Keywords: size, credit margin, funding cost, deposit interest rate, loan interest rate, gross profit, operating profit, and banks.

SIZE DOES MATTER: EMPIRICAL EVIDENCE FROM ISE-LISTED BANKS

Our study of ISE-listed commercial banks operating in Turkey indicates that the larger [smaller] the bank size, the lower [higher] the deposit interest rate (funding cost) and, therefore, the higher [lower] the bank credit margin will be. Also, loan interest rates do not explain why larger banks have higher credit margins than those of their smaller counterparts.

ÖNDER KAYMAZ is Assistant Professor in the Faculty of Economics and Administrative Sciences, Department of Business, Izmir University of Economics, Izmir, Turkey. Email: onder.kaymaz@ieu.edu.tr

MUSTAFA PEHLIVAN is an investment analyst in the Directorate of Investment Management, Turkish Airlines Inc. (THY A.O.). Email: mustafapehlivan@gmail.com

ÖZGÜR KAYMAZ is a Supervisor in the Inspection Board Directorate, Turkish Airlines Inc. (THY A.O.). Email: okaymaz@thy.com

Banks are strong economic agents that play an important role in economies through the provision of credit and financial services, more broadly. Their main role is financial intermediation, with commercial banks being the key providers of this activity.

In delivering financial intermediation services, the role of commercial banks (henceforth referred to as banks) is to collect deposits and grant loans. Once the inflows (revenues) accruing from loans granted exceed the outflows (expenses) incurred from deposits, a bank realises some net inflow (income) and records it as profit to its books. Should the opposite occur, the bank would bear some loss. Such profits or losses are gross profits or losses incurred as banks conduct their main activity — financial intermediation.

Gross profits are important indicators of corporate profitability not only for banking firms but for any other type of firm involved in financial performance evaluation. This is because they reveal viable (fundamental) corporate financial success since they, by definition, rely on firms performing their main course of actions as given above.

Some banks lead the market while others necessarily follow. Irrespective of whether they are operating cross border as a multinational or domestically, banks can have very different economic properties. Some may benefit from funding cost advantages while others might not. Size, a widely recognised brand name or market reputation, scale, and early entry to the market may be some underlying factors that lead to relatively lower funding costs. As banks usually operate under imperfect competition, having a cost advantage can be a key driver of financial success and ensure a bank's survival over the long run.

Larger banks usually have lower funding costs than smaller banks in Turkey. Funding costs are primarily interest expenses incurred through paying depositors for their time deposits. Therefore, they are sales costs for banks.

Table 1b presents average asset sizes (Panel A) and average deposit interest rates (Panel B) for all the banks quoted in the Istanbul Stock Exchange (ISE) of Turkey from 2002 to 2009. It is clear from the table that, on average, deposit rates fall as asset sizes grow. More generally, deposit rates fall (rise) in the banks with larger (smaller) asset sizes.

A bank is expected to make a gross profit through granting loans on the basis of the deposits they collect. Income or revenue accrued from charging interest rates on loans is interest income while the cost or expense incurred from charging interest rates on deposits is interest expense. The former, being the main source of income, is a sales revenue and the latter, being the main or ordinary source of expense, is a sales cost for regular banks. Once the interest revenues banks earn outweigh the interest expenses they incur, they realise gross profit. They realise gross losses if the opposite holds.

TABLE 1A: *Translation of Gross Profit Into Credit Margin*

(1). Sales Revenue (in %): Loan Interest Rate (a)
(2). Sales Cost (in %): Deposit Interest Rate (b)
[(1) — (2) =] (3). Gross Profit (in %): Credit Margin [= (a) — (b)]

TABLE 1B: *Size, Deposit Interest Rate (Funding Cost), Loan Interest Rate, Credit Margin*

Panel A. Total Assets Sizes of The Listed Commercial Banks in 2002-9 (rounded to the nearest TL. [000])*								
Banks	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Akbank	24.452.559	26.240.468	31.639.747	45.881.253	55.493.073	65.154.778	80.727.563	90.845.148
Alternatifbank	1.247.543	1.154.407	1.262.344	1.339.860	1.809.295	2.183.577	3.201.934	3.482.118
Denizbank	3.371.191	3.918.639	5.873.956	7.947.624	10.418.210	12.893.845	18.007.151	20.612.075
Finansbank	4.926.857	5.431.294	7.440.522	10.818.966	16.341.657	18.598.421	24.718.470	27.242.937
Fortisbank	3.894.487	4.278.001	6.427.978	6 .786.519	8.266.806	9.046.756	11.132.669	11.295.578
Garanti Bank.	19.563.059	20.349.308	25.047.131	31.122.927	45.828.374	59.534.820	78.596.082	98.634.817
Halkbank	n/a	n/a	21.790.358	25.917.223	32.719.289	37.703.082	47.320.500	55.151.528
İş Bankası	23.731.290	26.870.257	35.480.789	52.046.019	70.205.836	78.025.572	90.453.567	105.632.489
Şekerbank	2.191.348	2.363.973	2.889.730	3.159.476	3.530.807	5.300.413	7.516.465	8.505.639
TEB	2.373.182	2.520.307	3.435.124	4.484.686	7.123.723	10.323.969	14.047.863	13.948.058
Tekstilbank	1.082.031	1.100.885	1.176.855	1.504.071	2.370.265	2.798.545	3.181.619	2.173.945
Vakıfbank	12.733.306	14.904.240	19.835.766	28.744.040	34.963.091	39.959.113	49.335.647	60.231.888
YKB	18.825.275	19.561.743	23.475.907	24.119.721	32.056.600	48.204.479	59.058.169	64.324.741
Panel B. Deposit Interest Rates (Funding Costs) of The Listed Commercial Banks in 2002-9 (in %)*								
Banks	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Akbank	45.48	29.15	17.93	14.5	14.22	15.04	15.75	9.51
Alternatifbank	54.60	43.55	23.89	17.93	16.30	20.54	17.81	15.15
Denizbank	44.15	31.70	22.58	17.09	17.1	18.19	18.22	11.12
Finansbank	45.05	36.27	3.41	17.37	17.49	18.1	18.30	11.00
Fortisbank	43.77	36.58	22.79	17.84	16.82	18.25	18.45	12.00
Garanti Bank.	45.75	31.25	19.31	15.09	14.32	15.38	15.44	9.60
Halkbank	n/a	n/a	18.22	14.09	14.06	16.53	15.80	12.16
İş Bankası	38.93	30.12	17.57	13.41	13.99	16.04	15.32	9.36
Şekerbank	43.75	42.62	23.23	18.48	17.30	16.82	17.39	13.20
TEB	43.01	30.89	23.83	17.53	17.57	18.21	15.33	11.92
Tekstilbank	52.36	40.56	23.62	20.2	19.4	19.49	20.92	11.86
Vakıfbank	n/a	35.47	17.96	15.81	14.17	15.58	20.13	10.54
YKB	45.71	33.88	18.52	13.92	14.77	19.03	18.09	9.61
Panel C. Loan Interest Rates of The Listed Commercial Banks in 2002-9 (in %)*								
Banks	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Akbank	61.06	51.67	28.46	24.14	21.39	21.85	20.85	17.63
Alternatifbank	59.00	47.54	31.93	25.48	21.29	24.70	23.35	23.01
Denizbank	50.63	26.75	29.19	20.60	18.51	21.16	20.44	20.87
Finansbank	47.09	48.31	44.12	38.22	31.05	28.06	23.46	23.57
Fortisbank	58.06	44.38	33.32	24.46	20.56	23.03	22.80	15.50
Garanti Bank.	67.53	59.02	38.52	31.49	24.71	23.22	23.26	21.37
Halkbank	n/a	n/a	36.61	26.26	23.38	21.17	20.60	14.69
İş Bankası	50.08	50.47	34.74	26.57	20.12	22.14	21.93	20.40
Şekerbank	70.00	47.42	52.33	34.28	26.76	22.26	21.30	23.44
TEB	51.48	44.20	28.58	24.60	20.09	23.67	23.48	20.29
Tekstilbank	60.48	48.59	29.98	24.84	23.12	23.76	23.99	19.04
Vakıfbank	54.74	48.72	34.04	27.96	20.84	20.66	20.13	18.01
YKB	58.37	50.30	33.31	23.89	24.88	21.10	22.24	20.95
Panel D. Credit Margins of The Listed Commercial Banks in 2002-9 (in %)**								
Banks	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Akbank	15.58	22.53	10.53	9.63	7.17	6.81	5.1	8.12
Alternatifbank	4.40	3.99	8.04	7.55	4.98	4.16	5.53	7.86
Denizbank	6.48	21.80	6.61	3.51	1.41	2.97	2.22	9.75
Finansbank	2.04	12.04	20.71	20.85	13.56	9.96	5.17	12.58
Fortisbank	14.29	7.81	10.52	6.61	3.74	4.77	4.35	8.66
Garanti Bank.	21.78	27.76	19.21	16.4	10.39	7.84	7.81	11.77
Halkbank	n/a	n/a	18.39	12.16	9.31	4.63	4.79	7.43
İş Bankası	11.15	20.35	17.17	13.16	6.12	6.1	6.62	11.04
Şekerbank	26.25	4.80	29.09	15.81	9.46	5.44	3.91	10.24
TEB	8.47	13.31	4.75	7.07	2.53	5.46	8.15	8.37
Tekstilbank	8.12	8.04	6.36	4.65	3.72	4.27	3.07	7.19
Vakıfbank	54.74	13.25	30.04	23.95	16.84	16.66	4.95	7.48
YKB	12.66	16.43	14.79	9.97	10.1	2.08	4.15	11.34

Source: Calculated using the data available from the Istanbul Stock Exchange (ISE)'s or banks' own websites. See Endnote 1 for Notes to this table.

We argue that the reason why larger banks are likely to have higher credit margins is because their funding costs are significantly lower than those of smaller banks.

In the literature, the difference between the rate of interest that is charged on a loan and the rate of interest that is applicable to deposits is called bank credit margin or interest spread (henceforth, credit margin or margin). With academics generally defining margin as pure spread, we can say that margins are the premia or the compensation banks receive in return for performing pure intermediation activities.[2] In light of the above discussion, we go further and argue that credit margin is the key driver of banks' gross or main operating profits. Table 1a shows how gross profit translates into credit margin.

Panel D in Table 1b presents average credit margin values for the banks quoted in the ISE for the period 2002—2009. Table 1b indicates that banks with larger asset sizes have higher credit margins on average, as their funding costs (deposit interest rates) are lower relative to those facing higher interest rate exposures.

There are two empirical objectives of this paper. The main objective is to document whether larger banks have higher credit margins relative to smaller banks. Bank size is proxied by total assets. We argue that the reason why larger banks are likely to have higher credit margins is because their funding costs are significantly lower than those of smaller banks. Funding cost is proxied by deposit interest rate. We hypothesize that: the larger [smaller] the bank size, the lower [higher] the deposit interest rate and therefore the higher [lower] the bank credit margin will be. Our other objective is to investigate this hypothesis. Sampling the period running from the last quarter of 2002 through the last quarter of 2009 for all the listed banks whose stocks are publicly traded on the ISE, we perform a number of empirical investigations to meet these objectives.

The venue for this study is Turkey where banks finance their assets largely through deposits. This is the case not only in countries with emerging financial markets like Turkey but also in those with advanced capital markets (e.g. United States, Japan, Australia, Germany, United Kingdom and Canada).[3] This observation highlights the significance of the deposit interest rate in the composition of the credit margin as a key funding cost.[4] The recent global financial crisis further highlighted the importance of this relationship.[5] The purpose of our research here is to examine this relationship. We believe that the findings of this study may well be relevant to a wide range of economies across the globe, including Australia. The next section presents the empirical analysis along with test results.[6]

Empirical analysis

Prior literature

To the best of our knowledge, this is the first empirical study of the effect of size on bank credit margin across funding costs. There are some studies about leveraging across varying credit margin definitions. Among these are works considering margin in connection with the 'return on assets' ratio. For instance, Ho and Saunders (1981) define margin as a proportion of average bank assets. The authors of this early study, which is recognised as one of the seminal papers on margin literature, developed a spread model. A bank, acting as a mediating institution (intermediary) between those who are demanding and those who are supplying funds, is considered a risk-averse dealer. To measure bank efficiency, Kunt and Huizinga (1999) describe margin as an accounting value of a bank's *net interest income* over *total assets*. Thus, margin becomes net interest margin.

Building on Bartholdy et al. (1997), Barth et al. (1997) and Kunt and Huizinga (1999), Abreu and Mendes (2001) define margin as a ratio of *net interest amount* [interest received – interest paid] over *total assets*. They employ four different dependent variables to secure the robustness of their results. Similarly, using three different measures to control for bank profitability, Kaya (2002) defines margin as a ratio of *net interest income* or *revenue* to *total assets*. We note that definitions vary in such spread identifications based on the figures rating net interest proceeds.

Building on the concept of the loan and deposit arrival rates identified by Ho and Saunders (1981), Afanasieff et al. (2001) define the loan and deposit rates as: $\lambda_L = \alpha - \beta b$ *and* $\lambda_D = \alpha + \beta a$, where b and a are the fees charged on loans and deposits. The bank margin in the equilibrium, s, is hence obtained as: $s = a + b = (\alpha/\beta) + (1/2)(R)\,\sigma_I^2 Q$, where α/β refers to the risk neutral margin, R to the coefficient of absolute risk aversion, σ_I^2 to the variance of the interest rate on net credit inventories and Q to the size of the deposit/loan transaction (Q).

Hawtrey and Liang (2008) empirically investigate the margin determinants in OECD Member countries, sampling the period from 1987 to 2001. Following Ho and Saunders (1981) and Maudos and Guevara (2004), Hawtrey and Liang consider the banking sector in each of the sampled countries as a single representative banking firm which undertakes a risk-averse dealership position. They assume that banks set a margin (s) as a sum of a (fee charged on deposits) and b (fee charged on loans). 's', which is derived from the difference between loan interest rate and deposit interest rate, captures risk compensation. Hawtrey and Liang (2008) thereby specify average net interest margin as [*(Total Interest Income — Total Interest Expenses) / Average Total Assets*], which is an indicator of return on asset.

In addition to these, there are other studies recognising margins as the difference between loan interest rate

and deposit interest rate. Examining the banking spread pattern in Latin America, Brock and Suarez (2000) develop six proxies to control for margin to lessen measurement problems. They come up with three narrow-based and three wide-based margin definitions. 'Narrow' category comprises loans and deposits. 'Wide' category includes not only loans or deposits but all interest-bearing assets and liabilities together with the commissions and the fees involved. Among those definitions, bank margin is identified as the difference between the interest received on loans and the interest paid out to deposits. It suggests that margin is the value disentangling the rate applicable to the collected deposits from the rate applicable to the loans granted.

More recently, Kaya (2001) models margin as the difference between loan interest rate and deposit interest rate. Her *ex ante* margin definition is inspired by Montes and Landa (1999). In Kaya, interest margin value at the end of a financial period may remarkably diverge from the interest margin value at the beginning of the same financial period. In other words, interest margin value is the change over the financial period.

Sampling the period from 1986 to 2000, Kaya (2001) studies margins in the Turkish banking sector. Defining margin as the difference between loan and deposit interest rates, Kaya provides evidence that margins in Turkey are suffering from severe inflation, and real interest rates in the examined period are high. In particular, privately capitalised banks register higher margins than those of the state-owned banks. The reason for this difference is that the state-owned banks, in lieu of their definition of duties, charge lower loan rates and rely more on deposits than efficiency (profitability) in bank intermediation.

However, as stated already, the literature is silent regarding the effect of size on credit margin across funding costs. The next subsection explains the data structure and the variables used in this study.

Dataset and variable construction

Following Kaya (2002), we are using quarterly data belonging to all the banks whose stocks are publicly traded on the ISE.[7] The accounting data exclusively pertains to the financial information gathered from the banks' financial statements (balance sheets and income statements) as well as their published independent audit reports. Therefore, they are at firm level.

The sample presented in Table 2a includes all listed or quoted commercial banks. These banks are Akbank, Alternatifbank, Denizbank, Finansbank, Fortisbank, Garanti Bankası, Halkbank, İş bankası, Şekerbank, Türk Ekonomi Bankası (TEB), Tekstilbank, Vakıfbank and Yapı Kredi Bankası (YKB). ISE is the major source from which we obtained the data.[8]

Two important legs of the data, average loan and deposit interest rates, have been collected from banks' published independent audit reports. These credit margin-related values were not, however, available before the fourth (last) quarter of 2002 for any of the banks. For this reason, our sampling time spans the period from the last quarter (October—December) of 2002 to the last quarter of 2009 (October—December). In other words, we consider the widest sampling window available. This helped us to obtain the most representative results possible.

In Turkey, banks are mainly governed by the Banking Regulation and Supervision Agency (BRSA) for their banking-related activities. Once they become publicly listed, they start to be governed by and responsible to the Capital Markets Board (CMB) for their capital markets-related operations as well. The CMB often drafts and discloses communiqués to assure a complete, proper and accurate enforcement of the capital markets statute.[9]

We note that listed banks' financial reporting regimes were subject to changes, all of which were handled by the CMB and others. For instance, as concerns the last quarter of 2002 and the first quarter of 2003, the ISE provides us with historical cost-based financial statements prepared in compliance with the (CMB's) communiqué named serial XI No: 11. As from the second quarter of 2003, we also note that banks' financial statements were prepared and presented in two financial statement formats in line with the different reporting regimes: solo and consolidated.

For the second, third and fourth quarters of 2003, as well as for all the periods in 2004, the ISE provides versions of financial statements for banks: inflation-adjusted unconsolidated financial statements and inflation-adjusted consolidated financial statements. The solo version was compiled in compliance with the communiqué named serial XI No: 20 while the consolidated version was compiled in accordance with the communiqué named serial XI No: 21.

TABLE 2A. *Descriptives: 'Total Assets' is the proxy for bank size*

Credit Margin (CM)	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	200	7.9884	7.67176	.54248	6.9186	9.0581	-45.00	41.22
2	167	11.2532	6.89943	.53389	10.1991	12.3073	1.15	54.74
Total	367	9.4740	7.49942	.39147	8.7042	10.2438	-45.00	54.74

Inflationary accounting-based financial reporting did not last long. The fourth quarter of 2004 was the last time banks prepared inflation-adjusted financial statements. From 2005 to 2007, both solo and consolidated versions were produced in accordance with the communiqué named serial XI No: 25. The communiqué was *de facto* compatible with IFRS. From 2008 forward, banks have been mandated to provide IFRS-based financial reporting. Both solo and consolidated financial statements are required to be prepared in line with the communiqué named serial XI No: 29. The communiqué is *de jure* compatible with IFRS.[10]

Consolidated financial statements comprise data not only relevant to banks but also to all other related financial group firms such as affiliated businesses, entities and subsidiaries. However, solo financial statements only include the data relevant to banks per se. For this reason, we consider banks' solo financial statements where available.

Building on Ho and Saunders (1981), we divided our sample into two sections, in order to understand the effect of size on credit margins. We had two banking groups: larger banks versus smaller banks. 'Total assets' (asset size) has been exploited to capture bank size. Put differently, 'total assets' was chosen as a proxy for bank size.

The dependent variable is bank credit margin. For the setup of this variable, we follow the margin definitions suggested in Brock and Suarez (2000) and Kaya (2001). Credit margin was thus obtainable as the difference between average loan interest rate and average deposit interest rate. For the nature of the deposits, we consider Eroğlu (2001) who builds a function characterising the sourcing (funding) costs. Following Eroğlu (2001), deposit rate is considered as the bank-specific interest rate applicable to the time deposits collected in domestic currency (TL). Likewise, loan rate is considered as the bank-specific interest rate applicable to the loans granted in domestic currency only.

We observe that, in Turkey, deposits collected in TL constitute the highest proportion within the aggregate amount of the deposits collected. Therefore, different from Eroğlu (2001) and following Ho and Saunders (1981), we restrict the coverage of deposits to time deposits only, i.e. the deposits that are collected from customers in TL. Put differently, we exclude any other type of deposits — such as sight or demand deposits *or* time deposits that are collected in foreign currency terms.

Likewise, we only consider the loans granted in TL as it constitutes the highest proportion within the aggregate amount of the loans granted. Credit margin then becomes the difference between the average *loan interest rate* applicable to the loans granted in TL and the average *deposit interest rate* applicable to the time deposits collected in TL.[11] The next subsection conducts a set of empirical investigations to document our arguments and to accomplish the stated objectives.

Tests

Size — margin relationship

Our goal here is to explore whether banks that are larger (smaller) in size gain higher (lower) credit margins relative to banks that are smaller (larger) in size. That is, we aim to see if bank size accounts for the difference in the margin value. As analysis of variance (ANOVA) is a technique widely used in the literature to measure group differences, we consider it an appropriate analysis to perform here. Since there is only one explanatory variable regressing the margin, 'size', one-way ANOVA is conducted.

Bank size is proxied as total assets. For the execution of ANOVA, we divide the data into two sections: the group with larger asset sizes and the group with smaller asset sizes. In determining the groups, for each quarter, average value of asset size of the banks is calculated. The banks whose asset sizes are equal to or greater than the average asset size are considered to be the larger banks. On the other hand, banks whose asset sizes fall behind the average asset size are considered to be the smaller banks. The model is estimated as:

$$CM_{ab} = \delta + SIZE_{a} + \varepsilon_{ab}$$

where CM is bank-specific credit margin, SIZE is bank-specific size, δ is overall effect and ε_{ab} is the error term. Table 2a presents the descriptives when 'total assets' is proxied to capture bank size. Group 1 refers to smaller banks (banks with smaller total assets), Group 2 to larger banks (banks with larger total assets). It shows that, on average, larger banks have a credit margin of 11.25% while smaller banks have a credit margin of 7.99%.

Table 2b presents ANOVA results. The significance column shows that there is a robustly significant difference between the groups as p-value approaches 0. Therefore, we can say that banks with larger asset sizes realise higher or wider credit margins than the banks with smaller asset sizes.

TABLE 2B. *ANOVA: 'Total Assets' is the proxy for bank size*

Credit Margin (CM)	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	970.063	1	970.063	18.052	.000
Within Groups	19614.272	365	53.738		
Total	20584.335	366			

TABLE 2C. *Descriptives: 'Total Assets' is the proxy for bank size*

Credit Margin (CM)	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
1	200	21.8036	9.67061	.68382	20.4551	23.1520
2	166	17.4005	7.36281	.57146	16.2722	18.5288
Total	366	19.8065	8.96172	.46844	18.8854	20.7277

TABLE 3A. *Relationship between Total Assets and Deposit Interest Rates*

Random-effects GLS Regression	Number of obs = 366
Group variable: banks	Number of groups = 13
R-sq: within = 0.2028 between = 0.6717 overall = 0.1832	Obs per group: min = 23 avg = 28.2 max = 29
Random effects u_i ~ Gaussian corr(u_i, X)= 0 (assumed)	Wald chi2(0) = . Prob>chi2 = . (Std. Err. adjusted for clustering on banks)

dir|	Coef.	Rob.Std. Err.	z	P>|z|	[95% Conf. Interval]	
ta|	-1.47e-10	1.26e-11	-11.73	0.000	-1.72e-10	-1.23e-10
_cons|	23.55234	.6879245	34.24	0.000	22.20403	24.90065

sigma_u | .15881548
sigma_e | 7.8606121
rho | .00040803 (fraction of variance due to u_i)

The preceding empirical evidence strongly documents that larger banks have higher credit margins than the smaller ones. We argue that this is because their funding costs are significantly lower than those of smaller banks.

Size-funding cost relationship

The preceding empirical evidence strongly documents that larger banks have higher credit margins than the smaller ones. We argue that this is because their funding costs are significantly lower than those of smaller banks. Our goal here is to examine if banks that are larger (smaller) in size have lower (higher) funding costs than banks that are smaller (larger) in size. That is, we aim to see if bank size accounts for the difference in the funding cost value. As there is only one explanatory variable regressing the deposit interest rate, 'size', we perform a one-way ANOVA as in the preceding section.

Funding cost is proxied by deposit interest rate. Following the data grouping procedure indicated above, we divide banks into two groups. Group 1 refers to banks with smaller assets and Group 2 to banks with larger assets. We hence estimate the model as:

$$DIR_{ab} = \delta + SIZE_a + \varepsilon_{ab}$$

where *DIR* is bank-specific deposit interest rate, *SIZE* is bank-specific size, δ is overall effect and ε_{ab} is the error term.

Table 2c presents descriptives on deposit interest rates when total assets is proxied to capture bank size. It is clear that, on average, smaller banks and banks with lower credit margins have an average deposit interest rate of 21.8%. Larger banks, in other words, banks with higher credit margins, have an average deposit rate of 17.4%. The table reports that the difference on groups' deposit interest rates is robustly significant.[12] It suggests that larger banks with higher credit margins have lower funding costs than smaller banks with lower credit margins.

We perform panel data analyses to see how total assets are related to deposit interest rates. The panel regression models are specified as:

$$DIR_{it} = \delta_{0i} + \delta_i SIZE_{it} + \varepsilon_{it} \quad (1)$$

$$DIR_{it} = \delta_0 + \delta_i SIZE_{it} + \varepsilon_{it} \quad (2)$$

(1) and (2) above predict, respectively, random and fixed effects panel regressions. *SIZE*, being bank-specific size, is the independent variable regressing bank-specific deposit interest rate (*DIR*). *SIZE* refers to total assets (*ta*). Subscripts *i* and *t* refer to, respectively, cross-section (bank) and time.

Table 3a reports that there is a negative relationship between total assets and deposit interest rates. This relationship is significant at 1%. Every one unit increase in total assets results in a 1.47 unit decrease in deposit interest rates. Overall coefficient of determination, R^2, is 18.32%. This means that a change in total assets accounts for around 18% of the change in deposit interest rates.[13]

Size-loan interest rate relationship

We suspect that larger banks have higher credit margins because their loan interest rates might be higher, besides having lower funding costs. The goal here is to see if loan interest rates account for the difference in banks' credit margins. As there is only one independent variable regressing the loan interest rate, 'size', we perform a one-way ANOVA.

Following the same procedure indicated above, we split the data into two groups: the group with larger asset sizes and the group with smaller asset sizes. We thus estimate the model as the following:

$$LIR_{ab} = \delta + SIZE_a + \varepsilon_{ab}$$

where *LIR* is bank-specific loan interest rate, *SIZE* is bank-specific size, δ is overall effect and ε_{ab} is the error term.

As shown in Table 3b, we could not find any significant relationship. The difference in groups' loan interest rates is not significant.[14] The table reports that loan interest rates of larger and smaller banks are similar.

Table 3c presents descriptives when 'total assets' is proxied to capture bank size. Group 1 stands for smaller banks and Group 2 for larger banks. We see that, on average, smaller banks (29.79%) have higher loan interest rates than larger banks (28.55%). This explains the ANOVA result in Table 3b.

In addition, we perform panel data examinations to see more closely how size relates to loan interest rate. The panel regression models are specified as the following:

$$LIR_{it} = \delta_{0i} + \delta_i SIZE_{it} + \varepsilon_{it} \quad (1)$$

$$LIR_{it} = \delta_0 + \delta_i SIZE_{it} + \varepsilon_{it} \quad (2)$$

(1) and (2) above predict, respectively, random and fixed effects panel regressions. All the other components have obvious meanings.

Table 3d reports that there is a negative relationship between bank size and loan interest rates. This relationship is robustly significant. Table 3d shows that every one unit increase in total assets (ta) results in 2.68-unit-decrease in the level of loan interest rate (LIR).[15]

TABLE 3B. *ANOVA: 'Total Assets' is the proxy for bank size*

Loan Interest Rate (LIR)	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	140.485	1	140.485	.968	.326
Within Groups	52998.315	365	145.201		
Total	53138.800	366			

TABLE 3C. *Descriptives: 'Total Assets' is the proxy for bank size*

					95% Confidence Interval for Mean	
Loan Interest Rate (LIR)	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
1	200	29.79	12.338	.872	28.07	31.51
2	167	28.55	11.695	.905	26.76	30.34
Total	367	29.23	12.049	.629	27.99	30.46

TABLE 3D. *Relationship Between Total Assets and Deposit Interest Rates*

Random-effects GLS Regression				Number of obs	= 366	
Group variable: banks				Number of groups	= 13	
R-sq: within = 0.3280 between = 0.0070 overall = 0.1116				Obs per group: min avg max	= 23 = 28.2 = 29	
Random effects u_i ~ Gaussian corr(u_i, X)= 0 (assumed)				Wald chi2(0) Prob>chi2 (Std. Err. adjusted for clustering on banks)	= . = .	
dir|	**Coef.**	**Rob.Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
ta|	-2.68e-10	2.33e-11	-11.49	0.000	-3.13e-10	-2.22e-10
_cons|	35.96687	1.409805	25.51	0.000	33.2037	38.73004
sigma_u | 2.5121487 sigma_e | 9.7752894 rho | .06195215 (fraction of variance due to u_i)						

As we have shown, it is not that larger banks have higher credit margins because their loan interest rates are higher. On the contrary, evidence documents that larger banks have lower loan interest rates. Despite this, larger banks do gain higher credit margins because their deposit interest rates are significantly lower than those of their smaller counterparts. In other words, benefiting from the advantage of having lower funding costs, larger banks earn much more gross profit than do smaller banks.

Conclusion

We conducted a number of empirical investigations over the sample period from the last quarter of 2002 to the last quarter of 2009 for the listed banks, and employing quarterly micro data. The results of our study strongly indicate that larger banks have higher credit margins while smaller banks realise rather lower credit margins. The main contributing factor is that larger banks have lower funding costs than those of their smaller counterparts. We therefore conclude that the larger [smaller] the bank size, the lower [higher] the deposit interest rate and therefore the higher [lower] the bank credit margin will be.

The results of our study strongly indicate that larger banks have higher credit margins while smaller banks realise rather lower credit margins. The main contributing factor is that larger banks have lower funding costs than those of their smaller counterparts.

For a bank, deposit interest rates are sales costs and credit margins are gross profits. For these reasons, a lower (higher) deposit interest rate suggests a higher (lower) level of credit margin and thereby translates into higher (lower) gross profit. Hence, we can also conclude that the larger (smaller) the bank size, the lower (higher) the sales cost and the higher (lower) the gross profit will be.

Empirical examinations also provide evidence that loan interest rates do not allow larger banks to realise higher credit margins. Instead, smaller banks were found to maintain higher loan interest rates. ■

Notes

1. TL is Turkish Lira.
   *: Total asset sizes, deposit interest rates and loan interest rates represent the average values of each listed commercial bank. For instance, an asset size of 31.639.747 TL. (in 000) for Akbank in 2004 refers to the asset size value averaging the values at the first quarter, second quarter, third quarter and eventually the fourth quarter of 2004. All the other asset sizes as well as deposit and loan interest rate values of Akbank or other publicly listed banks should be interpreted similarly. The given values observed in 2002 belong to the last quarter of 2002 for each bank. All the values are bank-specific.
   **: Credit margin values, the difference between loan and deposit interest rates, refer to the average margin values for each listed commercial bank. For example, a spread of 10.53% for Akbank in 2004 represents the spread value averaging the spread values at the first quarter, second quarter, third quarter and the fourth quarter of the year 2004. All the other spread values of Akbank or other listed banks should be interpreted similarly. Credit margin values observed in 2002 belong to the last quarter of 2002 for each banks. All the values are bank-specific.
2. Although definitions tend to vary, for the papers defining the bank margin as pure spread like this study, refer for example to Ho and Saunders (1981), McShane and Sharp (1985), Brock and Suarez (2000), Afanasieff et al. (2001), Saunders and Schumacher (2000), Angbazo (1997), Valverde and Fernandez (2007) among others.
3. See www.bis.org/review/r091218e.pdf (accessed on 18.05.2010).
4. See www.bis.org/review/r091218e.pdf (accessed on 18.05.2010) and www.interest.co.nz/ratesblog/index.php/2009/06/23/westpac-economists-on-funding-costs-net-interest-margins-and-profits/, (accessed on 18.05.2010).
5. See Note 3 above.
6. This paper draws partly on Kaymaz's unpublished doctoral dissertation (2009). Therefore, some text throughout this work has been, directly or indirectly, taken from there. However, this is a much extended and largely amended version of the related sections of his dissertation. Among other things, for example, the sampling period is much wider and the content as well as the methods of the examinations are much broader and deeper in this paper. This produces different results.
7. For the official URL of ISE, see www.imkb.gov.tr.
8. We have obtained most of our data from the ISE's official website. However, not all of the necessary data were available there. Where the data are not available from the ISE, we have reviewed sampled banks' own official URLs and collected further data. In addition, some data were not available either from ISE's URL, banks' URLs, or from any other source. Our analyses have not been influenced by this lack of data as we only considered the existing data in our examinations.
9. For the official URL of CMB, see www.spk.gov.tr.
10. See Kaymaz and Kaymaz (unpublished manuscript).
11. Loan interest rates and deposit interest rates are the rates that each bank applies to their customers on a weighted basis. A loan or deposit interest rate for a specific period refers to the value calculated, such that simple interest rates applied to differing maturity lines are weighted by the principal amounts corresponding to the concerning maturity lines. These interest rate values have been readily obtained from the independent audit reports of the sampled listed banks in this study. See the official URL of ISE given above.
12. Variances of group deposit interest rates are not homogenous. Therefore, we conducted a non-parametric test to identify the group differences. For the sake of brevity, it is not reported here.
13. Panel data regressions have been tested both for random and fixed effects models so as to be realised from the specified models. As the significances are close to each other, we have conducted Hausman tests to decide which is better. Hausman tests documented that panel models with random effects should be chosen for both the cases. Therefore, for brevity purposes, we report random effects results.
14. For the sake of brevity, results are not reported here.
15. Panel data regressions have been tested both for random and fixed effects models so as to be realised from the specified models. As the significance levels are similar, we have conducted Hausman tests to decide what is better. Hausman tests indicated that panel models with random effects should be chosen for both the cases. Therefore, for the sake of brevity, we report random effects results.

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