Central Bank Review
Vol. 12 (July 2012), pp.11-24

ISSN 1303-0701 print / 1305-8800 online

https://www3.tcmb.gov.tr/cbr/

IS THE LEVERAGE OF TURKISH BANKS PROCYCLICAL?

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ABSTRACT This study examines the relation between leverage and asset growth in the Turkish banking sector, and finds that there is a statistically significant positive relationship between these two variables. This result indicates that the leverage ratio increases when there is positive asset growth, hence the leverage is procyclical. In addition, this relationship differs according to the business models of the banks. Procyclicality of the leverage indicates that expansion and contraction of bank balance sheets accelerate credit cycles implying that bank leverage and business cycles are related. Consistent with the predictions in the corporate finance literature, we find that balance sheet size and profits significantly affect the leverage. To decompose leverage, we also document that banks use non-deposits and deposits as substitutes during our sample period, and the leverage cycles and balance sheet expansions are highly correlated with non-deposit and non-core liabilities. In this sense, it is useful to include the leverage ratio in the counter-cyclical macroprudential policy tools kit.
JEL E3, G21, G28
Keywords Leverage, Procyclicality, Banking

ÖZ Bu çalışmada, Türk bankacılık sisteminde kaldıraç ile aktif büyümesi arasındaki ilişki incelenmiş ve bu iki değişken arasında pozitif ve anlamlı bir ilişki saptanmıştır. Bu sonuç bankacılık sisteminin büyüme gösterdiği dönemlerde kaldıraç oranının arttığını, dolayısıyla kaldıracın döngüsel olduğunu göstermektedir. Ayrıca, işlev bakımından banka grupları arasında da farklılıklar bulunmuştur. Kaldıracın döngüsel olması banka bilançolarının genişleme ve daralmalarının kredi çevrimlerini hızlandırdığı sonucunu vermekte, dolayısıyla kaldıraç ve iş çevrimleri ilişkisini de ortaya koymaktadır. Şirketler finansmanı literatüründeki öngörüler ile tutarlı olarak, bilanço büyüklüğü ve kârlılığın kaldıracı anlamlı şekilde etkilediği bulunmuştur. Kaldıracı ayrıştırmak amacıyla yapılan incelemede ise, çalışmaya konu olan örneklem döneminde bankaların mevduat ve mevduat dışı kaynakları birbirleriyle ikame ettikleri ve kaldıraç çevrimleri ile banka bilançolarının genişlemelerinin önemli ölçüde mevduat dışı ve çekirdek olmayan yükümlülükler ile ilişkili oldukları tespit edilmiştir. Bu anlamda, döngüsellik karşıtı makro ihtiyati önlemler sepetine kaldıraç oranının da eklenmesinin faydalı olacağı düşünülmektedir.
TÜRK BANKALARININ KALDIRAÇ ORANLARI DÖNGÜSEL MI?
JEL E3, G21, G28
Anahtar Kelimeler Kaldıraç, Döngüsellik, Bankacılık

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1. Introduction

The global financial crisis of 2007-2009 has underscored the importance of leverage as it was considered to be a major source of crisis. Similarly, in the wake of exit from the crisis, the slow recovery has also been attributed to the deleveraging of firms as costly excess to external funding and decline in the value of collaterals have limited firms' incentive to make new investments. After the seminal works by Kiyotaki and Moore (1997) and more recently Geanakoplos (2009), the leverage has been in the center of academic research and policy oriented discussions since the leverage cycles, financial, and business cycles are considered to be closely related.

Given the importance of leverage over the business cycles and its impact on the amplification mechanism to propagate shocks, recent studies have addressed the question of whether the leverage of financial and non-financial firms is procyclical. Considering that banking institutions raise funding through equity and debt, and if leverage ratio is defined as the ratio of financial assets over equity, change in the value of financial assets is reflected in equity, thus it affects leverage ratio.[1] In this context, assuming that the value of debt stays constant, an increase (decrease) in asset prices would lower (increase) leverage. This phenomenon is known as countercyclical leverage, and is not the case for financial institutions but is for economic agents that do not target leverage.

However, for the financial institutions that perform with a specific leverage target as in the model of Adrian and Shin (2008a, 2010), an increase in asset prices leads to further increase in debt to hold the leverage at the target level. This introduces a positive relationship between asset growth and leverage growth that implies procyclical leverage. As shown in Adrian and Shin (2010), procyclicality is an outcome of active management of leverage, which is driven by the possible feedback mechanism between price changes and the adjustment of leverage. Therefore, the adjustment of leverage induces positive relationship between asset growth and leverage growth. This phenomenon has important implications since the procyclicality of leverage accelerates the financial cycles in which the periods during which bank balance sheet expands and leverage increases overlap with the periods of credit cycles.

[1] As shown in Table 1, depending on the definitions used, increase in the leverage ratio might imply an increase or a decrease in indebtedness. In this paper, "increase in leverage" refers to increased indebtedness.

The academic literature does not provide conclusive evidence on the procyclicality of leverage for financial firms. For example, Adrian and Shin (2008a) present some evidence in favor of strong procyclical leverage for the United States especially for investment banks, and for Canadian banks, Damar et al. (2010) argue that the procyclicality exists and its degree positively depends on the use of wholesale funding. Panetta et al. (2009) find countercyclical leverage for some developed countries, while Kalemli-Ozcan et al. (2011) find that the leverage is procyclical for large commercial banks in the United States, but to a lesser extent for the banks in Europe.

In this study, we address two questions: first, we examine whether leverage in the Turkish banking sector is procyclical. Second, we investigate the determinants of the bank capital structure and leverage. Thus, our contribution is to provide evidence on the procyclicality of leverage for the case of Turkey that went under tight banking regulations after crisis in 2001 followed by widespread bank failures. Doing so, we offer different measures of leverage, and assess their procyclicality. Besides, we offer some evidence on the determinants of leverage and capital structure for a country case. We then decompose banking sector liabilities into deposit, non-deposit, and non-core liabilities, and look at their implications for the leverage.

Using various leverage definitions, we show that the size of the banking sector and leverage are positively related, i.e., leverage is procyclical in the banking system. In addition, leverage behavior of the banks differs across bank groups with different business models. Procyclicality of the leverage implies that expansion and contraction of bank balance sheets accelerate credit cycles.

As for the determinants of leverage, balance sheet size and profit are significant factors, which is consistent with the corporate finance view as discussed in Gropp and Heider (2010). Given that banks can finance their balance sheet growth with deposits and non-deposit liabilities, we find that the asset growth is driven by non-deposit and non-core liabilities to larger extent, and negatively related with deposit growth.

The rest of the paper proceeds as follows. Section 2 provides an overview of leverage and procyclicality. Section 3 presents alternative definition of leverage and empirical findings. Section 4 concludes the paper.

2. Leverage and Asset Changes – Overview

To illustrate the procyclicality of leverage for financial institutions, we utilize the balance sheet example from Adrian and Shin (2008a, 2008b, 2010). The leverage model defined here is the active leverage policy with a constant target for the case of financial institutions, where the leverage fluctuates as the market value of assets and equity changes. First, assume a

bank balance sheet at time t is given by A=D+E, where A, D and E are total assets, debt, and equity, respectively. Given the market value of assets and equity, the leverage is defined as follows:

$$L = \frac{A}{E} = \frac{A}{A - D} \tag{1}$$

We may illustrate the balance sheet of a bank with a diagram in which the balance sheet size is $100, and the leverage is 10:

Assets	Liabilities
Securities =100	Equity = 10
	Debt = 90

Assume that the banks actively manage their balance sheet to keep the leverage at a desired level, such as 10 and the price of debt is approximately constant for small changes in total assets. If the price of securities increases by 1 percent, then the leverage is L=A/E=101/11=9.18, which is below the target level of 10. Therefore, to increase the leverage back to its target level, the bank has to raise its debt by $9; and the new balance sheet would look like:

Assets	Liabilities
Securities =110	Equity = 11
	Debt = 99

An increase in price of securities by 1 dollar, thus leads to 10 dollars increase in balance sheet with additional 9 dollar of debt. The financial institution in this example reacts to an increase in asset price by increasing its debt to hold the leverage at the target level. This introduces a positive relationship between asset growth and leverage growth implying procyclical leverage, and such active balance sheet management amplifies financial cycles (Kalemli-Ozcan et al., 2011).

Adrian and Shin (2008b, 2010), Greenlaw et al. (2008), and Kalemli-Ozcan et al. (2011) associate procyclical leverage phenomenon with countercyclical value at risk (VaR). For example, when VaR per dollar of assets held by a bank is V, and total equity is equal to total value at risk, then Total Equity=V*(Total Assets). Given that the leverage ratio L ≡ (Total Assets)/(Total Equity), then L=1/V. In this case, leverage will be high during boom times of financial expansion due to low risk implying that there is a relation between leverage and banks' risk perceptions. At this point, Adrian and Shin (2008a) argue that the value at risk is the main determinant of the balance sheet size and leverage. Similarly Greenlaw et al. (2008) argue that, as a result of procyclicality, banks take value at risk rather than

regulatory restrictions into account when determining their capital structure. Gropp and Heider (2010) also find that capital regulation and buffers may only be of second-order importance in determining the capital structure of most US and European banks.

On the other hand, the countercyclicality of risk and procyclicality of leverage could accelerate financial cycles. Banks exhibit a behavior which they increase demand for assets and expand their balance sheets in an environment of low risk perceptions. If this situation is accompanied by a market that is not perfectly liquid, an increase in the demand for assets would put upward pressure on asset prices. In this case, the balance sheet growth, asset demand, and price increases would introduce a structure that feeds each other, and an additional accelerator effect could be seen if there is specific leverage target. Therefore, as a result of an increase in asset prices, banks raise more funds to increase their leverage, and in case of falling asset prices, they reduce their liabilities to lower the leverage.

As a result of this cyclical relationship between leverage and bank balance sheets, periods of rapid growth in the banking sector and increasing leverage could overlap with credit cycles. Thus, it is possible to establish a link between business and leverage cycles. Indeed, the ongoing economic recession after the global financial crisis is to large extent attributed to deleveraging of banks and other economic agents.

3. Data, Methodology and Results

3.1. Alternative Leverage Definitions and Evidence

We have used asset/equity ratio as a leverage definition in our discussions so far. As shown in Table 1, it is possible to find alternative definitions of leverage in the banking literature. While some of these definitions, such as asset/equity ratio, are widely used in academic literature, other definitions are used by regulatory institutions as a risk indicator in banking system or as an indicator in the framework of policies aimed at reducing macro-financial risks. On the other hand, for example, the Savings Deposit Insurance Fund (SDIF) in Turkey uses definition of Leverage-VI as "capital asset multiplier" in the framework of saving deposit premium. However, in this paper, we use alternative leverage definitions to study whether there is a procyclical relationship between leverage and asset growth without discussing which leverage definition is relevant for any particular purpose.

Table 1. Alternative Leverage Definitions

I	Debt / Equity
II	(Debt+Off Balance Sheet Liabilities) / Equity
III	Assets / Equity
IV	(Tier 1 Capital-Regulatory Deductions) / (Assets+Off Balance Sheet Liabilities)
V	(Tier 1 Capital-Regulatory Deductions) / (Debt+Off Balance Sheet Liabilities)
VI	[Assets + Contingencies + Commitments (except derivatives and revocables)] / Regulatory Capital

Notes: For the definitions of Leverage-IV and Leverage-V, all contingencies are included in off-balance sheet transactions, and only 10 percent of revocable commitments are taken into account. Increases in Leverage-IV and Leverage-V ratios imply reduction of debt, while increases in other leverage definitions imply increasing debt.

The source of all data is the Interactive Monthly Bulletin of the Banking Regulation and Supervision Agency (BRSA).[2] The data covers foreign branches of the banks. Constrained by data availability, we use monthly data in regression analysis for the period December 2002 – August 2011. Table 2 presents descriptive statistics for different leverage definitions. The leverage ratios in the Turkish banking sector are relatively lower when compared to the banks and countries analyzed in Kalemli-Özcan et al. (2011). It is possible to reconcile this with the strong capital and high capital adequacy ratios of the Turkish banks due to strict regulations implemented after financial crisis in 2001.

Statistics based on banks' business models reveal that commercial and participation banks work with higher leverage than the development/ investment banks.[3] This is the consequence of the fact that an important determinant of the leverage is the size of the bank balance sheets.[4] On the other hand, the regulations about banks' capital adequacy limit the cross sectional and time series variation of the leverage. As Greenlaw et al. (2008) state, however, one should recall the finding that as a result of the procyclicality of leverage, banks consider internal Value at Risk (VaR) rather than the regulations when utilizing their capital.

[2] http://www.bddk.org.tr/WebSitesi/english/Statistical_Data/Statistical_Data.aspx

[3] The development/investment banks collect funds through underdeveloped securities market rather than deposits which might be the driving force behind the difference in leverage ratios.

[4] In a panel data analysis, Caliskan (2011) finds that there is a statistically significant relationship between the growth of the leverage and the size of the bank balance sheets measured by total assets.

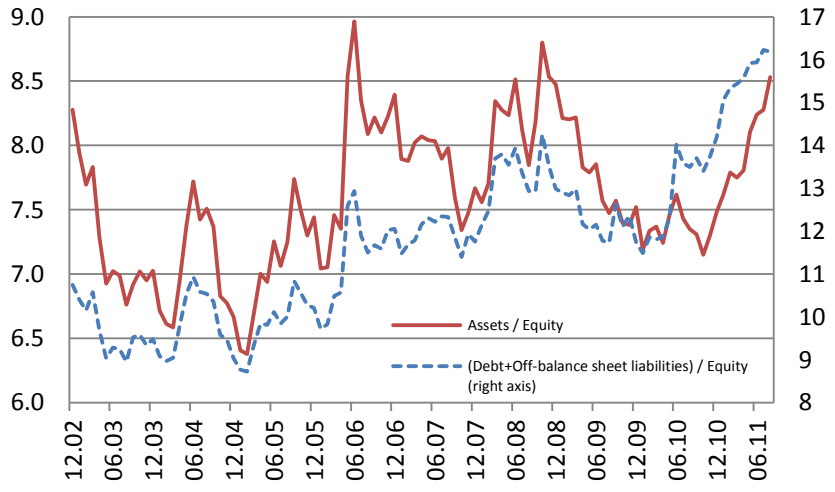
Table 2. Descriptive Statistics

	Commercial Banks		Participation Banks		Development/Investment Banks		Banking Sector	
Leverage	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
I	7.32	0.68	7.60	1.35	1.22	0.22	6.60	0.56
II	12.79	1.92	18.71	7.14	2.51	0.46	11.72	1.87
III	8.32	0.68	8.60	1.35	2.22	0.22	7.60	0.56
IV	7.03	0.51	6.08	0.67	32.11	3.03	7.80	0.53
V	7.66	0.59	6.50	0.76	48.22	6.74	8.57	0.64
VI	11.41	0.85	15.21	2.10	2.63	0.25	10.40	0.66

Notes: All leverage definitions are in proportions except for IV and V, which are in percentages.

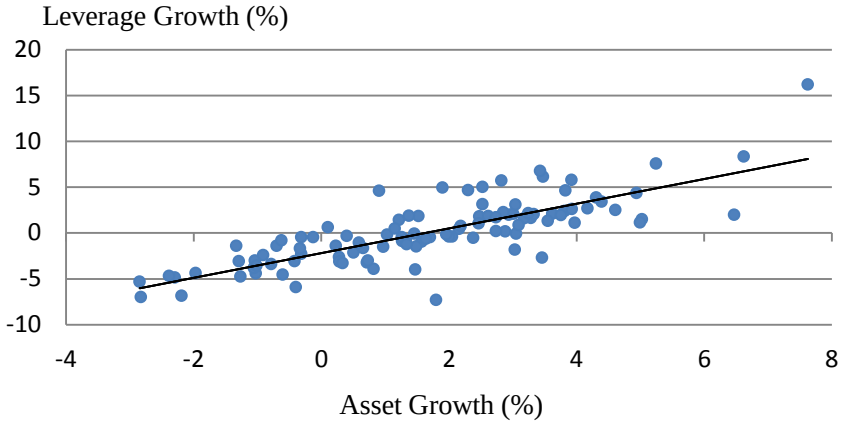
When Leverage-II and III definitions are examined for the banking sector, it is seen that Leverage-II displays an increasing trend due to the increase in off-balance sheet transactions, whereas the assets/equity ratio (Leverage-III) displays cycles that have relatively longer durations and the ratio fluctuates around the mean of 7.6 (Figure 1). For example, after the last quarter of 2008 in which the global crisis has spread to the emerging markets, there is a clear cycle in the leverage ratio and this cycle overlaps with the credit cycle. Therefore, as discussed earlier, this relationship between leverage and credit cycle might provide an opportunity for policy makers to use the leverage as a macroprudential tool to smooth the financial cycles.

Figure 1. Time-series Behavior of the Leverage Ratios



Data source: Banking Regulation and Supervision Agency (BRSA).

Figure 2. Growth of Assets and Leverage-III



Data sources: BRSA and the Central Bank of the Republic of Turkey .

It is necessary to examine the relationship between various leverage definitions and the asset growth to test statistically whether leverage is procyclical. As an example, Figure 2 displays a strong positive relationship between asset growth and assets/equity ratio which is a widely used as a measure of leverage for the banking sector. We first consider the following model to formally test whether leverage is procyclical.

$$Y_t = \beta_0 + \beta_1 X_t + \beta_2 t + \varepsilon_t \qquad (2)$$

where Y is the leverage growth, X is the asset growth, i and t denote banks and time, respectively, and ε is the error term. A trend term is included to control for trends in the leverage growth. Standard errors are adjusted for possible heteroskedasticity and serial correlation.

Table 3. Leverage and Asset Growth Relationships - Estimation Results for the Sector

	(1)	(2)	(3)	(4)	(5)	(6)
Asset Growth	1.547***	1.329***	1.344***	-0.967***	-1.084***	1.177***
	(0.117)	(0.126)	(0.102)	(0.093)	(0.101)	(0.120)
Trend	0.009*	0.014**	0.008**	-0.013**	-0.014***	0.008**
	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.004)
Constant	-2.998***	-2.449***	-2.623***	2.370***	2.619***	-2.409***
	(0.275)	(0.289)	(0.234)	(0.401)	(0.418)	(0.279)
N	103	103	103	103	103	103
R-squared	0.633	0.414	0.636	0.348	0.367	0.456

Notes: All estimations are done by OLS. Dependent variables are the leverage ratios defined in Table 1. Heteroskedasticity and serial correlation adjusted standard errors are given in the parentheses. ***, **, and * show significance levels at 1%, 5%, and 10% levels, respectively.

Results presented in Table 3 show that the relationship between asset growth and the leverage ratio is statistically significant for the banking sector.[5] These results indicate that the leverage is procyclical for the banking sector, hence higher asset growth is associated with higher leverage. The statistically significant coefficient of the trend term shows that the banks' leverage has an increasing trend in Turkey.

The following model is utilized to see how results change when different banking models are considered:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \alpha_1 D_1 + \beta_2 (X_{it} \times D_1) + \alpha_2 D_2 + \beta_3 (X_{it} \times D_2) + \beta_4 t + \varepsilon_{it} \quad (3)$$

where Y is the leverage growth, X is the asset growth, D_1 and D_2 are dummy variables for participation and development/investment banks, respectively, i and t denote banks and time, respectively, and ε is the error term. A trend term is included to control for trends in the leverage growth and standard errors are adjusted for possible heteroskedasticity and serial correlation. The commercial banks is the excluded category when defining the dummy variables for bank groups. $\beta_1 \neq 0$, $\beta_1+\beta_2 \neq 0$, and $\beta_1+\beta_3 \neq 0$ indicate a statistically significant relationship between leverage and asset growth for the commercial banks, participation banks, and development/investment banks, respectively. When the estimated values of β_1, $\beta_1+\beta_2$, and $\beta_1+\beta_3$ are positive (negative) for Leverage I,II,III,VI (Leverage IV,V), the leverage is procyclical.

Table 4 presents results from estimating Equation 2. Results from joint hypotheses tests indicate that the leverage of the participation banks is not procyclical, whereas the leverage of the commercial banks and development/investment banks are procyclical. In addition, leverage has a statistically significant positive (negative) trend for Leverage-I, II, III, VI (Leverage-IV, V) indicating that banks operated with an increasing leverage during our sample period.

[5] Since a significant portion of assets and debts of the banks in Turkey is held in foreign currency, we also test whether the leverage is still procyclical when we adjust for exchange rate effect. The basket value used to adjust for exchange rate effect for our sample period (12:2002-08:2011) is composed of foreign exchange selling rate of 70 percent of US dollar and 30 percent of euro. The weights of US dollar and euro in the basket are based on the weights of dollar and euro denominated assets. We find that the leverage is still procyclical, but the magnitude of procyclicality is reduced. These results are not reported to save space, but available from the authors.

Table 4. Leverage and Asset Growth Relationships According to Banking Groups

	(1)	(2)	(3)	(4)	(5)	(6)
Asset Growth	1.555***	1.306***	1.369***	-0.955***	-1.062***	1.206***
	(0.142)	(0.141)	(0.125)	(0.084)	(0.092)	(0.143)
D_1	1.011	3.340	0.894	-0.992	-1.139	1.079
	(0.867)	(2.395)	(0.756)	(0.797)	(0.854)	(0.761)
Asset Growth*D_1	-1.021***	-1.168***	-0.909***	0.679**	0.763**	-0.885***
	(0.385)	(0.411)	(0.339)	(0.302)	(0.321)	(0.331)
D_2	-0.300	-0.090	0.582***	-0.058	0.664	0.781***
	(0.278)	(0.537)	(0.210)	(0.333)	(0.466)	(0.264)
Asset Growth*D_2	0.350**	0.290	-0.319**	-0.122	-0.588***	-0.219
	(0.164)	(0.193)	(0.138)	(0.152)	(0.213)	(0.158)
Trend	0.018***	0.030**	0.014***	-0.016***	-0.020***	0.011***
	(0.005)	(0.013)	(0.004)	(0.004)	(0.005)	(0.003)
Constant	-3.402***	-3.245***	-2.923***	2.521***	2.899***	-2.628***
	(0.291)	(0.734)	(0.231)	(0.348)	(0.394)	(0.287)
N	284	284	284	284	284	284
R-squared	0.597	0.106	0.531	0.313	0.376	0.403
Joint Hypotheses						
$\beta_1 + \beta_2$	2.230	0.130	2.130	0.900	0.950	1.160
$\beta_1 + \beta_3$	531.80***	144.89***	317.56***	71.84***	73.79***	197.50***

Notes: All estimations are done by OLS. Dependent variables are the leverage ratios defined in Table 1. D_1 and D_2 are dummy variables for participation and development/investment banks, respectively. Heteroskedasticity and serial correlation adjusted standard errors are given in the parentheses. Commercial banks are the base group. Joint hypotheses test results report the values of the χ^2 statistic. ***, **, and * show significance levels at 1%, 5%, and 10% levels, respectively.

3.2. Determinants of Leverage and Decomposition

The determinants of leverage are well documented in the corporate finance literature. For instance, motivated by Modigliani and Miller (1985)'s seminal work, Rajan and Zingales (1995) is one of the main studies that investigates the determinants of the capital structure of non-financial firms of the G-7 countries. The empirical literature on the capital structure and leverage has showed that the main set of determinants include size, collateral, profit, market-to-book ratio, and dividend payment.[6] Therefore, given that size, collateral, and profit are being the main determinants of leverage as in Kalemli-Ozcan et al. (2011), we investigate the role of these variables using our aggregate data for the banking industry by estimating the following model:

$$L_t = \beta_0 + \beta_1 Log(Size_{t-1}) + \beta_2 Profit_{t-1} + \beta_3 Collateral_{t-1} + \varepsilon_t, \quad (4)$$

where L is leverage defined as assets/equity or alternatively 1-(equity/assets), *Size* is measured by total assets, *Profit* is net income/assets, and *Collateral* is

[6] For other studies that examine the determinants of the capital structure and leverage of both banks and non-financial firms, see Gropp and Heider (2010) and Kalemli-Ozcan et al. (2011).

measured by total of securities, treasury bills, bonds, cash and due from banks over total assets, and ε is the error term. The standard prediction regarding these factors is that the leverage is positively correlated with size and collateral and negatively correlated with profits.[7]

Table 5 shows the results of estimating Equation 4. Specifications (1) and (2) indicate that all coefficients are statistically significant at one or five percent level. The sign of the coefficients of balance sheet size and profits are consistent with the standard regressions of Rajan and Zingalez (1995), Gropp and Heider (2010), and Kalemli-Ozcan et al. (2011). Hence, the banks' leverage depends positively on size and negatively on profits. The sign of the coefficient of collateral, on the other hand, is negative in our case, which contradicts with the standard view. This, however, could be the case since the share of collateral in balance sheet, which mostly consists of securities portfolio including treasury bonds and bills, declines as the balance sheet expands. For instance, the correlation of yearly asset growth and credit growth is 0.81, while the correlation of asset and security portfolio growth is -0.16 in our sample.

Table 5. Leverage Determinants and Decomposition

	[Assets/Equity]	[1-(Equity/Assets)]	Non-deposit liab.	Deposits	Non-core liab.
	(1)	(2)	(3)	(4)	(5)
Log(Size)	0.400**	0.008**	1.661***	-0.910***	1.713***
	(0.172)	(0.003)	(0.362)	(0.344)	(0.319)
Profit	-0.073**	-0.001**	-0.280**	0.156	-0.242**
	(0.036)	(0.001)	(0.136)	(0.130)	(0.123)
Collateral	-0.092***	-0.002***	-0.332***	0.179	-0.349***
	(0.033)	(0.001)	(0.108)	(0.109)	(0.086)
Constant	5.704**	0.825***	15.254**	67.238***	7.299
	(2.679)	(0.046)	(6.957)	(4.976)	(5.661)
Observations	104	104	104	104	104
R-squared	0.415	0.417	0.653	0.398	0.688

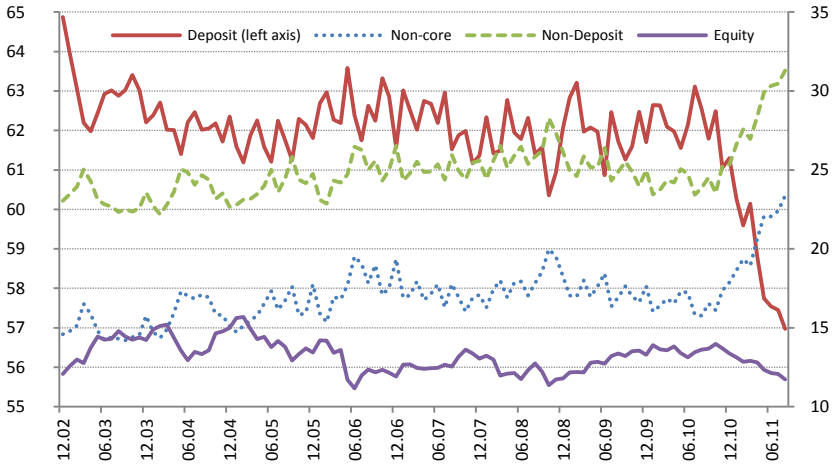
Notes: Heteroskedasticity and serial correlation adjusted standard errors are given in the parentheses. ***, **, and * show significance levels at 1%, 5%, and 10% levels, respectively.

Following Gropp and Heider (2010), we use 1-(equity/assets) to illustrate the decomposition of leverage. Since banks can finance assets with both deposits and non-deposit liabilities (=total liabilities net of deposits and equity), it is important to document which of these components is the main driver of procyclical leverage. For instance, the correlation between deposit and non-deposit liabilities (both as a share of total assets) is -0.83 and correlation between deposits and non-core liabilities is -0.79 in our sample.

[7] In contrast to market or corporate finance view on predicted effect of the leverage determinants, the buffer view predicts positive effect of profit, while no effect of collateral. For this classification and related discussions, see Gropp and Heider (2010).

Figure 3 also illustrates the evolution of these indicators over time. Therefore, both simple correlation and graphical illustration of bank liabilities show that banks have substituted non-deposits for deposit (or vice versa) over our sample, with marked increase in substitution in recent periods.

Figure 3. Liabilities – Deposit and Non-Deposits (as share of total assets)



Data sources: BRSA and the Central Bank of the Republic of Turkey.

The substitution between deposit and non-deposit liabilities is investigated by estimating the following equation:

$$Liab_t = \beta_0 + \beta_1 Log(Size_{t-1}) + \beta_2 Profit_{t-1} + \beta_3 Collateral_{t-1} + \varepsilon_t, \qquad (5)$$

where Liab denotes either deposit, non-deposit or non-core liabilities as percentage of total liabilities. Other variables are as defined in Equation 4. Using a classification similar to Hahm et al. (2012), we define non-core liabilities that include payables to money market, payables to securities market, payables to banks, and funds from repo transactions. Shin and Shin (2011) and Hahm et al. (2012) argue that non-core liabilities could be used to gauge the stage of the financial cycle, and propose an approach to bank liability aggregates based on the distinction between core and non-core liabilities. Therefore, besides total non-deposit liabilities, we also look at its sub-component of non-core liabilities to investigate its implication for leverage.

The results of estimating Equation 5 are presented in Specification (3) to (5) in Table 5. The estimation results for non-deposit and non-core liabilities are consistent with the leverage regression implying that the cyclical behavior of leverage overlaps with non-deposit funding. In other words,

when banks increase their leverage and expand balance sheets, they raise funding through non-deposit liabilities rather than core liabilities or deposits.

4. Conclusions

This study shows that leverage of the Turkish banking sector is procyclical. In addition, the relation between leverage and asset growth differs according to the business models of the banks. Procyclicality of the leverage indicates that the expansion and contraction of the bank balance sheets accelerate the credit cycles implying that bank leverage and business cycles are related.

Among the determinants of leverage, balance sheet size and profits significantly affect the leverage. These results are consistent with the predictions in the corporate finance literature including Gropp and Heider (2010) and Kalemli-Ozcan et al. (2011). In addition, we document that banks use non-deposits and deposits as substitutes during our sample period, with marked increase in recent periods. The estimation results for non-deposit and non-core liabilities are consistent with the leverage regression implying that when banks increase their leverage and expand balance sheets, they raise funding through non-deposit liabilities rather than core liabilities or deposits. Thus, non-deposit and non-core liabilities are important drivers of leverage in our sample.

D'Hulster (2009) argues that the leverage should be used as a macro- and micro-prudential tool. He discusses that the leverage ratio is a useful and easy-to-use policy tool, but it is not a tool to limit the debt and riskiness of the financial system when used alone. In this context, as argued by D'Hulster (2009), some authors think that the use of the leverage ratio together with Basel type capital adequacy ratios might decrease the risks of the banks and the whole financial system originating from high leverage.

Considering the results from the current literature suggesting that the leverage is procyclical and triggers financial cycles (Geanakoplos, 2009), the increases in credit and assets might be limited by employing a dynamic countercyclical leverage rule. That is, lowering the leverage ratio when the asset growth of the banks is high, and raising it in the opposite case should contribute to smoothing credit/financial cycles. Accordingly, a countercyclical leverage ratio interval is a possible policy proposal.

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