



Panel Data Analysis to Identify the Factors Affecting Capital Adequacy Ratio of Deposit Banks

Ersan Özgür¹

ABSTRACT

Capital adequacy ratio serves as a basic indicator linking current equities of banks to the amount of risk that they can undertake. Therefore, it is taken into consideration while evaluating banks and expected to be at a normal level. According to the Basel I criteria published by the Basel Committee in 1988 for the international banking sector, capital adequacy ratio as “Total Capital / Credit Risk” should be at least 8%. Basel I Criteria began to be implemented in Turkey in 1992. In this process, it was decided that capital adequacy ratio would be implemented as 8% starting from 1998 in Turkey. The purpose of this study is to identify the factors affecting the capital adequacy of state-owned, private and foreign deposit banks operating in Turkey between 2009-2019. The result obtained from the analysis has revealed that the established model is significant. The ratio of independent variables for explaining the dependent variable is 36%. The independent variable OME has a statistically significant and positive effect on the dependent variable at 1% significance level.

INTRODUCTION

Banks are an important element of the financial system. Being the units most rapidly affected by the general situation of the economy, banks should attach importance to their financial structures, asset quality, income and expense balance, liquid assets and risk management activities so as to be affected the least by the possible negative developments. Legislative regulations are developed by supervisory and regulatory authorities for financial institutions to have a solid and stable structure and avoid possible risks (TBB, 2013, p.1).

There are also international practices protecting financial institutions from economic risks. One is the Basel Committee operating under the auspices of the Bank for International Settlements (BIS) in Basel, Switzerland since 1930. This committee was a union founded for capital consensus, and established a standard to determine the minimum capital requirements for banks (Hacıevliyagil & Şit, 2019, p.56-57).

¹ Dr. Ersan Özgür, The Grand National Assembly of Turkey, The Ombudsman Institution, E-posta:ersanozgur99@gmail.com, ORCID ID: <https://orcid.org/0000-0002-6165-4556>

In the banking sector, the concept of risk has been increasing in importance, and it is considered beneficial to pay attention the evaluations by the Basel Committees organized by the Bank for International Settlements. In the evaluations, the minimum capital requirement is specified by considering banks' risk status. Since the market has a dynamic structure, new financial situations being experienced are evaluated by the Basel Committee and the criteria identified beforehand are updated. In the Basel I criteria published by the Basel Committee in July 1988; the Capital Adequacy Ratio (CAR) was determined as "Total Capital / Credit Risk", and it was indicated that this ratio should be at least 8% for banks. Basel I criteria, adopted by Turkey in 1989, began to be implemented in 1992 with a gradual transition process. It was ensured in this process that the capital adequacy ratio was implemented as 5% in 1989, 6% in 1990, 7% in 1991 and 8% starting from 1998 (Çıtak & Göker, 2020, p.170-171).

Due to the globalization and competition conditions, Basel II criteria were introduced as the Basel Committee updated the criteria considering the latest situation. Besides maintaining the capital adequacy ratio as minimum 8%, the Basel II criteria made it obligatory to consider operational risks in calculations. Another regulation regarding capital adequacy calculations in Turkey began to be implemented starting from 2006. Due to the global economic crisis, Basel III criteria were determined. Basel III criteria are essentially considered to be a whole of subsidiary regulations complementing the deficiencies observed in Basel II criteria (Aydın & Başkır, 2013, p.30-31)

As a result of the crises experienced in the finance, risk management began to be considered as an important domain to be taken into account for the Turkish banking sector. Accordingly, international practices and measures taken against risk factors are evaluated. The capital adequacy ratio of banks is of great importance both for the relevant bank management and stakeholders and for the financial authorities regulating the system. The capital adequacy ratio, which is a basic indicator that establishes a relationship between the banks' current equities and the amount of risk they will undertake, has the feature of important data required to be considered in the evaluation of banks (Kına, 2018, p. 104).

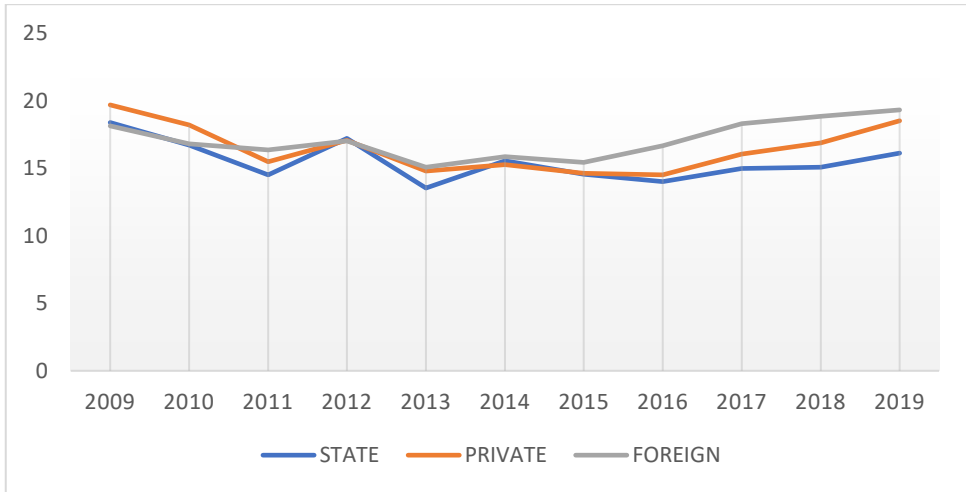
The function of bank capital for banks differs from other businesses since they act as intermediaries in the money market of the finance sector. In this respect, capital for banks is not only explained by business ownership and funding of activities, but it also has other functions. There are many reasons behind the need for a minimum amount of legal equity. An important function of bank capital regarding capital adequacy is to compensate for possible or very high amounts of unexpected losses that may stem from the risks undertaken. Besides, capital can also be an important indicator considering solvency and liquidity adequacy (TBB, 2013, p. 4-5).

The development trend of deposit banks' capital adequacy ratio over the years 2009-2019 according to capital structure of bank groups is presented in Figure 1.

It is observed that regarding the development of capital adequacy ratio between 2009-2019, state-owned banks had the lowest ratio; it was at 16.8% in 2019, and foreign banks had higher rates especially after 2015 and reached 19.5% in 2019.

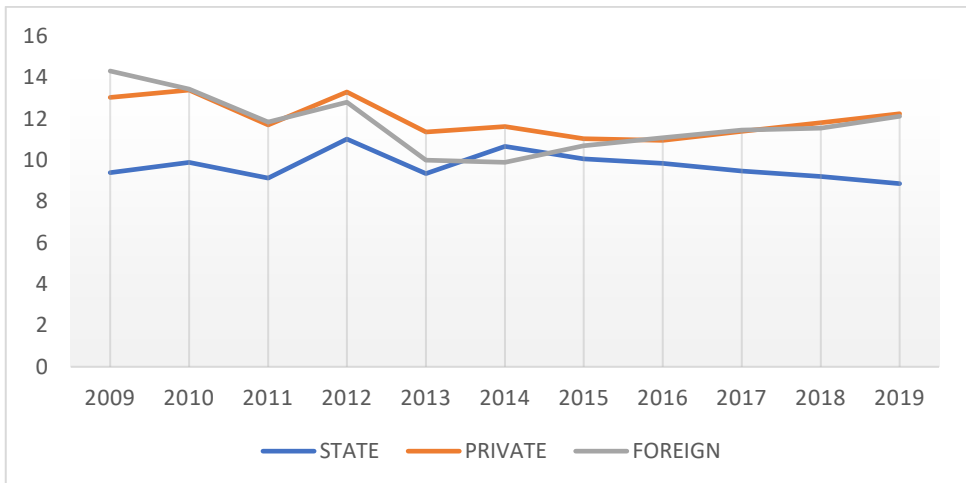
Considering the share of equities in total assets between 2009-2019, state-owned deposit banks had much lower ratios compared to other bank groups and drew a zigzag between 8.9% and 11%. Private and foreign deposit banks were identified to be at 12.2% level in 2019.

Figure 1. Capital Adequacy Ratio 2009-2019 Development Trend



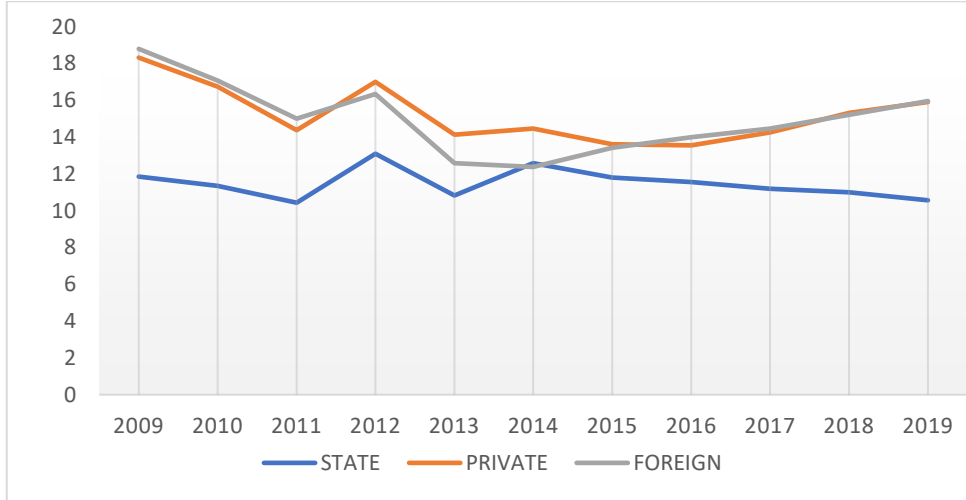
Source: TBB, 2020b

Figure 2. Equities / Total Assets 2009-2019 Development Trend



Source: TBB, 2020b

**Figure 3. Equities / (Deposit + Non-Deposit Resources) 2009-2019
Development Trend**



Source: TBB, 2020b

As for the ratio of equities to deposit and non-deposit resources between 2009-2019, state-owned deposit banks are observed to have lower rates compared to other bank groups, zigzagging between 10,4% and 13,1% over the years and finally reaching 10,6% in 2019. Private and foreign deposit banks were identified to show a similar trend and they were at 16% as of 2019.

In the study, first literature review on the capital adequacy ratio of state-owned, private and foreign deposit banks operating in Turkey will be presented after that purpose and context of research will be provided, then information on the research method and model in terms of panel data analysis will be declared, finally the findings obtained from the analysis will be evaluated.

LITERATURE REVIEW

Some of the studies in the literature regarding capital adequacy ratio of deposit banks are summarized as follows.

In their research, Büyükşalvarcı and Abdioğlu (2011) intended to identify the factors affecting the capital adequacy ratio through panel data analysis, with the data of 24 banks operating in Turkish banking sector between 2006 and 2010. Bank size, deposit, loan, loan loss provision, liquidity, profitability, net interest margin and financial leverage were utilized as independent variables in the research application. The analysis revealed that variables of equity profitability, asset profitability, and loan

loss provision had a positive effect on the capital adequacy ratio whereas loan and financial leverage variables had a negative effect.

Aydın and Başkır (2013) aimed, in their study, to classify 44 banks through cluster analysis to determine the banks that were similar or different based on the capital adequacy ratio in 2012. In order to find out the appropriate number of clusters for the quality of cluster structures, the Silhouette index was utilized. It was identified as a result of the analyses that banks with similar structure in the multidimensional scaling analysis were also in the same cluster in the cluster analysis.

In Dizgil (2017)'s study, the purpose was to determine the micro factors affecting the profitability of the current deposit banks in the banking sector. Panel data analysis was performed with the data of 10 banks with the largest asset size between 2009 and 2017. The study results presented that the factor with a positive impact on the bank profitability in both models was the capital adequacy ratio. It was also revealed that the operating expenses ratio in both models had a negative effect on the profitability rates.

Topaloğlu (2018) carried out panel data analysis to determine the micro factors affecting the financial fragility of the banks operating in the banking sector between 2002-2015. Financial fragility was represented by non-performing loan ratio and capital adequacy ratio, and the independent variables were return on assets ratio, return on equity, liquidity ratio, bank size, financial leverage and net interest margin. Accordingly, two different models were established, and it was identified at the end of the analysis that non-performing loan ratio had a significant negative relationship with bank size, and a significant positive relationship with liquidity ratio in Model 1. Moreover, in Model 2, capital adequacy ratio had a significant positive relationship with net interest margin and return on assets ratio, and a significant negative relationship with financial leverage and return on equity.

Hacıevliyegil and Şit (2019) investigated the effect of banks' capital adequacy ratios on their profitability through a comparative panel data analysis regarding conventional banks and participation banks. Using the 2011-2016 quarterly data, they compared the capital adequacy and profitability of the 10 largest banks (7 private, 3 state-owned) based on their asset size and 3 participation banks. The research results revealed that banks' capital adequacy had an impact on their profitability. On the other hand, no difference for capital adequacy was encountered considering participation banks and conventional banks.

In their study, Çıtak and Göker (2020) aimed at identifying the factors that affected the capital adequacy ratio of deposit banks by utilizing the data between 2002-2017 through panel data analysis. It was identified as a result of the analysis that there was a significant relationship between capital adequacy ratio and banks' total asset size, deposit / total asset ratio, loan / total asset ratio, interest margin and non-performing loan / total loan ratios. Furthermore, it was discovered that bank size, interest margin and non-performing loan / total loan ratios had a positive relationship with capital adequacy ratio, and deposit / total asset ratio and loan / total asset ratio had a negative

relationship. On the other hand, return on assets and liquid asset ratio had no statistically significant relationship with capital adequacy ratio.

EQUATION, DATASET AND METHODOLOGY

The purpose of this study is to identify the factors affecting the capital adequacy of state-owned, private and foreign deposit banks operating in Turkey between 2009-2019. Almost all deposit banks were included in the study; consequently, the data of 3 state-owned, 8 private and 12 foreign deposit banks were utilized in the study. Balanced panel application was conducted since the 2009-2019 financial data of all state-owned, private and foreign banks within the scope of the study, which were planned to be used as the variables, were obtained. The banks selected as the study sample are presented in Table 1.

Table 1. Information on the Deposit Banks in the Study Sample

No.	Deposit Bank	Capital Structure
1	T.R. Ziraat Bank Inc.	State-owned
2	Turkey's Halkbank Inc.	State-owned
3	Turkey's VakıfBank T.Inc.	State-owned
4	Akbank T. Inc.	Private
5	Anadolubank Inc.	Private
6	Fibabank Inc.	Private
7	Sekerbank T. Inc.	Private
8	Turkish Bank Inc.	Private
9	Turkish Economy Bank Inc.	Private
10	Turkey's Isbank Inc.	Private
11	YapıKredi Bank Inc.	Private
12	Alternatifbank Inc.	Foreign
13	A&T Bank Inc.	Foreign
14	Burgan Bank Inc.	Foreign
15	Citibank Inc.	Foreign
16	Denizbank Inc.	Foreign
17	Deutsche Bank Inc.	Foreign
18	HSBC Bank Inc.	Foreign
19	ICBC Turkey Bank Inc.	Foreign
20	ING Bank Inc.	Foreign
21	QNB Finansbank Inc.	Foreign
22	Turkland Bank Inc.	Foreign
23	Garanti BBVA Inc.	Foreign

The capital adequacy ratio calculated by the Banks Association of Turkey was used as the dependent variable in this study. A total of 23 decision-making units including 3 state-owned, 8 private and 12 foreign deposit banks currently operating were involved in the application study. The data on the variables were obtained from the July 2020 report by the Banks Association of Turkey, and covered the 11-year period between 2009-2019.

While conducting causality analysis between dependent and independent variables, the datasets are evaluated in three different ways as time-series, cross-sectional and panel data sets. Panel data are described as time series of multiple sections or cross-sectional data with time dimensions. Time series comprises of the values that one or more variables take over time. Panel data analysis enables that the variables analyzed over time are observed within the same cross-section units. In this respect, the panel data set is created by using the time-series and cross-sectional observations of the relevant economic units together. It involves both time and space dimensions. Panel data is expressed in various ways as mixed data, micro panel data and long-section data. Using time series and cross-section data together, panel data can give more information about the model (Alsul, 2017, p. 305).

Panel data analysis can be expressed as follows;

$$Y = \alpha_{it} + \beta_{it} X_{it} + u_{it} \quad i=1, \dots, N ; t=1, \dots, T \quad (1)$$

In the formula; Y: dependent variable, X: independent variable, α : constant parameter, β : slope parameter and u: error term. “i” subscript represents units (person, firm, city, country etc.), and “t” subscript represents time (day, month, year etc.) (Tatoğlu, 2020, p. 7).

There are three models utilized in panel data methodology. These are classical model, fixed effects model and random effects model. To decide which model to use, formal tests (Hausman, Breusch-Pagan Test, Chow Test, F test) are performed (Reis et al., 2016, p. 29).

In panel data analysis, the same cross-sectional units (N) are generally reviewed in a specific time period (T), and both differentiations between units and in time are examined simultaneously. Panel data analysis is a method combining cross-sectional and time-series analyses. Since the panel data has a complex structure, there is packaged software (Stata, EViews etc.) developed in computer environment to conduct analysis (Er, 2009, p. 48).

In order to determine the factors affecting capital adequacy ratio of deposit banks in the study, panel data analysis was utilized, and the model applied is as follows:

$$SYO_{it} = \alpha_{it} + \beta_{it} OME_{it} + \beta_{it} BDO_{it} + \beta_{it} NBO_{it} + u_{it} \quad (2)$$

In the model, $i=1, \dots, 23$ represents the banks included in the study, and $t=2009, \dots, 2019$ represents time.

In the research study, variables used to identify the factors affecting the capital adequacy ratio of state-owned, private and foreign deposit banks were considered to be the most appropriate items regarding their influence on the capital adequacy in the bank balance sheets. Accordingly, the variables determined to be used in the analysis step of the study and their abbreviations are presented in Table 2.

Table 2. Dependent and Independent Variables

Abbreviation	Variable Explanation	Variable Type
SYO	Capital Adequacy Ratio	Dependent
OME	Equities / (Deposit + Non-Deposit Resources)	Independent
BDO	Exchange Position in Balance Sheet / Equities	Independent
NBO	Net Balance Sheet Position / Equities	Independent

In the application study, the Capital Adequacy Ratio was calculated as Equities / (Credit + Market + Amount Subject to Operational Risk) x100. This calculation is described as the “Capital Adequacy Standard Ratio” calculated in the section of the “Financial Structure” of the Postscripts within the scope of the “Communiqué on Financial Tables to be Announced to the Public by Banks and Relevant Explanations and Postscripts” and declared to the public.

ESTIMATION RESULTS

To identify the factors affecting capital adequacy ratio of state-owned, private and foreign deposit banks in this study, capital adequacy ratio was determined as the dependent variable, and model estimation was made by using the independent variables in Table 2. The analysis was conducted with a total of 253 observations. Descriptive statistics for the variables are presented in Table 3.

Table 3. Descriptive Statistics for the Variables

Variable	SYO	OME	BDO	NBO
Mean	1.780.395	1.534.466	7.797.866	-4.149.842
Standard Deviation	5.303.808	6.262.881	6.649.179	574.833
Minimum	12.06	3.06	-137.3	-203.6
Maximum	50.7	70.9	384.9	343.7
Number of Observations	253	253	253	253

The results in Table 3 indicate that the mean was calculated as 17.80% for deposit banks' capital adequacy ratio between 2009-2019, and 15.34% for the ratio of equities to the total of deposit and non-deposit resources. The mean for the ratio of in-balance

sheet exchange positions to equities was 77.97% whereas the mean for the ratio of net balance sheet position to equities was -41.49%.

Before the panel data analysis, it is required to identify if there is a multicollinearity problem among the specified variables. When the variables have relationships at high rates, it is called multicollinearity, and it indicates an unsuitable situation in regression analysis. The simple correlation coefficient between two variables is desired to be 0.80 and higher (Kasım, 2019, p. 122). Before the panel data analysis, correlation analysis was performed on the variables, and the coefficient data obtained from the correlation analysis are shown in Table 4.

Table 4. Correlation Analysis for the Independent Variables

	SYO	OME	BDO	NBO
SYO	1.0000			
OME	0.6533	1.0000		
BDO	-0.1213	-0.2018	1.0000	
NBO	0.0056	0.1166	-0.7361	1.0000

In the analysis, the correlation among all the variables was calculated to be below 0,8 determined as the limit value.

When time series reach a specific value or fluctuate around the desired value over time, it is called “stationarity”. Before performing the statistical analysis of the time series, it is required to identify if the process for that series is constant over time; in other words, if it is static or not. The impacts of the factors affecting time series may be permanent as well as temporary. In case the effects are permanent, it leads the series to deviate from stationarity and avoid them from reaching a specific value, causing erroneous evaluation of the analysis results (Tatoğlu, 2020, p. 14). Thus, the variables are tested to see whether they are static or not.

In the literature, it is possible to encounter cases with or without correlation between units. The tests developed for the scenarios without correlation are called first generation tests, and the tests developed for the scenarios with correlation are called second generation tests (Güriş, 2015, p. 204). The data in Table 5 show the cross-sectional dependence results for each variable in the analysis.

In the results of the correlation between units (Pesaran CD Test), it was revealed that there was a correlation at 1% significance level in all variables. Considering the result, it was required to prefer second generation unit root tests to check the stationarity of the variables. As the second-generation unit root test in the study, Pesaran CIPS Test was used. The hypothesis of the test is “H0: $b_i = 0$ for all i ” (Taysı, 2020, p. 22).

Table 5. Unit Root Tests

Variable	Pesaran (2004) CD Test	Pesaran's CIPS Unit Root Test	
		Lagged level Statistics	First difference Statistics
SYO	17.59*		-3.776*
OME	17.29*		-2.375**
BDO	2.88*		-3.206*
NBO	3.38*		-3.170*

*, **, *** represent importance levels of 1%, 5% and 10% respectively

According to the test results utilized to control the constancy of the series in the study, all the variables used in modeling were identified to include unit roots, and the stationarity of the series was ensured by taking the first differences of the variables.

After checking whether the series involved unit root or not, and those with unit roots were made stationary, the second step was to identify the panel data analysis method to be performed. In order to reveal which of the three methods used in panel data analysis is appropriate for the research model, it is necessary to run some tests, and these are F test, LM test and Hausman test. The statistics for the tests are presented in Table 6.

Table 6. F Test and LM Test Results

	F Test		LM Test	
	Statistics	Probability	Statistics	Probability
SYO_{it}	0.31	0.9988	0.00	1.000

*, **, *** represent importance levels of 1%, 5% and 10% respectively

It is observed in F test and LM test statistics in Table 6 that the probability values are higher than 0.05. Since the hypothesis that “H₀: no unit and time effect” was accepted for both tests, the analysis continued with the pooled least squares method (Taysı, 2020, p. 23).

To examine the existence of heteroscedasticity and autocorrelation in the model based on the pooled least squares method, White Test and Wooldridge Autocorrelation Test were performed successively. The relevant test results are presented in Table 7.

Table 7. Model Assumption Tests

	Heteroscedasticity		Autocorrelation	
	Statistics	Probability	Statistics	Probability
SYOit	0.08	0.7840	0.460	0.5047

*, **, *** represent importance levels of 1%, 5% and 10% respectively

The assumption tests in Table 7 indicated no heteroscedasticity and autocorrelation in the model. The test results obtained from the model are presented in Table 8.

Table 8: Panel Data Analysis Results for the Factors Affecting Capital Adequacy Ratio of Deposit Banks

Variables	Coefficients	Standard Error	T Statistics	Probability
OME	0.3979	0.0366	Eki.84	0.000*
BDO	-0.0164	0.0094	-1.73	0.085***
NBO	-0.0188	0.0106	-1.77	0.078***
C	-0.0217	0.2058	-0.11	0.916
R²	0.36			
F Statistics	42.71	Probability	0.000	

*, **, *** represent importance levels of 1%, 5% and 10% respectively

When the aforementioned results of the analysis evaluating the factors affecting the capital adequacy ratio of deposit banks are examined, it is observed that the level of model's power to explain the significant and independent variable is 36%. Based on the high ratio, it can be interpreted that the correct independent variables were selected while establishing the model. The independent variable OME has a statistically significant and positive effect on the dependent variable at 1% significance level, which can be expressed as "1-unit raise in OME increases the dependent variable by 0.39 unit". As for BDO and NBO, it was identified that they had a statistically significant and negative effect on the dependent variable at 10% significance level. The test findings reveal that 1-unit increase in both variables decreases the dependent variable by approximately 0.02 unit, which indicates that the negative effect of BDO and NBO on the dependent variable is at a very low level.

CONCLUSION

Capital adequacy ratio, which is an important indicator in banking, is a type of data followed as a specific lower limit rate indicated by the Basel Committee constituted by

high-level officials from central banks and banking supervision authorities. In this study, it was attempted to determine the factors affecting the capital adequacy ratio through the 2009-2019 data of deposit banks operating in Turkey. The research application involved panel data analysis, for which a model was established by selecting dependent and independent variables within the scope of the research study. The data used in the analysis was obtained from the July 2020 report by the Banks Association of Turkey, and a panel data set for the 11-year period between 2009-2019 was created.

In the study, first, correlation analysis to determine the existence of multicollinearity and unit root test to check the stationarity of the series were performed. The series with unit roots were stabilized by taking their first differences according to the test results, and the analysis continued with the stationary series. To identify the estimator to be selected, F test and LM tests were conducted, and based on the results obtained, the pooled least squares model was applied for the rest of the analysis. When the basic assumptions in the model were examined, neither heteroscedasticity nor autocorrelation was identified in the model. The analysis result revealed that OME variable had a statistically significant positive effect on the dependent variable at 1% level, whereas BDO and NBO variables had a statistically significant negative effect at 10% level. Considering the test findings obtained, the dependent variable increases by 0.39 with a 1-unit increase in OME and decreases by 0.02 with a 1-unit increase in BDO and NBO. The level of the negative effect of BDO and NBO is quite low.

In light of the data obtained, that the increase in the ratio of equity to deposit and non-deposit resources reflected positively on the capital adequacy ratio to a considerable extent can be interpreted to result from that deposit and non-deposit resources have the biggest share within the total assets of the deposit banks. Regarding the subject and implementation, this is an original study on the identification of the factors affecting capital adequacy followed carefully in the banking sector. It is anticipated that researchers will have the opportunity to carry out applications to determine the other factors with possible impacts on the capital adequacy ratio in deposit banks in the future.

References

- Alsul, E. (2017). 'Sermaye Yapısının Karlılık Üzerindeki Etkisi BIST 100 Üzerine Panel Veri Analizi', *Gaziantep Üniversitesi Sosyal Bilimler Dergisi*, Cilt: 16 - Sayı: 2, 303-312
- Aydın, D. and Başkır, M.B. (2013). 'Bankaların 2012 Yılı Sermaye Yeterlilik Rasyolarına Göre Kümeleme Analizi ve Çok Boyutlu Ölçekleme Sonucu Sınıflandırılma Yapıları', *Bankacılık ve Sigortacılık Araştırmaları Dergisi*, 5-6(1), 29-47.
- Büyüksalvarcı, A. and Abdioğlu, H. (2011). 'Determinants of capital adequacy ratio in Turkish banks: A panel data analysis', *African Journal of Business Management*, 5(27), 11199-11209.
- Çıtak, F. & Göker, I. E.K. (2020). 'Bankacılık sektöründe sermaye yeterlilik rasyosunu belirleyen faktörlerin analizi', *Business and Economics Research Journal*, 11(1), 169-185.
- Dizgil, E. (2017). 'Türkiye'deki Mevduat Bankalarının Karlılığını Etkileyen Mikro Düzeyli Faktörler Üzerine Ampirik Bir Araştırma', *BDDK Bankacılık ve Finansal Piyasalar* Cilt: 11, Sayı: 2

- Er, Ş. (2009), *Dinamik Panel Veri Analizi ve Bir Uygulama*, Unpublished PhD Thesis, İstanbul Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı, İstanbul
- Güriş, S. 2015, *Panel Veri Modelleri*, Der Yayınları, İstanbul.
- Hacievliyagil, N and Şit, A. (2019). ‘Türkiye’de Sermaye Yeterliliğinin Banka Kârlılıkları Üzerine Etkisi’. *Muhasebe ve Finans İncelemeleri Dergisi*, 2 (1), 55-69. DOI: 10.32951/mufider.512395
- Kasım, M. (2019). *İslam İşbirliği Teşkilatı Ülkelerinde Sermaye Piyasalarının Gelişmişliğini Etkileyen Faktörlerin Panel Veri Analizi İle İncelenmesi*, Unpublished Master's Thesis, Süleyman Demirel Üniversitesi Sosyal Bilimleri Enstitüsü, Isparta
- Kına, İ. (2018). *Türk Bankacılık Sektörü’nde Sermaye Yeterliliği Düzenlemeleri ve Mevduat Bankalarının Sermaye Yeterliliklerinin Analizi*, Unpublished Master's Thesis, Başkent Üniversitesi Sosyal Bilimler Enstitüsü, Ankara
- Reis, Ş. G., Kılıç Y. & Buğan M.F. (2016). ‘Banka Karlılığını Etkileyen Faktörler: Türkiye Örneği’, *Muhasebe ve Finansman Dergisi* Ekim/2016, DOI: 10.25095/mufad.396715
- Tatoğlu, F.Y. (2020). Panel veri analizi Viewed 15 December 2020 <[http://auzefkitap.istanbul.edu.tr/kitap/ekonometri ue/panelverianalizi.pdf](http://auzefkitap.istanbul.edu.tr/kitap/ekonometri_ue/panelverianalizi.pdf)>
- Topaloğlu, E.E. (2018). Bankalarda Finansal Kırılganlığı Etkileyen Faktörlerin Panel Veri Analizi ile Belirlenmesi, *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*, Nisan 2018, C. 13, S. 1, 15-38
- Taysı, K. (2020). ‘Aktif Karlılığa Etki Eden Faktörlerin Panel Veri Analizi Yöntemiyle Belirlenmesi’, *Journal of Original Studies*, Cilt / Volume:1, Sayı / Issue:1
- Türkiye Bankalar Birliği (TBB) (2013). *Sermaye Yeterliliği Şerhi*, Türkiye Bankalar Birliği Yayın No:299, İstanbul, Viewed 06 April 2021, <https://www.tbb.org.tr/content/upload/dokuman/2120/299-sermaye_yeterliliği_serhi-web.pdf>
- Türkiye Bankalar Birliği (TBB) (2020a). *Bankalarımız 2019 Raporu*. Türkiye Bankalar Birliği Yayın No:336 Mayıs 2020. İstanbul.
- Türkiye Bankalar Birliği (TBB) (2020b). *Türkiye’de Bankacılık Sistemi Seçilmiş Rasyolar 2009-2019*, Türkiye Bankalar Birliği Rapor Kodu: YT05