after the global financial crisis of 2008? According to a recent publication by the Turkish Banking and Regulation and Supervision Agency (BDDT), the average capital adequacy ratio of Turkish deposit banks was 17.7 percent in 2010, which is above the regulatory minimum of 8%. The same ratio was 15.19 percent as of December 2011.

Table A shows the distribution of the capital adequacy ratio for a sample of 30 deposit banks in Turkey during the period of 2004-2011. It is obvious that there is a large variation in

banks' capital ratios in Turkey, indicating that banks' capital structure choice deserves further investigation.

Table A: Turkish deposit banks' capital adequacy ratios based on risk weighted asset method

Capital Adequacy Ratio	Number of Banks
Below 14%	0
14 to 16%	13
17 to 19%	6
20 to 22%	3
23 to 25%	1
Above 25%	7

Source: The Banks Association of Turkey Reports, http://www.tbb.org.tr

This paper borrows from the literature on non-financial firms to investigate the capital structure determinants of Turkish deposit banks. Heider and Gropp (2010) suggest that similarities between banks' and non-financial firms' capital structures are substantial. They find that standard cross-sectional determinants of firms' capital structure also apply to large, publicly traded banks in the US and Europe. Studies such as Flannery (1994), Myers and Rajan (1998), Diamond and Rajan (2000), and Brewer et al. (2008) find that the levels of bank capital are much higher than the regulatory minimum. Non-binding capital requirements are also explained by the market discipline literature. According to the market view, pressure on banks by shareholders, creditors and depositors determines banks' capital structure (Flannery and Sorescu, 1996; Morgan and Stiroh, 2001; Martinez Peria and Schmuckler, 2001; Calomiris and Wilson, 2004; Ashcraft, 2008; Flannery and Rangan, 2008). Heider and Gropp (2010) also report that the direction and significance of most determinants of a bank's capital structure are the same when compared to the findings by Frank and Goyal (2009) for the US firms and Rajan and Zingales

(1995) for firms operating in G-7 countries.

Banks are the most heavily regulated financial institutions in the world and in Turkey as well. The question of what determines banks' capital structure still remains unanswered. Findings of Heider and Gropp (2010) shed new light on the debate over whether regulation or market forces determine capital structure of banks. They report that, for most banks, regulation and "buffers" are not binding and may have secondary importance in determining their capital structures. Theories of optimal capital structure developed by Flannery (1994), Myers and Rajan (1998), Diamond and Rajan (2000) and Allen et al. (2009) suggest that capital requirements are not necessarily binding. For the case of Turkey, Asarkaya and Ozcan (2007) report that banks hold more capital than the regulatory minimum. The explanation they put forward is that banks tend to hold more capital as a precaution against possible shocks and that bank-specific variables rather than regulation are more important in determining capital structure choices.

It is likely that leverage ratios are also affected by the market conditions in which the firm operates. Antoniou et al. (2008) study compares the determinants of firms' capital structure in bank-oriented and market-oriented economies. This study examines five developed countries (US, UK, Japan, Germany and France) with different financial orientations. They report that firms in capital market-oriented economies, such as US and UK, tend to be less leveraged than firms operating in bank-oriented economies, such as Germany and Japan. Turkey is considered to have a bank-oriented economy. Therefore, capital structure choices of Turkish banks may be affected by the macroeconomic conditions of Turkey during and after the global financial crisis of 2008.

Theories of Capital Structure

Following the works of Modigliani and Miller (1958, 1963), three major theories of

capital structure have been developed: trade-off theory (Bradley et al., 1984), pecking order theory (Myers and Majluf, 1984), and agency cost theory (Jensen and Meckling, 1976).

The trade-off theory states that the choice of financing method is determined by the relative costs of different financing options. According to the trade-off theory, firms do have target capital structure. In the absence of transaction costs, optimal leverage ratio is determined when the benefits (e.g., tax shield) and costs (e.g., bankruptcy cost) of using additional debt are balanced. Therefore, the trade-off theory predicts a positive relationship between profitability and the optimal leverage ratio because the benefits from debt outweigh the costs of debt when firms make more profit. Furthermore, a more profitable firm may choose a higher leverage ratio to increase its firm value by reducing the free cash flow problem (Chen and Zhoa, 2005).

The pecking order theory, one of the most influential theories of capital structure, states that firms follow the pecking order from retained earnings to debt, and to equity to finance new investments. External equity capital is the least favored financing method. The pecking order theory, in the presence of information asymmetry, suggests that a particular firm does not have a target capital structure. More profitable firms tend to use relatively less debt, and hence their leverage ratios will be lower. The negative relationship between profitability and the leverage ratio suggests that tax benefits of using debt capital to finance investments are of secondary concern (Chen and Zhao, 2005). Empirical findings of Rajan and Zingales (1995) also support this prediction.

Chen and Zhao (2005) explain how trade-off theory with costly adjustment provides additional interpretation to the negative relation between profitability and leverage ratio. The costly adjustment argument predicts that the choice of debt-equity mix must push firms toward their target ratios. Even though the static trade-off theory predicts a positive relationship between profitability and leverage, a negative relation between profitability and actual leverage ratio may

still exist in the presence of transaction costs. Because of transaction costs, firms do not adjust their leverage ratios frequently; instead, they let them move within a range around the optimal leverage ratios. As firms become more profitable, their market value of equity grows faster than that of debt, leading to a negative relationship between profitability and leverage ratios until boundaries for readjustment are reached. Once the adjustment boundaries are reached, more profitable firms will start issuing more debt relative to equity to rebalance their target ratios (Chen and Zhao, 2005).

The agency cost theory, originated by Jensen and Meckling (1976), states that the optimal capital structure calls for the value of debt that mitigates the conflicts between shareholders and managers. By issuing debt rather than equity, a firm can reduce moral hazard problem associated with its managers. According to this theory, agency costs increase with the size of free cash flow and firms are forced to use more debt in order to reduce the amount of free cash flow under the control of managers[1]. This way, managers are going to be disciplined and encouraged to take on investment projects aligned with the interest of shareholders (Jensen 1986). On the other hand, "underinvestment" and "asset substitution" are the agency costs associated with the conflicts of interest between shareholders and debtholders that push firms away from leverage (Ramalho and Silva, 2009).

Signaling theory, based on information asymmetry, is another theory of capital structure worth mentioning here**.** Information asymmetry exists when one party to a transaction has more or superior information than the other party. A signal is an action taken by the better informed to reveal the superior information to the less informed. Equity issues can be undervalued by the market when a company has private information about its future cash flows (Myers and Majluf,

[1] This is also known as "free cash flow theory" in the capital structure literature.

1984). A firm, therefore, can signal its quality to investors by issuing debt rather than equity (Ross, 1977).

III. Data and Methodology:

The purpose of this study is to investigate the capital structure determinants of thirty Turkish deposit banks during the period of 2004-2011. The sample period includes the global financial crisis that took place in 2008. Therefore, the overall sample period of 2004-2011 is divided into two sub-periods. The period of 2004-2007 is used to determine the capital structure determinants of Turkish banks before the crisis and the period of 2008-2011 is used to explore the crisis effects on such determinants and to see if there are any deviations from the traditional determinants established by previous studies. Panel data analysis is used to increase the degrees of freedom, to reduce collinearity among the explanatory variables, and to obtain more efficient estimates (Antoniou et al., 2008).

The regression model for all periods is specified as follows:

$$DR_{it} = \alpha + \beta_1 ATO_{it} + \beta_2 CR_{it} + \beta_3 COLL_{it} + \beta_4 GROWTH_{it} + \beta_5 RISK_{it} + \beta_6 ROA_{it} + \beta_7 ROE_{it} + \beta_8 SIZE_{it} + \beta_9 FATO_{it} + \beta_{10} DR_{it-1} + C_i + C_t + \varepsilon_{it}$$

$i = 1,\ldots,N$ and $t = 1,\ldots,T$ where $N = 30$ banks and $T = 31$ quarter periods for the overall estimation period of 2004Q1 – 2011Q3.

The formulae for calculating the variables used in the regression model are given in the appendix. The regression includes bank fixed effect (C_i) and time fixed effect (C_t) to account for unobservable heterogeneity at the bank level and across time that may be correlated with the explanatory variables (Gropp and Heider, 2008). The hypothesis tested independently for each regression is that the capital structure of the banks expressed by the ratio of total liabilities to

total assets (DR) depends upon its asset turnover (ATO), liquidity position (CR), collateral, growth, risk, profitability, size, and tangibility. A one-period lagged dependent variable, ($DR_{i, t-1}$), is included to build a dynamic model that allows for a possible autoregressive (AR) process and an examination of the adjustment costs (Devereux and Schiantarelli, 1990) (see Antoniou et al., 2008, page 69).

In order to test for stationarity, the Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS) methods based on Augmented Dickey Fuller (ADF) and Philips-Perron (PP) test statistics are most commonly used. The null hypothesis of the existence of unit roots was rejected for the period 2004-2011. The Hausman test for the periods of 2004-2011, 2004-2007 and 2008-2011 is used to test the null hypothesis that no systematic differences exist between the parameters of the fixed-effect and the random-effect models. Since the null hypothesis was rejected, the fixed-effects model should be preferred to the random-effects model. The restricted F tests also indicate that the fixed-effect estimation model should be preferred to the pooled OLS model.

The Wooldridge (2002) test for autocorrelation in panel data was used for all estimation models. The test results revealed that there exists an autocorrelation problem. To test for heteroscedasticity, the Wald test was used and the null hypothesis that there is no heteroscedasticity was rejected. To solve for the heteroscedasticity and the auto correlation problems, the PCSE cross-section method (since T > N) for the 2004-2011 period, the White diagonal or the White period method (since T < N) for the 2004-2007 period, and the Period SUR (PCSE) method (since T < 1/2 N) for the 2008-2011 period is used. The cross-section weights technique available in the GLS method was used for all regression models except for the short-term debt estimation model for the period of 2004-2011. For estimating the models and

unit root tests, the E-views, and for the other tests, the STATA statistical programs were used in this study.

IV. Results

Table 1 shows the results for the regression estimates where total liabilities are used to calculate the leverage ratios for all periods. The overall estimation period is 2004Q1 - 2011Q3. The second estimation period is the pre-crisis period 2004Q1 – 2007Q4, and the third period is the post-crisis period 2008Q1 – 2011Q3.

Explanatory Variables	**Table 1: Fixed-Effect Panel Data Regression Models** Dependent variable: Debt ratio					
	DR (2004Q1-2011Q3)		DR (2004Q1-2007Q4)		DR (2008Q1-2011Q3)	
	β coef.	T value(sig)	β coef.	T value(sig)	β coef.	T value(sig)
C	0.2739	8.7675*	-0.0354	-0.4591	-0.3073	-2.1343**
ATO	0.0003	0.0192	-0.0423	-1.8594***	0.1619	5.3495*
CR	-5.41E-05	-0.3102	-5.75E-05	-0.4537	-0.0244	-10.0441*
COLLATERAL	0.0200	3.0965*	0.0075	0.5857	0.0420	3.0038*
GROWTH	0.0194	9.3580*	0.0211	4.8138*	0.0204	4.2564*
RISK	-0.0002	-1.5055****	-0.0001	-1.7617***	-0.0004	-1.8699***
ROA	-0.1936	-5.0005*	-0.0912	-2.2114**	-0.8738	-3.7866*
ROE	-0.0094	-1.3135	-0.0307	-3.2635*	0.0232	0.6807
SIZE	0.0001	0.1318	0.0227	5.5705*	0.0355	5.4320*
TFATA	-0.1238	-4.1950*	-0.0587	-1.0730	-0.2665	-1.6145***
LEV(-1)	0.6530	29.9247*	0.4501	11.0099*	0.4368	10.6286*
R^2	0.95		0.96		0.99	
Adj R^2	0.94		0.96		0.99	
F-statistic(sig)	416.79*		285.82*		1478.06*	
DW	2.06		1.88		1.67	
Hausman(sig)	41.75 *		214.28*		1630.45*	
Restr. F. t.(sig)	64.08 *		38.46 *		49.03 *	
Breush-P. 8(sig)	2919.73 *		726.40 *		732.02 *	
Wooldridge(sig) AR	42.53*		34.93 *		17.41 *	
Heterosc.Wald test	95171.50 *		5924.53 *		4126.77 *	
Num.of obs.	900		450		420	

Note: * significant at 1%, ** significant at 5%, *** significant at 10%, **** significant at 13%

In order to determine if Turkish depository banks' capital structure choice in the short-run is different from their choice in the long-run, total debt was divided into two components, short-term debt and long-term debt. **Table 2** shows the estimation results when the short-term debt ratio is used as the dependent variable in the regression and **Table 3** shows the estimation results when the long-term debt ratio is used as the dependent variable.

Explanatory Variables	**Table 2: Fixed-Effect Panel Data Regression Models** Dependent variable: Short-term debt ratio					
	DR (2004Q1-2011Q3)		DR (2004Q1-2007Q4)		DR (2008Q1-2011Q3)	
	β coef.	T value(sig)	β coef.	T value(sig)	β coef.	T value(sig)
C	-0.0124	-0.0883	-0.5345	-1.4256	0.6797	2.0833**
ATO	-0.3646	-3.9900*	-0.1791	-2.1711**	-0.1669	-2.2186**
CR	-0.0017	-4.1302*	-0.0012	-4.8376*	-0.0815	-12.7479*
COLLATERAL	0.2309	6.1349*	0.2545	3.8790*	0.1448	3.6596*
GROWTH	0.0149	1.8596***	0.0262	2.9488*	0.0193	1.7285*
RISK	-0.0003	-1.0284	-0.0005	-0.9167	-0.0003	-0.6313
ROA	-0.3525	-3.1745*	-0.0370	-0.3772	-0.1320	-0.5189
ROE	0.0295	0.9009	-0.0247	-0.6869	0.0451	0.8029
SIZE	0.0101	1.6653***	0.0338	1.9735**	-0.0060	-0.4189
TFATA	0.1177	0.8201	0.1278	0.5331	0.3795	0.7995
LEV(-1)	0.4927	13.6484*	0.4721	7.5349*	0.2025	5.1723*
R^2	0.76		0.86		0.98	
Adj R^2	0.75		0.84		0.98	
F-statistic(sig)	70.75*		62.10		561.39*	
DW	1.93		1.92		1.66	
Hausman(sig)	98.98*		62.92*		146.15*	
Restr. F. t.(sig)	31.31*		18.30*		12.71 *	
Breush-P. 8(sig)	2140.39*		632.74*		404.11*	
Wooldridge(sig)	33.170*		14.58*		18.37*	
Heterosc.Wald	1581.57*		1058.26*		26200.17*	
Num.of obs.	900		450		420	

Note: * significant at 1%, ** significant at 5%, ***significant at 10%

Profitability: Profitability plays a significant role in determining a firm's capital structure because internal funds, one of the three major financing sources, depend largely on profits. It is well documented that more profitable firms tend to have lower leverage ratios (Chen and Zhao, 2005). This prediction is also true for Turkish banks. The magnitude of the coefficient

estimate on ROA show that profitability measured as ROA is the most important determinant of capital structure. The coefficient estimates on ROA are negative and significant for all three periods. More profitable companies avoid using both short-term and long-term leverage. This negative relationship between profitability and the leverage ratio also suggests that tax benefits of using debt capital to finance investments are of secondary concern (Chen and Zhao, 2005). The findings are consistent with the pecking order theory.

Explanatory Variables	**Table 3: Fixed-Effect Panel Data Regression Models** Dependent variable: Long-term debt ratio					
	DR (2004Q1-2011Q3)		DR (2004Q1-2007Q4)		DR (2008Q1-2011Q3)	
	β coef.	T value$^{(sig)}$	β coef.	T value$^{(sig)}$	β coef.	T value$^{(sig)}$
C	0.0866	1.062782	0.18782	0.7459	-0.6131	-2.2553**
ATO	0.0988	2.482982*	0.005832	0.1172	0.2570	4.5868*
CR	0.0009	4.319163*	0.001095	6.6179*	0.0296	6.3824*
COLLATERAL	-0.1137	-5.121674*	-0.18093	-3.9600*	-0.0971	-2.8954*
GROWTH	0.0057	1.780677*	-0.002582	-0.7558	0.0185	2.1418**
RISK	-0.0002	-1.020861	0.000229	0.7346	-0.0003	-0.5623
ROA	-0.0243	-0.46437	-0.086343	-1.8463**	-0.3006	-2.0028**
ROE	0.0021	0.123463	0.01145	0.5445	-0.0151	-0.3401
SIZE	0.0027	0.761633	0.000244	0.0213	0.0337	2.7721*
TFATA	-0.0167	-0.236193	-0.065071	-0.4775	-0.4252	-1.1061
LEV(-1)	0.5719	24.4193*	0.553719	9.6645*	0.3298	7.4364*
R^2	0.87		0.86		0.97	
Adj R^2	0.86		0.84		0.96	
F-statistic$^{(sig)}$	152.84*		65.69*		319.62*	
DW	1.95		1.99		1.93	
Hausman$^{(sig)}$	error		-16.87 suest		28.74*	
Restr. F. t.$^{(sig)}$	32.46*		18.65*		29.94*	
Breush-P. $^{8(sig)}$	3181.50*		877.73*		943.38*	
Wooldridge$^{(sig)}$ AR	14.12*		4.627*		29.66*	
Heterosc.Wald	**1147.95***		**1109.14***		**24734.29***	
Num.of obs.	900		450		420	

Note: * significant at 1%, ** significant at 5%, ***significant at 10%

Another financial ratio to measure for profitability is ROE. The coefficient estimate on ROE is negative and significant for the pre-crisis period 2004-2007. For the other periods covered in this study, there is no significant relationship between ROE and the leverage ratio.

Most empirical studies use ROA operating income or pre-tax income to find support for the pecking order and trade-off theories. For example, Rajan and Zingales (1995), Frank and Goyal (2009), and Fama and French (2002) found that more profitable firms are less leveraged. Gropp and Heider (2008) found a similar result for banks, Their findings are also consistent with the pecking order theory.

Growth: Table 1 shows that growth (GROWTH) is positively and significantly related to the leverage ratio for all periods. The coefficient estimates for the regression equation where short-term and long-term leverage ratios are used as dependent variables are presented in Tables 2 and 3. The findings are the same except for the pre-crisis period 2004 – 2007 where growth is negatively but not significantly related to long-term leverage. According to the pecking order theory, when internal resources of growing firms are not sufficient to finance projects with positive net present value, firms may have to issue debt before equity. This implies that growth opportunities and leverage are positively related. The findings in this study show that, Turkish banks with higher growth prefer to use more debt instead of equity to finance their investments. It is worthwhile to mention that a negative relationship between growth and leverage is also possible. For example, Antoniou et al. (2008) state two reasons for expecting a negative relationship between growth and leverage. First, an increase in the cost of financial distress that results from an increase in expected growth forces managers to reduce the level of debt. Second, under asymmetric information, firms may choose equity over debt when equity is overvalued and this overvaluation leads to higher expected growth.

Size: It is widely accepted that larger firms have relatively less chance of bankruptcy and higher debt capacity. Therefore, they may choose to use more debt to maximize their tax benefits. Since larger banks have lower information asymmetry, they are more likely to have

easier access to debt markets and to borrow at lower cost. Small firms have lack of profitability; hence they are forced to issue relatively more equity than debt (Chen and Zhao, 2005; Antoniou et al., 2008). Therefore, a positive relationship is expected between leverage and firm size. The findings for Turkish deposit banks confirm this expectation for most of the periods studied. The coefficient on bank size (SIZE) is positive for all periods and significant for periods 2004-2007 and 2008-2011. Gropp and Heider (2008), Rajan and Zingales (1995), Frank and Goyal (2009), and Flannery and Rangan (2006) also report that larger firms are more leveraged.

Risk: Earnings volatility is used as a measure of risk. Firms with high earnings volatility are exposed to the risk of generating insufficient resources to meet their debt service commitments. When such an event occurs, firms may end up reorganizing the funds at a high cost or facing bankruptcy risk. Therefore, firms with highly volatile earnings are expected to have lower leverage (Antoniou et al., 2008). This prediction is also true for Turkish banks. The coefficient estimates on risk are negative and significant for all three periods in the regression model where total liabilities are used to compute the leverage ratio. However, there is no significant relationship between risk and the time horizon of the leverage as shown in Tables 2 and 3.

Liquidity: The current ratio is considered as a measure of liquidity risk. It is an indication of a bank's ability to pay its short-term debt obligations that come due in one year. Banks with a higher current ratios have relatively more cash and marketable securities; hence they are expected to rely less on short-term and more on long-term leverage. The coefficient estimates on the current ratio (CR) in the post-crisis period confirm this prediction; see Tables 1, 2 and 3. There is no significant relationship between the current ratio and leverage during the pre-crisis period. Before the global financial crisis of 2008, liquidity risk was not a major

concern for financial institutions. They increasingly relied on short-term debt to finance their long-term investments. As a result, many bank failures in 2008 were caused or accelerated by the failure to manage the liquidity risk created by excessive use of short-term debt. When short-term liquidity providers systematically withdrew their funds, many financial institutions were forced to liquidate their assets at severely reduced prices. After the global financial crisis, governments and financial institutions became aware of the risk associated with sudden and unexpected liquidity withdrawals that can help spread the risk more widely and rapidly through the financial system.

Collateral: The ratio of liquid assets plus tangible fixed assets to total assets is used as collateral in the estimation models. The liquid assets include current assets excluding credits and account receivables. Most capital structure theories suggest that the type of assets owned by a firm affect its capital structure choice (Titman and Wessels, 1988). Myers and Majluf (1984) also suggest firms with assets that can be used as collateral may be expected to issue more debt to avoid costs associated with asymmetric information. Jensen and Meckling (1976) and Myers (1977) suggest that stockholders have an incentive to use more debt to transfer wealth from creditors. This may lead to a positive relationship between leverage ratios and collateralizable assets. On the other hand, managers have an incentive to consume more than the optimal level of perquisites. This may produce the opposite relationship between collateralizable assets and the leverage ratios. Grossman and Hart (1982) suggest that managers of highly leveraged firms do not have this tendency because of the increased threat of bankruptcy. Additionally, managers of highly leveraged firms may choose to consume less than the optimal level of perquisites since creditors have greater incentive to closely monitor highly leveraged firms. Firms with less

collateralizable assets may choose to issue more debt to limit excessive consumption of perquisites, Grossman and Hart (1982).

For this study, there is a positive relationship between collateral (COLLATERAL) and total debt. The coefficient estimates on collateral are positive for all regression models where total liabilities are used to calculate the leverage ratio. Note, however, that collateral is positively and significantly related to short-term leverage but negatively and significantly related to long-term leverage for all periods. These findings show that, in general, Turkish banks with relatively more collateral tend to use more short-term debt and less long-term debt. This tendency did not change after the global financial crisis.

Tangibility: Tangibility is computed as the ratio of tangible fixed assets to total assets (as in Titman and Wessels, 1988; Rajan and Zingales, 1995; and Frank and Goyal 2009)**.** During bankruptcy, tangible fixed assets are more likely to have a market value, while intangible assets will lose their value. Since the risk associated with lending to firms with higher tangible assets is lower, creditors will ask for a lower risk premium (Antoniou et al., 2008). This implies a positive relationship between debt and tangible assets. Frank and Goyal (2009) also predicts a positive relationship between tangibility and leverage as a result of "lower expected cost of distress" and "fewer debt-related agency problems". Empirical studies (for example, Rajan and Zingales, 1995; and Frank and Goyal 2009) provide evidence for a positive relationship between tangibility and leverage.

However, Harris and Raviv (1991) argue that, under the pecking order theory, there is a negative relationship between debt and tangibility of assets. Intangible assets are associated with more information asymmetry and higher transaction and bankruptcy costs. On the other hand,

tangible assets are associated with lower information asymmetry and, therefore, lower cost of equity. Studies by Psillaki and Daskalakis (2009), Hall et al. (2004), and Sogorb-Mira (2005), among others, support a negative relationship between debt and the tangibility of assets. The estimation results for Turkish depository banks given in Table 1 show that there is a negative and significant relationship between debt and the tangibility of assets (TFATA) for the overall estimation period and the post-crisis period.

Efficiency: The total assets turnover (ATO) ratio is used as a measure of efficiency. The coefficient estimates on ATO given in Table 1 reveal that banks with more efficient use of total assets relied relatively less on debt in the pre-crisis period. After the crisis, the same banks used significantly more debt to finance their operations. The regression estimates presented in Tables 2 and 3 show that, after the crisis, short-term leverage and ATO are negatively and significantly related whereas long-term leverage and ATO are positively and significantly related.

V. Conclusion

The aim of this study is to examine the relationship between leverage and a set of explanatory variables for the case of Turkish depository banks during the overall period of 2004-2011. In order to study the effects of the 2008 global financial crisis on leverage and, therefore, capital structure determinants, the overall sample period is divided into two sub-periods, pre-crisis and post-crisis. The results, overall, support the pecking order theory. According to the theory, firms follow the pecking order from internal funds to debt, and to equity to finance their investments. As Turkish banks make more profits, they tend to use less debt for financing since they will have more internal funds upon which to rely. This negative relationship between profitability and the debt ratio also implies that the tax benefit from using leverage is not a primary concern for Turkish banks when they make capital structure decisions. It is also found that Turkish deposit

banks with highly volatile operating income prefer to use less leverage. Moreover, larger banks and banks with more growth opportunities use more leverage in their capital structure decisions. This trend was not different during the crisis period. Additionally, Turkish banks that used their assets more efficiently relied relatively less on debt before the crisis but they showed an increase in their reliance on long-term debt after the crisis due to an increase in their financing needs. Finally, Turkish banks with low liquidity risk showed a preference for long-term debt over short-term debt.

Appendix:

Variables used in the regression

ATO = Sales / Total Assets

CR = Current Assets / Current Liabilities

COLLATERAL = (Liquid Assets + Tangible Fixed Assets) / Total Assets; where Liquid Assets = Cash and Balances with the Central Bank of Turkey + Banks + Money Market Placements + Financial Assets Available for Sale (net) + Investments held to Maturity (net) + Derivative Financial Assets Held for Hedging+ Financial assets where fair value change is reflected to income statement (net).

This is also consistent with the definition used by Gropp, R. and Heider, F. (2010) They used the following definition for collateral:

Collateral = (total securities + treasury bills + other bills + bonds + CDs + cash and due from banks + land and buildings + other tangible assets)/book value of assets

GROWTH = Quarterly percentage change of total assets

RISK = Earning Volatility (Standard deviation of quarterly percentage change of operating income (EBIT)

ROA = Net Income / Total Assets

ROE = Net Income / Equity

SIZE = The natural log of total assets

TFATA = Tangible Fixed Assets / Total Assets

LEVERAGE RATIO = Total Debt / Total Assets

SHORT TERM LEVERAGE = Short-term Debt / Total Assets

LONG TERM LEVERAGE = Long-term Debt / Total Assets

References

Allen, F., Carletti, E. and Marquez, R. (2009). Credit market competition and capital regulation. Review of Financial Studies forthcoming.

Asarkaya, Y. and Ozcan, S. (2007). Determinants of Capital Structure in Financial Institutions: The Case of Turkey. Journal of BRSA Banking and Financial Markets, 1(1), 91-109.

Antoniou, A, Y. Guney, and K. Paudyal (2008). The Determinants of Capital Structure: Capital Market-oriented versus Bank-oriented Institutions. Journal of Financial and Quantitative Analysis, 43, 59-92.

Ashcraft, A. (2008). Does the market discipline bank? New evidence from regulatory capital mix. Journal of Financial Intermediation, 17, 543–561

The Banks Association of Turkey Reports, Retrieved December 31, 2011, from http://www.tbb.org.tr

Bradley, M., Jarrell, G.A. and Kim, E.H. (1984). On The Existence of An Optimal Capital Structure: Theory and Evidence. Journal of Finance, 39, 857-877.

Calomiris, C., and Wilson, B. (2004). Bank Capital and Portfolio Management: The 1930s, Capital Crunch, and Scramble to Shed Risk. Journal of Business, 77(3), 421-456.

Chen, L., and Zhao, X. S. (2005). Profitability, Mean Reversion of Leverage Ratios, and Capital

Structure Choices. Retrieved March 17, 2011, from: http://ssrn.com/abstract=666992

Devereux, M., and F. Schiantarelli. (1990). Investment, Financial Factors and Cash Flow: Evidence from UK Panel Data. R. G. Hubbard, ed Asymmetric Information, Corporate Finance and Investment, 279-306. Chicago, IL: University of Chicago Press.

Diamond, D., and Rajan, R. (2000). A theory of bank capital. Journal of Finance, 55, 2431-2465.

Fama, E. F., and French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. The Review of Financial Studies, 15(1), 1–33.

Flannery, M.J., and Rangan, K.P. (2006). Partial adjustment toward target capital structures. Journal of Financial Economics, 79 (3), 469–506

Flannery, M. and Sorescu, S. (1996) Evidence of bank market discipline on subordinated debenture yields: 1983-1991, Journal of Finance 51, 1347-1377

Frank, M., and Goyal, V. (2009). Capital Structure Decisions: Which factors are reliably important? Financial Management, 38, 1-37.

Flannery, M.J. and Rangan, K.P. (2006), Partial adjustment toward target capital structures. Journal of Financial Economics, 79, 469–506.

Gropp, R. and Heider, F. (2010) The Determinants of Bank Capital Structure, Review of Finance, 14, 587-622.

Gropp, R. and Heider, F. (2009. The determinants of bank capital structure. European Central Bank Working Paper Series, No. 1096, September, pp. 1-50.

Grossman, S. and Hart, O. (1982). Corporate Financial Structure and Managerial Incentives. In: McCall, J. (Ed.), The economics of information and uncertainty. University of Chicago Press, Chicago.

Hall, G.C., Hutchinson, P.J. and Michaelas, N. (2004). Determinants of the capital structures of European SMEs. Journal of Business Finance and Accounting, 31(5–6), 711–728.

Harris, M., and Raviv, A. (1991). The theory of capital structure. The Journal of Finance, 46, 297–355.

Jensen, M. and Meckling, W. (1976). Theory of The Firm: Managerial Behavior, Agency Cost and Ownership Structure. Journal of Financial Economics, 3, 305-360.

Martinez Peria, M. and Schmuckler, S. (2001). Do depositors punish banks for bad behaviour? Market discipline, deposit insurance and banking crises. Journal of Finance, 56 (3), 1029-1051.

Modigliani, F., and Miller M. (1958). The Cost of Capital, Corporation Finance, and The Theory of Investment. American Economic Review, 48, 261-297.

Modigliani, F., and Miller M. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. American Economic Review, 53, 433-443.

Morgan, D. and Stiroh, K. (2001). Market discipline of banks: The asset test. Journal of Financial Services Research, 20, 195-208.

Myers, S. C., (1977). Determinants of Corporate Borrowing. Journal of Financial Economics, 5, 147–175

Myers, S.C., and Majluf, N.S. (1984). Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. NBER Working Paper Series, Working Paper No. 1396, 1-57.

Psillaki, M., and Daskalakis N. (2009). Are the determinants of capital structure country or firm specific? Small Business Economics, 33(3), 319–333.

Ramalho J.J.S., and Silva J.V. (2009). A two-part fractional regression model for the financial leverage decisions of micro, small, medium and large firms. Quantitative Finance, 9(5), 621-636.

Rajan, R.G., and Zingales, L. (1995). What Do We Know about Capital Structure? Some

Evidence from International Data. The Journal of Finance, L, 5, 1421-1460.

Ross, S. A. (1977). The determinants of financial structure: The incentive signaling approach. The Bell Journal of Economics and Management Science, 8: 232–240.

Sogorb-Mira, F. (2005). How SME Uniqueness Affects Capital Structure: Evidence From a 1994-1998 Swedish Data Panel. Small Business Economics, 25(5), 447-457.

Titman, S., and Wessels, R. (1988). The Determinants of Capital Structure Choice. Journal of Finance, 43, 1-19.