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DETERMINATION of the BANK CLUSTERS WITHIN the SCOPE of the SENSITIVITY to MARKET RISK RATIOS

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ABSTRACT

Foreign capital banks operating in a country have positive and negative aspects to the country's financial system and banking activities. One of the negativities is that banks with foreign capital are not prepared for certain risks and crises; and they tend to leave the country in the face of social and political problems in the country. The aim of this study is to analyze the sensitivity of foreign banks to market risk and to test whether these attitudes of foreign banks have changed despite the impositions of globalization. In line with this determined purpose, it is investigated by cluster analysis whether public, private and foreign capital deposit banks operating in Turkey differ from each other in terms of market risk sensitivity ratios. In other words, their risk groups are investigated by cluster analysis.

Results of the analysis, for the period 2018-2020 which includes the pandemic crisis have emphasized that the banks with foreign capital did not differ significantly from other deposit banks. On the contrary, there exist similarities with other banks. This shows that the banking sector has adapted to the globalization phenomenon and does not perform much differently than local banks in terms of sensitivity to market risks.

Keywords: *Bank ratios, Risk groups, Market risk, Sensitivity to market risk, Cluster analysis*

Jel Codes: *C38, G21*

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BANKALARIN PİYASA RİSKİNE DUYARLILIK RASYOLARI ÇERÇEVESİNDE GRUPLANDIRILMASI

ÖZET

Bir ülkede faaliyet gösteren yabancı sermayeli bankaların finansal sistem ve bankacılık faaliyetlerine olumlu ve olumsuz yönleri bulunmaktadır. Olumsuzluklardan biri, yabancı sermayeli bankaların belirli risklere ve krizlere karşı hazırlıklı olmaması ve ülkedeki sosyal ve siyasi sorunlarla karşılaştığında ülkeden ayrılmaya eğilim göstermesidir. Bu çalışmanın amacı, yabancı bankaların piyasa riskine duyarlılığını analiz etmek ve küreselleşmenin etkilerine rağmen yabancı bankaların bu tutumlarının değişip değişmediğini test etmektir. Belirlenen bu amaç doğrultusunda, Türkiye'de faaliyet gösteren kamu, özel ve yabancı sermayeli mevduat bankalarının piyasa riskine duyarlılık rasyoları açısından birbirlerinden farklı olup olmadığı diğer bir ifadeyle risk grupları kümeleme analizi ile araştırılmaktadır.

Pandemi krizini de kapsayan 2018-2020 dönemine ilişkin analiz sonuçları, yabancı sermayeli bankaların diğer mevduat bankalarından önemli ölçüde farklılaşmadığını vurgulamıştır. Aksine, diğer bankalarla benzerlikler bulunmaktadır. Bu durum, bankacılık sektörünün küreselleşme olgusuna uyum sağladığını ve piyasa risklerine duyarlılık açısından yerel bankalardan çok farklı performans göstermediğini göstermektedir.

Anahtar Kelimeler: *Banka oranları, Risk grupları, Piyasa riski, Piyasa riskine duyarlılık, Kümeleme analizi*

Jel Kodları: *C38, G21*

1. INTRODUCTION

The concept of banking, in general, has a very large scope in terms of activity, function and type. Each country has a banking system that has been formed depending on its unique historical and legal structure (Cengiz, 2010:232). However, as a result of the globalization of economic activities and the crossing of borders, the banking sector has been directly and effectively affected by globalization. Therefore, it is seen that the activities and investments of the banks are gradually increasing and has turned into a complex and risky form (Aydın ve Başkır, 2013:41). In light of these developments, the Turkish banking sector has benefited from these trends and has developed into a key pillar of the economy. Banking sector became a sector with the largest share in the financial system. According to the December 2020 report of the Banks Association of Turkey, there are 54 banks in Turkey. 34 of them are deposit banks. Of the deposit banks, 3 are public banks, 9 are private

banks, and 21 are foreign banks. Due to the high share of deposit banks in the banking sector, the risk ratings of these banks are also very important (Bayramoğlu ve Gürsoy, 2017: 3). It is well known that negative news about banks can lead to decrease of banks' reputation. Adversely, a strong reputation is a valuable intangible asset that can create a competitive advantage and attract new customers in the global trade (Araújo and Vinhado, 2016). Drawing upon a cross-bank dataset, we utilize nonparametric tests to discriminate the sound and unsound banks in Turkish banking sector.

For this reason, in this study, a clustering analysis was carried out using the data of 27 deposit banks operating in the banking sector, using the market risk sensitivity ratios which are among the risk assessment ratios, for the period 2018-2020. Cluster analysis is a multivariate analysis and evaluates many variables by ensuring that units with common characteristics are included in the same cluster (group) and maximizing the difference between clusters simultaneously (Karaatlı ve Yıldız, 2021: 4). Thus, with cluster analysis, the banks will be grouped in terms of sensitivity to the market risk.

2. LITERATURE

In this part of the study, some studies in the domestic and foreign literature related to this subject are mentioned.

The earlier studies in the literature are stated that, with the influence of the global economy, foreign capital banks are beneficial for transition economies and developing countries (Levine, 1997; Claessens et al. 2001). With the positive wind of globalization, the most of countries have adapted their banking regulations and laws to the global trend to be more attractive for the foreign investors. On the other hand, other study examined by Liu et al. (2021) have found that foreign banks' performance was not as good as that of the local banks in China. The authors have rendered the reason of unsound foreign banks and they hope that the recent policy changes may help them to overcome some of the cost of foreignness in the country. Later studies that are relatively novel studies about bank performances have included other parameters such as crises and/or risky. Financial crises that occurred in a country have the ability to affect the other countries abroad with the globalization. For that reason, considering the interactions of today's banking systems with each other, the danger of systemic risk (market risk) is much higher than in the past. One of the basic points of systemic risk assessment is the determination of systemically key and important banks for the establishment of macro-scale prudential policies (Ercan and Sayaseng,

2016). For this aim, authors were used cluster analysis to determine the similar pattern according to banking ratios and changes in the cluster groups affected by the financial crisis. Chen et al. (2019) examined the interactive role of bank competition and foreign bank entry by explaining the risk-taking of banks over the globe. According to the result of this study, the restrictions on bank activities and monetary stringency regulation reduced the level of the risk factor. Similarly, Claessens and Horen (2013) pointed out that foreign banks tend to outperform domestic banks in developing countries and in countries with weak institutions.

In the studies of Molinero, Gomez and Cinca (1993); Hierarchical clustering and principal components analysis was carried out with the financial data of 88 banks operating in Spain and it was concluded that the clustering was appropriate for the groups. Tükenmez, Demireli and Akkaya (2009) applied CAMELS analysis to three commercial banks with public capital in the Turkish banking system for the years 2003-2007. As a result; they concluded that between these years, the Liquidity Status component caused a 60% performance increase in state-owned banks, none of the banks could improve for all components, and the performance decrease was due to the Market Risk Sensitivity, Asset Quality and Management Quality components. Özkan and Boran (2014) conducted a K-means cluster analysis for some of the Turkish manufacturing industry companies by using some financial ratios in their study and obtained the result that the companies in the same sector are mostly in the same cluster.

On the other hand, in the studies of Yılmaz and Ergin (2014), using cluster analysis, the main activities of the banking sector in Turkey were classified on the basis of provinces and tried to determine the provinces with similar banking activities. Tekin and Temelli (2021) performed a cluster analysis using the financial ratios of 272 companies operating in different sectors and concluded that companies operating in different sectors are in the same clusters on the basis of financial ratios. Karaatlı and Yıldız (2021) examined the financial structures of 20 deposit banks with cluster analysis and found that the effect of ownership structures such as public, private and foreign ownership on cluster formation is low in clustering results. Contrary to these findings, Tekin and Bastak (2022) compared the similarities and differences in the risk and financial performance of commercial banks operating in Turkey with cluster analysis and concluded that public, private and foreign capital banks form different clusters. As it can be seen, although there are many studies in the literature on the CAMELS rating model of the Turkish

banking sector and the clustering analysis with ratios of some of its components, there is not yet a study in the literature with the ratios belonging to the market risk sensitivity component. Therefore, this study is expected to contribute to the literature.

3. DATA and METHODOLOGY

The data set of the study consists of public, private and foreign capital deposit banks operating in our country and these banks are shown in Table 1. In the study, market risk sensitivity ratios of public, private and foreign capital deposit banks operating in Turkey for the period 2018-2020 were used. The data set was obtained from the website of the Banks Association of Turkey. Bank of China Turkey A.Ş., a foreign-owned bank is excluded from the analysis due to lack of data.

In the study, data entry was made by considering the annual separation of the banks so that the performance analysis of the banks could be made in detail. For example, Citibank A.Ş. 2018, Citibank A.Ş. 2019 and Citibank A.Ş. 2020. Data entries were made in the form of 2020. Thus, while it is possible to monitor the annual performance of the banks separately in terms of the selected bank ratios, their performance can also be monitored periodically.

Table 1: The Banks Used in the Study

Public Capital Banks	**Private Capital Banks**	**Foreign Capital Banks**
T.C. Ziraat Bankası A.Ş.	Akbank T.A.Ş.	Alternatifbank A.Ş.
Türkiye Halk Bankası A.Ş.	Anadolubank A.Ş.	Arap Türk Bankası A.Ş.
Türkiye Vakıflar Bankası T.A.O.	Fibabanka A.Ş.	Bank of China Turkey A.Ş.
	Şekerbank T.A.Ş.	Burgan Bank A.Ş.
	Turkish Bank A.Ş.	Citibank A.Ş.
	Türk Ekonomi Bankası A.Ş.	Denizbank A.Ş.
	Türkiye İş Bankası A.Ş.	Deutsche Bank A.Ş.
	Yapı ve Kredi Bankası A.Ş.	HSBC Bank A.Ş.
		ICBC Turkey Bank A.Ş.
		ING Bank A.Ş.

	MUFG Bank Turkey A.Ş.
	Odea Bank A.Ş.
	QNB Finansbank A.Ş.
	Rabobank A.Ş.
	Turkland Bank A.Ş.
	Türkiye Garanti Bankası A.Ş.

Source: Turkish Banks Association, Our Banks 2020 Handbook.

In order to analyze whether public/private and foreign banks are different in terms of their sensitivity to market risk, the market risk ratios S1, S2, S3 and S4 for the years 2018-2020 are used and their definitions are given in Table 2. These ratios have been selected from among the CAMELS evaluation ratios, last letter of the CAMELS word, S-Sensitvity to Market Risk ratios which are considered sufficient for the supervision and monitoring of banks by the international finance authorities. CAMELS is a recognized international rating system that is used in order to rate financial institutions according to six factors represented by its acronym.

S1,S2,S3 ve S4 ratios for 2018-2019 have been utilized in order to analyze whether public and foreign origin banks shown different characrestics in their sensitivity towards market risks. Definitions of the ratios are exposed in Table 2. This selected ratios have been derived from among the CAMELS assessment ratios. The capital letter S represents the market sensitivity componenet. The ratios of these components are also regarded as sufficient criteria in monitoring and auditing the banks by the international finance authorities.

Table 2: Expressions of the Variables

Codes	Expressions
S1	FX Liabilities / Total Liabilities
S2	Non-Interest Income (Net) / Total Assets
S3	Interest Income / Total Assets
S4	FX Liquid Assets / FX Liabilities

The empirical methodology of this paper is the cluster analysis. Although there exist many types of cluster analysis, hierarchical cluster analysis is used in the current study in order to reveal the natural groupings (or clusters) using the data set. It is an exploratory statistical method for which there is no accepted sample size in the literature. Therefore it is applied to our data set which has not a big sample size. In additionaly, the method generates the clusters depending on the market measures of banks', instead of not depending on any mathematical formula.

Determination of the bank clusters may help to identify and classify the sound and unsound banks in the banking sector (Dao and Khanh, 2014). Being able to identify systemic risk at an early stage will help to the policymakers to take necessary steps in the preventing problems or crisis. It also helps to prevent the domino-like bank failures when the necessary measures are taken urgently. Feldstein (2002) has shown that the countries with strong banking systems and good bank supervision have the ability to prevent the difficulties that occurred the crisis countries.

For that reason, the banks should be constantly monitored by using such scientific methods and early precautions should be taken regularly to minimize the probability of the risk or crises.

4. FINDINGS

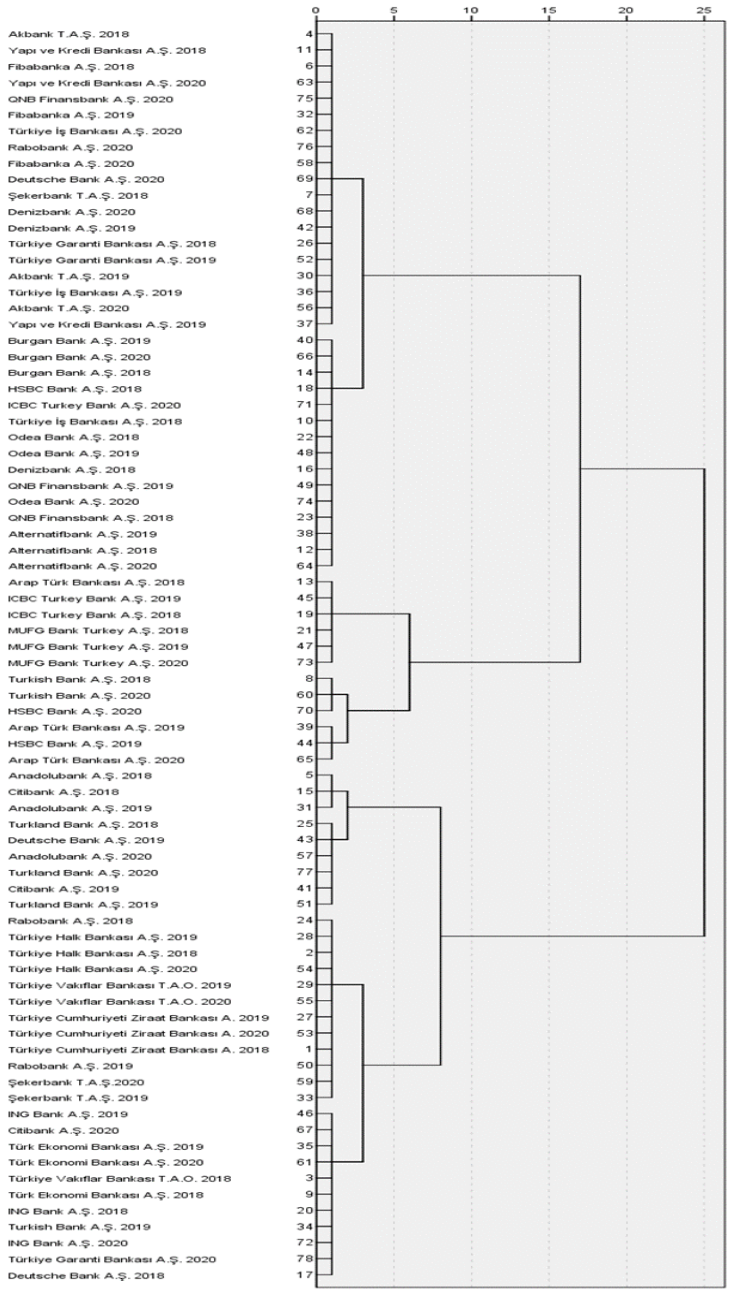
In the hierarchical clustering analysis, the number of clusters are determined by the analyst and it is for this reason alone many researchers find this spurious as to the leading results. Nevertheless, interpretation of the model is considerably easy (Karagöz, 2017: 413). This work uses ANOVA test to verify the results and compromise the disadvantages present in the model and attempt to verify the results of the cluster test. This work has chosen Ward's connection method for clustering and squared Euclidean distancing for measurement method.

Table 3 reveals Dendogram which is obtained at the end of the analysis. As this graph reveals, banks are categorized in two clusters: On the one hand, some banks are systematically fallen into one particular type of clusters, while on the other hand some others perform divergence throughout the years. As Table 3 highlights, banks with private capitalization, namely, Akbank T.A.Ş,, Yapı ve Kredi Bankası, Türkiye İş Bankası have shaped systematic clusters across the sampled period and have remained in same cluster every year in sample period. Yet, banks like those of Fibabanka A.Ş., QNB Finansbank A.Ş., HSBC Bank A.Ş.

have displayed different pattern in clustering pending on their diverging performance across the sampled period. For instance, Şekerbank T.A.Ş. has fallen into the first group (cluster) in 2018 but switched into the second category in 2019 and 2020. This kind of dramatic change insinuate a falling performance. For a general assessment, it is observed that .TC. Ziraat Bankası A.Ş., Türkiye Halk Bankası A.Ş. and Türkiye Vakıflar Bankası T.A.O remained in the second cluster for the all periods and can be translated as not being insulated against the market risks.

In the current analysis, each cluster is formed based on its distinctive features that reflect the characteristics of each cluster. In addition, it can assist to draw some brief summaries of the common characteristics about the clusters. The interpretation of obtained clusters offers information to analyze them in broader perspective, instead of analyzing individually each bank. If a bank is in the risky cluster, negative customer/investor perception will arise gradually.

Table 3: Dendrogram for the Banks



ANOVA test has been used to test the reliability of this grouping. The hypotheses to be tested in the analysis are given below;

H_1: There is a difference between bank groups in terms of S1.
H_2: There is a difference between bank groups in terms of S2.
H_3: There is a difference between bank groups in terms of S3.
H_4: There is a difference between bank groups in terms of S4.

Table 4: Result of the ANOVA Test

		Sum of Squares	df	Mean Square	F	Sig.
S1	Between Groups	6352,360		6352,360	55,129	,000
	Within Groups	8757,227	6	115,227		
	Total	15109,587	7			
S2	Between Groups	4,218		4,218	3,562	,063
	Within Groups	90,010	6	1,184		
	Total	94,229	7			
S3	Between Groups	50,930		50,930	6,706	,012
	Within Groups	577,152	6	7,594		
	Total	628,081	7			
S4	Between Groups	408,082		408,082	3,882	,052
	Within Groups	7988,612	6	105,113		
	Total	8396,694	7			

According to the result of ANOVA analysis, the H1 hypothesis is supported, and it is revealed that there is a difference between the groups in terms of the S1 variable. Similarly, the hypothesis H3 and H4 have been confirmed and it can be accepted that there is a difference between the groups in terms of S3 and S4 ratios. However, it is presented with the

value of sig=0, 063 that there is no difference between the groups in terms of the S2 ratio. As a result, it can be stated that the grouping obtained from the hierarchical clustering analysis is statistically significant.

5. CONCLUSION

In this study, deposit banks operating in the Turkish banking sector have been grouped by cluster analysis, in line with their performance in the period of 2018-2020 according to ratios of sensitivity to the market risk. Then, the effects of the variables used in grouping, in other words, whether these variables are statistically significant in grouping are examined. As a result of the analysis, it is observed that 26 banks are divided into two statistically significant groups in terms of sensitivity to market risk between 2018 and 2020. In the groups formed, contrary to many studies in the literature, it is clearly revealed that private and foreign capital deposit banks were not clearly differentiated from each other, but public banks are homogeneously placed in one cluster which includes the other private and foreign capital banks with low performances.

It is seen that mostly private and foreign capital banks are in the first group and they are strong against market risk. It can be concluded that foreign and some private owned domestic banks performance tend to converge and these domestic banks have gained a competitive advantage in the global trade.

One of the interesting findings of the study is that no state-owned banks are included in this group. This situation makes it necessary to take measures to increase the sensitivity of state-owned banks to market risk. That is exactly the opposite of the result pointed out in Karaatlı and Yıldız (2021)'s study. In the current study, the effect of ownership structures of the banks is not low on cluster formation. According to the current study’s result, public capital banks are systematically fallen into one particular type of cluster that is high risk group.

This result has uncovered the vulnerable banks in the sector. If systemic risk can be detected earlier and the necessary measures are taken urgently, spread of bank failure is possibly avoided.

On the other hand, it is not possible to say that foreign banks are not sensitive to market risk; on the contrary, it is revealed that they exhibit a strong performance. Therefore, it is seen that foreign capital banks, which are the subject of the study, did not follow a different policy

from strong private banks in terms of sensitivity to market risk in 2018-2020. This result of the study is consistent with the study of Tekin and Baslak (2022) since the changes between clusters are not systematic for private and foreign-owned banks. This situation can be evaluated as an indication that the foreign banking sector has adapted to the globalization, that banking sector has gained substantial experience from the 2008 financial crisis. It is also thought that strengthening the supervision and monitoring of the banks is very effective tool in the sensitivity to the market risk. Increasing globalization in the world trade is also another key factor for the foreign capital banks. Their increased appetite to gain big share is another important factor for the foreign banks in the global economy. If a bank is in the risky cluster, negative customer/investor perception will arise and their share in the market will reduce gradually.

Finally our findings obtained by using some of the ratios, not all can help identify a particular banking problems clearly. Clusters can help to distinguish sound banks from those that are weak considering the selected ratios.

Future research can examine the reputation risk of the banks operating in the Turkish banking sector.

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