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FINANCIAL PERFORMANCE OF TURKISH BANKS IN THE COVID-19 ERA: A CLUSTER ANALYSIS

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ABSTRACT

Purpose- Stability of the financial system and the performance of its most important constituents, namely the banks, are crucial for the well-being of an economy. Turkey is one of the biggest Emerging Market economies making its banking sector a good case for analysing the bank performance in the era surrounding the Covid-19 Pandemic. This paper aims to map Turkish banking sector in terms of its players' financial strength and identify the attributes of the banks that present weaknesses in the period around Covid-19 Pandemic.

Methodology- A hierarchical cluster analysis with Ward's method and squared Euclidean distance measure is conducted to divide the Turkish banking sector into groups which display maximum between cluster variance and minimum within-cluster variance based on 14 attributes both derived from CAMEL ratios and categorical characteristics. The analysis repeated with non-hierarchical and two-steps clustering to identify the most relevant characteristics in distinguishing the banks. A subsequent ANOVA test is also applied looking at any statistically significant differences among the clusters in regard to bank credit ratings. 32 banks are included in the study which are headquartered in Turkey and regularly publish independently audited annual financial reports.

Findings- Turkish banking sector can be divided into three groups in terms of their financial strength: the large local banks with strong capital levels, the large banks owned by foreigners and the small local banks with limited lending capabilities. The results of ANOVA test shows that there is a significant main association of a bank's cluster with its potency, $F(2,29) = 16.106$, $P=0.000$. The tests reveal that 2 clusters that make up the three-fourths of Turkish banking sector have underperformed.

Conclusion- The analysis provides an ease for understanding the Turkish banking sector's structure by grouping the banks into certain categories. Such grouping enables the reader to grasp which attributes are important in evaluating the strength of the players, as well as the overall banking sector. It is found that there is room for improvement for a significant three-fourth portion of the sector. It is also shown that the key attribute which is going to play a central role in this improvement is capitalization.

Keywords: Turkish banks, Turkish banking sector, Cluster Analysis, bank performance in Turkey, Turkish Banking in Covid19 Era.
JEL Codes: C12, C38, G21.

1. INTRODUCTION

Banking is one of the key sectors of any economy. The health and performance of a country's banking sector is reflected in its overall economic performance. The sector is instrumental in terms of decreasing agency costs, enhancing the monitoring of the agents (Diamond, 1984), generating liquidity (Gorton & Pennacchi, 1990), channeling funds to the real sector and providing credit (Petersen & Rajan, 1994). Any structural weaknesses in the banks' balance sheets are going to cause inevitable and serious damages to an economy and its actors like businesses or households. Therefore, assessing the performance of the banking sector is essential.

Having the importance of measuring the strength of the banking in mind, this paper aims to map the Turkish banking sector in terms of the financial quality of its players. The financial quality of a bank is determined by looking at its balance sheet and income statement items, as well as certain performance ratios. With this study, it is intended to find out which players in the banking sector are strong, which are relatively weak, and which are vulnerable in a way to pose a threat to the soundness of the economy. To this end, a cluster analysis is going to be conducted based on the performance indicators which the literature

widely employs, and the banks in the Turkish financial system are going to be formed into clusters according to their certain attributes to test the following hypotheses:

$H1_o$: Turkish banks display no statistically significant difference in terms of their financial strength and can be approached as one group.

$H1_1$: Turkish banks are different in terms of their financial strength, so should be grouped in separate clusters to be identified.

One widely suggested tool to decrease risks of the banking system is capital requirements. Capital requirements constitute regulatory and supervisory authorities' most commonly employed prescription to mitigate the risks in the financial system (Buckley, 2004). With this research paper, it can also be tested whether looking at capitalization to evaluate a bank's vulnerability makes sense for Turkish banks, in a period marked with the effects of Covid-19 pandemic. Hence, these null and alternative hypotheses are formed:

$H2_o$: There is not a statistically significant difference between bank balance sheet items in their power of determining a bank's vulnerability.

$H2_1$: Capital levels are key in assessing whether a bank is strong or vulnerable.

This paper is organized to have the following flow: introduction section provides some background information and explains why clustering the Turkish banks is important. Second part is allocated to the related literature and how our paper is linked to previous studies. Third section elaborates the data and the methodology that is going to be applied in this research paper. Fourth part presents the results and discusses their implications, and the fifth part concludes.

2. LITERATURE REVIEW

In the banking literature, the determinants of the bank performance measures are usually classified with internal and external determinants. The most known internal factors used in bank performance are the return on assets (ROA) and the return on capital (ROE) which are calculated based on bank financial statements. The attibutes derived from so called CAMEL (Capital Adequacy, Asset Quality, Earnings, and Liquidity) ratios make up the other performance indicators. Berger (1995) in his seminal paper addressed the impact of capital on the performance of US Banks between 1983 and 1989 and found that the high capital and earnings positively Granger-caused each other, meaning that the increase in capital leads to an increase in earnings. Goddard et al (2004) studied the performance of European banks across six countries and found a weak connection between size and profitability (measured by ROE). Molyneux and Seth (1998) investigated the performance of foreign banks in the United States (1987- 91) and their overall results indicate that capital strength, commercial and industrial loan growth, and assets composition were important factors in determining foreign banks' ROA in the period under study. Athanasoglou et al. (2006; 2008) and Vong and Chan (2009) found that bank performance and credit risk have a negative relationship, therefore the higher exposure to credit risks leads to reduction in bank profits. Bourke (1989), Molyneux and Thornton (1992), Athanasoglou et al. (2006; 2008), and Pasiourias and Kosmidou (2007) confirmed that a low level of cost enhances bank efficiency, impliying a negative relationship between operating expenses and performance. In terms of external factors, Perry (1992) studied the relationship between bank performance and inflation, and concluded that the impact of inflation is pretty much linked to the expected inflation rates by banks. Pereira and Filipe (2018) investigated the relationship between the board quality of banks and bank performance in Portugal and found that the level of education of board members positively influence both the ROA and ROE. Heffernan and Fu (2008) worked on determinants of bank performance in Chinese banks, and checked whether bank efficiency and performance of Chinese banks got better after the 1978 reforms. Their study showed that some macroeconomic variables and financial ratios are significantly associated, and a bank's type matters whereas its size, being listed or having foreign ownership do not.

Before, cluster analysis is also applied for a number of times to group Turkish banks in terms of their efficiency (Yayar & Karaca, 2014), profitability (Oral & Akkaya, 2015; Sevinc 2015), capitalization (Karaatli, 2020), likelihood to fail (Boyacıoğlu, Kara & Baykan, 2009) or their customers' perceptions and usage habits of internet banking services (Polatoglu & Ekin, 2001). What this paper contributes is that it will cluster the Turkish banks not only on key performance ratios and widely-accepted balance sheet and income statement items, but also on categorical attributes like ownership characteristics and participation banking activities. The examination will also be a recent one, as the latest available published annual reports of the banks are employed which coincided with the era of economic slowdown due to Covid-19 pandemic. As the credits provided to the real sector through banks are among the most influential tools to stir up the economy, spotting and mapping the capability of Turkish banking sector will provide implications both for investors and policy-makers.

3. DATA AND METHODOLOGY

As of the time of this paper, there are 52 banks operating in Turkey. The sector is large one with a total asset size of TRY 6.5 trillion, a value which is greater than Turkish GNP. More than 202.000 people are employed by the sector (BDDK, 2021). Not all the banks that have operations in Turkey are included in this study. The branches of foreign banks and representative offices are excluded since their performance indicators like liquidity position or capitalization are determined by their home country dynamics rather than the aspects of Turkish banking sector. The banks that were transferred to State Deposit Insurance Fund (SDIF- TMSF) after the 2001 crisis are also omitted from the sample because they have activity mostly limited to transaction banking, making their figures unrepresentative of the sector. Taken all these into consideration, 32 banks are included in this study. The sample comprises all the banks that are headquartered in Turkey, and regularly publish independently audited annual financial reports. The data is primary, collected from the latest annual financial statements of Turkish banks.

This paper's objective is to come up with groups of banks that are distinct from each other while at the same time have similar members inside each of them. Cluster analysis technique enables the researcher to divide the observations into distinct groups by combining them with maximum between cluster variance and minimum within cluster variance (Hair, Black, Babin, & Anderson, 2018). This technique is selected as the method of this research, because it is a good fit for the objective of the paper which is to come up with groups that provide the reader an explanation of the Turkish banking sector's structure. SPSS is employed as the statistical package. Cluster analysis is based on the 14 performance indicators that are listed and explained below.

Foreign/ Local Ownership Dummy: Foreign ownership stands for the share of foreign shareholders with more than 25% of the total shares.

Participation/ Conventional Banking Dummy: Participation bank means the bank acts in accordance with the Islamic rules.

State/ Private Ownership Dummy: State ownership means 25% or more shares of a bank belong to the Turkish state.

Institutional/ Real Person Ownership Dummy: What is meant by institutional ownership is to have an institutional owner which holds more than 25% of the bank's total shares.

Total Assets (TA): Total assets stand for the asset size of a bank in TRY millions.

Total Equity (TE): This variable shows the total shareholders' equity of a bank in TRY millions.

Non-performing Loans (NPL) Ratio (%): This variable is calculated by dividing impaired loans of a bank's loan book by total loan amount.

Growth of Gross Loans (%): This variable is the yearly percentage growth rate of a bank's credits.

Return on Average Equity (ROAE) (%): This ratio is calculated by dividing the profit by average shareholder's equity value for the last two subsequent periods.

Return on Average Assets (ROAA) (%): It is calculated by dividing the profit by average asset size for the last two subsequent periods.

Loans/ Deposits (%): This ratio is used to measure how liquid a bank is. Smaller the ratio, more liquid is the bank. As the name suggests, the ratio is derived by dividing the loan figure by customer deposits.

Liquidity Coverage Ratio (%): This ratio is calculated according to regulatory standards by dividing high quality liquid assets (such as cash and securities) by total cash flows.

Capitalization (%) : This variable represents the percentage value of Common Tier I Equity Capital Ratio of a bank, meaning that Common Tier I Equity divided by risk weighted assets.

Total Weighted Risks (TWR): This item represents the weighted risks on and off-balance sheet items of a bank. It shows the extent of a bank's exposure.

After the selection of variables, our analysis starts with the application of hierarchical clustering to determine the number of clusters. For the linkage method, Ward's method is chosen because it enables the researcher to get roughly equal sized clusters through the minimization of within-group variation. In Ward's method, the similarity between two clusters is the sum of squares within the clusters across all variables. When two clusters are going to be combined, the ones that cause the smallest rise in sum of squares in cluster distances are going to be merged (Ward, 1963). As the distance measure, squared

Euclidean distance is employed. Squared Euclidean measure of similarity is attained through the summation of the squares between two groups for all variables. It is selected because its usage with Ward's method of clustering is recommended (Hair, Black, Babin, & Anderson, 2018). Standardization is undertaken by the transformation of values into Z scores. Hierarchical clustering is followed by a non-hierarchical clustering to assess the relevance of the variables. Finally, a two steps analysis is carried, and the ultimate cluster number is decided upon as 3. After the cluster analysis, the next thing to check is whether there exists any statistically significant difference between these clusters in terms of their financial strenght. To find out, an ANOVA test is run. The categories are the 3 bank groups which are derived from the cluster analysis and how different they are in terms of their strenght is checked based on the FI ratings of Fitch. These ratings fall into 6 categories for Turkish banks as of the date of this paper, the lowest being b- and the highest being bb+.

4. FINDINGS

Hierarchical clustering suggests a two-cluster solution, presenting a 28% increase in the coefficient which shows the difference between two closest observations in the combined cluster if clustering was resumed in the final step. Subsequently, k-means clustering which employed the k-value "2" in accordance with the results of the first test, is run to spot the power of variables. Five of the variables have p values smaller than 0.05 making them most the relevant ones. These 5 variables with high power are foreign/ local ownership, state/ private ownership, total assets (TA), total equity (TE), and total weighted risks (TWR). To have precise findings, 9 variables with low power are removed, and with the inclusion of only high-power variables, a two-step cluster analysis is conducted. First, since it is the cluster number generated from agglomeration table of hierarchical clustering, as well as the k-value used in non-hierarchical clustering, "2" is specified as the fixed number in two-step cluster analysis. Subsequently, another two-step cluster analysis is run in which no fixed number is specified. The cluster quality of these applications is compared with each other. The latter model which came up with three clusters provided a better cluster quality compared to the model with two clusters. Based on these analyses, we decided to proceed to profiling with the model which comprise three clusters. A summary of the results is listed in Table 1.

Table 1: Results of the Cluster Analysis

Clusters	Highest Mean in Assets	Lowest Mean in Assets	Highest Mean in Capitalization	Lowest Mean in Capitalization	Highest Mean in TWR	Lowest Mean in TWR	Characterizable with Private Ownership	Characterizable with Foreign Ownership
1st Cluster			X					
2nd Cluster	X				X		X	X
3rd Cluster		X		X		X		

The cluster analysis has provided some straightforward findings for profiling. The first cluster which we label as "large local banks with strong capital levels", has the highest mean value for TE value meaning that the members of this cluster can be associated with strong capitalization levels. In terms of TA and TWR, the cluster's mean values fall between those of the second and third clusters. In asset size, the mean value is closer to the second cluster which is made of banks with the largest asset size. On the other hand, for TWR, it is closer to the third cluster which has the banks with smallest asset size and capital levels. The cluster is made of local banks. State ownership or private ownership are not among the distinguishing features of this cluster, as state owned and private banks are evenly distributed in it. First things that immediately catch the eye in the second cluster are the highest mean in TA and TWR. This cluster displays how lending capabilities increase with greater asset size and it also implies that the banks' balance sheets are largely made of loans despite the negative environment stemmed from Covid-19 pandemic. Second cluster is wholly consisted of private banks with foreign ownership. This cluster can be named as "large banks owned by foreigners". Third cluster has the lowest mean for all three continuous attributes of TA, TE and TWR. It can be seen that size and lending levels are positively associated for this data set, and as size declines, the TWR figure also decreases. These banks are entirely locally owned. In terms of state ownership, there is no clear tendency; but it seems that the private banks slightly dominate this cluster. It is appropriate to label this cluster as "small local banks with limited lending capabilities".

With the employment of ANOVA, it is found that there is significant main association of a bank's cluster with vulnerability, $F(2,29) = 16.106$, $P=0.000$. Results can be seen in Table 2. Prior to the ANOVA test, error variances are checked and Levene's test of equality of error variances gave insignificant result. Therefore, homogeneity of the variance is assumed. Following the results of the ANOVA, 2 post-hoc analyses, namely Tukey HSD and LSD are run which gave the same results. As Tukey HSD tends to give better results in equally sized comparisons, LSD results are going to be interpreted here. The post-hoc analysis of LSD suggests that there is a statistically significant difference between Cluster 1 and Cluster 2, as well as Cluster 1 and Cluster 3. On the other hand, there is no statistically significant difference between Cluster 2 and Cluster 3.

Table 2: Results of ANOVA Test

Vulnerability	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	22.563	2	11.281	16.106	.000
Within Groups	20.313	29	.700		
Total	42.875	31			

After the cluster analysis and the ANOVA test following it, the first null hypothesis which states that Turkish banks display no statistically significant difference in terms of their financial strength is rejected. Turkish banks are distinct, and should be assessed in different clusters. As the cluster analysis suggests, the groups have different characteristics and although the first cluster with high capitalization can be accepted as a safe cluster, the remaining two pose vulnerabilities and they must be monitored under more strict scrutiny. This brings us to the second hypothesis which is about the role of capitalization as an important factor that reduces vulnerability of a financial institution. Again, the null hypothesis of there is not a statistically significant difference between bank balance sheet items in their power of determining a bank's vulnerability is rejected. Capitalization is substantial in the determination of a bank's strength. So, the alternative hypothesis is supported with the findings of this research paper. This result is also in line with BRSA's capital requirement regulations and Basel framework.

5. CONCLUSION

This research is conducted in order to map the Turkish banking sector and to spot which banks are more likely to adversely affect the financial system's stability. To find out, a cluster analysis is run. Following the trial of several combinations of linkage method, distance measure and sample components, as well as the comparison of model qualities derived from three clustering appplications, we concluded that Turkish banking sector is best described in three clusters which we name as large local banks with strong capital levels, large banks owned by foreigners and small local banks with limited lending capabilities. Subsequently, an ANOVA test was conducted to check whether the differences between the clusters are statistically significant. It is found that the first cluster is significantly different from the second and third clusters. This cluster is also the one which possesses the highest mean for capitalization and the rating. It can be regarded as the cluster of safest Turkish banks. Second and third clusters are not significantly different from each other and can be associated with underperformance. Our findings which suggest to approach Turkish banking sector in groups rather than as a whole is in line with the previous literature.Through its results about the attributes of strong banks, our paper can also be linked to the literature which stresses the importance of capitalization for banking industry. It is a well-known and well-documented fact that the problems in the financial sector spill over to the rest of the economy and may cause reduction in wealth and living standards. Therefore, identifying and addressing to the banking sector's problems is vital. This research paper serves to this identification.

REFERENCES

Allen N. Berger (1995). The Relationship between Capital and Earnings in Banking Journal of Money, *Credit and Banking*, 27(2): 432-456.

Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2): 121-136

BDDK. (2021, May 13). *Monthly Banking Sector Data*. BDDK. https://www.bddk.org.tr/BultenAylik/

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance*, 13(1): 65-79.

Boyacıoğlu, M. A., Kara, Y., & Baykan, Ö. K. (2009). Predicting bank financial failures using neural networks, support vector machines and multivariate statistical methods: A comparative analysis in the sample of savings deposit insurance fund (SDIF) transferred banks in Turkey. *Expert Systems with Applications*, 36(2): 3355-3366.

Buckley, A. (2004). Multinational Finance. London: FT: Prentice Hall.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies*, 51(3): 393-414.

Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004). The profitability of European banks: A cross-sectional and dynamic panel analysis. Manchester School, 72(3): 363-381.

Gorton, G., & Pennacchi, G. (1990). Financial Intermediation and Liquidity Creation. *The Journal of Finance*, 45(1): 19-71.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). Multivariate Data Analysis. Andover, Hampshire: Cengage Learning, EMEA.

Heffernan, Shelagh A. and Fu, Xiaoqing, The Determinants of Bank Performance in China (August 22, 2008). Available at SSRN: https://ssrn.com/abstract=1247713 or http://dx.doi.org/10.2139/ssrn.1247713

Karaatlı, M., & Yıldız, E. (2021). Mevduat bankaların finansal yapılarının kümeleme analizi ile incelenmesi. *Business & Management Studies: An International Journal*, 9(1): 1-17.

Molyneux, P., & Seth, R. (1998). Foreign banks, profits and commercial credit extension in the United States. *Applied Financial Economics*, 8(5): 533-539.

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking and Finance*, 16(6): 1173-1178.

Oral, C. & Akkaya C. G., (2015). Profitability Analysis Of Banks By Using Clustering Method: An Application On Turkish Banking Sector, *Proceedings of International Academic Conferences*, 2503730, International Institute of Social and Economic Sciences.

Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21(2): 222-237.

Pereira, V. M. M., & Bonito Filipe, J. A. C. (2018). Quality of board members' training and bank financial performance: Evidence from Portugal. *International Journal of Economics and Business Administration*, 6(3): 47-79.

Perry, P. (1992). Do banks gain or lose from inflation? *Journal of Retail Banking*, 14(2): 25-30.

Petersen, M. A., & Rajan, R. G. (1994). The Benefits of Lending Relationships: Evidence from Small Business Data. *The Journal of Finance*, 49(1): 3-37.

Polatoglu, V. N., & Ekin, S. (2001). An empirical investigation of the Turkish consumers' acceptance of Internet banking services. *International Journal of Bank Marketing*, 19(4): 156-165.

Sevinç, V. (2015). "A Classification Of The Banks In Turkey With Bayesian Cluster Analysis Based On Mixture Models," *Eurasian Econonometrics, Statistics and Emprical Economics Journal*, 2(2): 16-24.

Vong, A. P. I., & Chan, H. S. (2009). Determinants of Bank Profitability in Macao. *Macau Monetary Research Bulletin*, 12(6): 93-113.

Ward, J. H. (1963). Hierarchical Grouping to Optimize an Objective Function. *Journal of the American Statistical Association*, 301(58): 236-244.

Yayar, R., & Karaca, S. S. (2014). Efficiency Analysis in Turkish Banking Sector. *Niğde Üniversitesi İİBF Dergisi*, 7(2): 1-15.