

Comparison of Banks with Cluster Analysis Before and After Covid-19 Pandemic

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ABSTRACT

The Covid-19 virus, which emerged in Wuhan, China, in December 2019, spread all over the world in 2020, bringing commercial, social and economic life to a standstill. Governments have applied many support practices to reduce the impact of the virus on the economy. With public banks' social life support loans, those who lost their income due to the pandemic were supported. In 2020, when the most intense effects of the Covid-19 pandemic were experienced, public banks' loan and deposit volumes grew significantly. Banks profit by using the deposits they hold or collect as loans. Therefore, the efficiency of fiscal and monetary policies is increased through banks. The study aims to investigate whether the Covid-19 pandemic has caused a change in the clustering of banks by using the financial and size data of the deposit banks in the BIST Liquid Bank Index. The study tried to determine which banks included in the Borsa İstanbul (BIST) Liquid Bank Index were clustered using the values published in the 2019 and 2020 year-end annual reports. Cluster analysis was applied using the SPSS program. The study's findings determined that the pandemic process affected the clustering of banks and that public banks were in a different cluster compared to 2019.

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1. INTRODUCTION

The bank's name is derived from the Italian word banca and passed into Turkish. It means a place of exchange. It is estimated that banking history dates back to Sumer and Babylon. In 3500 B.C., the first bank named "model" was established in the Sumerians. In recent times, however, there are different views on the development of banking. One of them started with the use of church pastors as custodians due to people's need to deliver their valuables to a place they can trust when travelling to distant places. Traders used to deliver their goods to church priests, fearing that their valuables would be stolen on the road. Modern banks were first established in Mesopotamia. They made banks use loans in exchange for bail.

According to Islam, interest was haram that caused Muslims in the Ottoman Empire to stay away from banking. Therefore, the money market has always been owned by non-Muslims. Galata bankers

bought and sold money to Muslims in exchange for interest. Later, in 1845, Istanbul Bank was established, operating as the first bank. Ottoman Bank was established in 1856 to replace this institution, which was closed five years later. The Committee of Union and Progress wanted to end non-Muslim moneylenders by supporting Turkish companies. The foundations of İş Bank, the first bank of the Republic, were laid at the İzmir Economics Congress. It was founded by M. Kemal Atatürk on August 26, 1924.

Fifty-five active banks operate in Turkey; 32 deposit banks, 15 development and investment banks, and six participation banks. In addition, there are two banks transferred to the Savings Deposit Insurance Fund. The primary duty of deposit banks is to collect funds from individuals and organizations with surplus funds in return for a specific interest rate and to fund individuals and organizations in need of funds in return for a certain interest. The economy brings together those who supply and demand funds, and all benefit from this relationship. For example, banks give 10% interest to customers who have surplus funds and give loans at 12% to those who request funds, thus making a profit of 2%. Ziraat Bank, Halk Bank and VakıfBank belong to the state. The other 29 banks are private institutions, mostly with foreign capital. In addition, the Ministry of Treasury and Finance assigned 11 of 32 deposit banks to be market maker banks. The functioning of monetary and fiscal policies is facilitated through these banks. Fund flow is provided to the real market, and income distribution is intervened (Yetiz, 2016).

The importance of the development of investment banks in the economy is very significant. They provide the necessary funds to develop the country's industry and economy. They do not collect funds like deposit banks and do not engage in retail banking. Instead, they provide project support to foreign investors for the revival and development of the industry in the country. İller Bank, Turk Eximbank, Development and Investment Bank of Turkey are state-owned. The others are private and foreign capital development banks.

Participation banking carries out a different type of banking compared to deposit banking. The concept of interest is not used in participation banking. Instead, it operates with the logic of Islamic banking. It evaluates the funds it collects in participation accounts and gives dividends to individuals and organizations. Instead of providing cash support to the people and organizations in need of funds to purchase commercial goods or movable/immovable goods, the bank first buys the goods in need and then sells them to the requesting person or organization by adding the profit share. Thus, the bank carries out its activities with the logic of trade, apart from the interest system. Ziraat Participation and Emlak Participation banks are state-owned banks. The shares of Vakıf Katılım belong to the General Directorate of Foundations. Other participation banks are private and foreign capital.

Two active banks are transferred to the Saving Deposit Insurance Fund (TMSF), protecting the savers' rights from corruption and irregularities. As a result, Adabank and United Fund Bank cannot continue their activities like other banks. Instead, they continue their activities under the TMSF.

The first official Covid-19 case in Turkey appeared on March 11, 2020. On this date, it was declared a pandemic by the World Health Organization (WHO). Considering the rate of spread of Covid-19 and the threat it poses to human health, the World Health Organization had declared a pandemic not to endanger more human lives.

In China's Wuhan Province, the first cases of Covid-19 began to appear in December 2019. The disease diagnosis, which showed symptoms such as cough, fever, and shortness of breath, took place in January 2020. It is thought to be transmitted from bats to humans due to the Chinese people consuming wild animals. Covid-19 continues its effect by spreading first to the Wuhan Province, then to the whole of China and then to the whole world. Many industries had to close due to the virus. Governments have imposed many restrictions to decrease crowded environments necessary for the virus to survive. Many sectors such as workplaces, cinemas, theatres, schools, coffee shops, patisseries and restaurants had to close their workplaces in this process. When commercial life came to a standstill, producers and sellers suffered great losses.

Many commercial enterprises were unable to repay their bank loans. The checks of the companies were written, and their unpaid loans were transferred to the follow-up. The economic situation of the people who were out of work deteriorated. Unable to pay off their debts, their credit scores plummeted. The tourism industry has also been hit hard by Covid-19. The lack of tourism revenues, especially in a country like ours, where tourism revenues are in great need, created another reason for the current account deficit problem in the Turkish economy.

Today, the number of cases reached 250 million, and there have been 5 million deaths worldwide. Today, 7 billion vaccine doses have been administered worldwide. The vast majority of cases are located in the Americas. In Turkey, 8.26 million cases have been detected so far, and 72,314 people have died. Approximately 115 million doses of vaccine were administered (www.who.int). Countries have started to take normalization steps because they trust the vaccine and need to revive their economies. However, switching the education system online for a long time has caused students to remain passive and away from the educational environment. It is predicted that the reopening of schools will cause an increase in Covid-19 cases.

2. BIST LIQUID BANK INDEX

The "Star Market" is the market in which shares with a market value of 300 million Turkish Lira and above and listed on the BIST are traded. The BIST Liquid Bank Index is the index where companies with high trading volume operate. The number of shares to be included in the index is at least six. BIST Liquid Bank Index started to be calculated on 04.11.2019. Banks included in the index: Akbank, Garanti Bank, Halk Bank, Turkey İş Bank, Turkey Industrial Development Bank, Turkey VakıfBank, Yapı ve Kredi Bank.

One of the banks in the BIST Liquid Bank Index, Turkey Industrial Development Bank, is not included in the analysis as it is not a bank that collects deposits. Information on other banks subject to the analysis is given in Table 1. A comparison was made with the data obtained from the banks' 2020 year-end activity reports. The financial and size values obtained from the annual reports are shown in Table 1.

Table 1: 2020 Financial and Size Values of Banks Included in the BIST Liquid Bank Index

	Akbank	Garanti Bank	Halk Bank	İş Bank	VakıfBank	Yapı ve Kredi Bank
Total Assets (Billion TL)	478	541	680	594	699	486
Loans (Billion TL)	279	335	450	345	422	282
Deposit (Billion TL)	293	358	457	369	414	259
Equity (Billion TL)	63	62	43	68	46	48
Net Profit (Billion TL)	6	6,4	1,7	6,8	5	5
Number of Branches	714	894	1007	1227	936	835
Number of ATM	5000	5309	4060	6521	4247	4535
Capital Adequacy Ratio	20,7	16,9	15,2	18,7	16,44	16,7
Number of Personnel	12446	18656	20171	23518	16748	16037
TL Housing Loan (Million TL)	9,582	21,283	48,581	21,129	40,609	11,146
TL Vehicle Loan (Million TL)	0,229	2,092	0,513	1,236	0,478	1,519
TL Consumer Loan (Million TL)	30,276	39,079	26,062	43,913	49,179	35,078
Interest Income (Billion TL)	35	39	55	48	48	35
Interest Expenses (Billion TL)	14	14	35	19	28	17

Source: Compiled by the authors from the annual reports of banks.

VakıfBank was the leading bank in total assets at the end of 2020. Akbank has the lowest total asset value. Funding the market through public banks in order to reduce the economic effects of Covid-19, provided a rapid increase in the assets of VakıfBank and Halk Bank. The bank with the lowest loan volume is Akbank. As of the end of 2020, the bank that collected the most deposits was Halk Bank, while the bank that collected the least deposits was Yapı ve Kredi Bank. When examining banks' equity capital, private and foreign capital banks are better than public banks. Regarding net profit, İş Bank achieved a high income as in the previous periods and ranked first with TL 6.8 billion. On the other hand, Halk Bank came in last with a low net profit of TL 1.7 billion. The bank with the most branches is İş Bank, whilst Akbank has the least branches. While İş Bank had the highest number of ATMs, Halkbank had the lowest number. While the bank with the most personnel is İş Bank, the bank with the least personnel is Akbank. In order to reduce the damage of the Covid-19 pandemic done to the construction sector, government-supported housing loans were given through public banks. Housing loans were given with 0.64% interest rates for new houses and 0.74% for second-hand houses. This situation highlights the public banks as the banks that give the most loans in the housing loans section. Private banks give more loans related to vehicles. Particularly, Garanti Bank stands out with TL 2 million. The leading bank in consumer loans was VakıfBank, followed by İş Bank. The bank with the highest interest income and expense is Halk Bank, while the bank with the lowest interest income and expense is Akbank.

3. LITERATURE

There is no study conducted with cluster analysis between the banks in the BIST Liquid Bank Index and Covid-19. However, there are studies in the literature between deposit banks and cluster analysis. There are also existing studies between the banking sector and Covid-19.

Ersoy, Gürbüz and Erdoğan (2020) examine the banking data for the ten weeks after March 11, 2020, and the ten weeks before that date when the Covid-19 outbreak occurred in Turkey. They examined the effects of the measures taken in the fight against the disease on the banking sector and included deposit and participation banks in the analysis. They emphasize that the banks included in the analysis contributed to the economy with practices such as providing liquidity, extending loans, extending the maturity of loans and reducing the follow-up rates in order to reduce the impact of adverse economic developments that may occur on the real sector and households during the pandemic process.

Arabaci and Yücel (2020) put forward the policies implemented to eliminate the negative effects of Covid-19 on the economy in their research. In the fight against the pandemic, countries emphasized that some regulations, including monetary policies such as restructuring of loan debts, providing liquidity support to the market, low-interest loan options and changes in policy interest rates were put into effect. They also stated that financial institutions such as the International Monetary Fund (IMF), European Central Bank (ECB), and the World Bank quickly put into effect credit support packages. They declared that Turkey announced the Economic Stability Shield Package on 18.03.2020 to reduce the effects of the Covid-19 pandemic on the economy and that the most detailed part of the 21-item package is related to public banks. In order to reduce the adverse effects of the pandemic on the economy, the loan principal and interest payments of the companies whose cash flow has deteriorated will be postponed for a minimum of 3 months, and additional financial support will be provided to them when necessary. The loan debts, principal and interest payments due to Halk Bank for April, May and June 2020 of the tradesmen and craftsmen whose work was adversely affected will be postponed for three months without any interest. Credit Guarantee Fund limit will be increased from 25 billion Lira to 50 billion lira, and loans will be given primarily to firms and SMEs in need of liquidity. Measures have been taken regarding loans, such as introducing social loan packages under favourable and advantageous conditions to encourage citizens. The loanable amount will be increased from 80% to 90% in housing purchases under 500 thousand lira, and the minimum down payment will be reduced to 10%. They stated that four loan programs were announced through Ziraat Bank, Halk Bank and VakıfBank, including low-interest holiday support loans, housing loans, vehicle loans and consumer loans.

Cengiz (2010) aimed to cluster the deposit banks in Turkey using their ratios and evaluated them by comparing the clustering methods. The analysis was carried out with 29 deposit banks. He included many different variables in his study, such as the size and capital structure of banks. He did not include the banks whose ratios he could not access. In order to eliminate the multicollinearity problem between the ratios of the banks, factor analysis presents a total of 5 factors and an explanation rate of 84%. He applied all rotation methods to measure the conceptual significance of the factors and decided that the varimax method was appropriate. He applied the k-means analysis and tried the number of clusters as 3 and 4. In the analysis where he determined the number of clusters as 4, the results of the clustering of banks and the ANOVA table were not suitable. When he considered the number of clusters as 3, the banks in the clusters were not significant. At the end of the analysis, it was stated that a cluster analysis made by only considering the ratios of banks gave unreasonable results.

In Doğan (2008)'s doctoral study, cluster analysis was applied based on the financial ratios of active commercial banks between 1998 and 2006. With the test result, the compatibility of the financial structures of the banks was observed. The clusters determined as a result of the study included variables such as capital adequacy, asset quality, balance sheet structure, income and expense ratios, liquidity, profitability, and asset size. According to these variables, it was stated that the banks that were most similar to each other came together. The 1997 Russian crisis and the 2000-2001 crises in the Turkish banking sector deeply shook the banking sector. In the analysis, he concluded that banks were separated into clusters in a meaningful way and that the banks in the clusters were close to each other in terms of financial value. It has been concluded that the ownership structures of banks (public, foreign, private) do not have any effect on cluster formations. Also, banks can use existing methods as complementary methods to identify their strengths and weaknesses.

Akgöz (2010) applied cluster analysis with the data obtained from the balance sheets and income statements of commercial banks operating in Turkey in his master's thesis. According to the analysis he made regarding profitability indicators, he determined that 25 commercial banks were not around the average, and they differed from each other according to their profitability. Therefore, the number of clusters was determined as 4. In the first cluster, 13 banks are clustered and include public and private banks. Akgöz (2010) concluded that Adabank and Deutsche Bank are in the second cluster, and domestic and foreign capital banks are in the third cluster. In the fourth cluster, CitiBank was clustered alone. When he examined banks in terms of capital adequacy, asset quality, income-expenditure structure, he stated in his study that there were different groups similar to the above.

Akgül and Başkir (2013) take the criteria affecting the asset sizes of the banks subject to analysis between 2008 and 2012 as a basis and applied clustering analysis. They examine why businesses consider the banks included in the analysis as working partners. The appropriate number of clusters required for cluster analysis was found using the Silhouette index, and the cluster numbers and differences of clusters were compared as a result of the Ward technique and PAM algorithm. According to the analysis, the number of clusters should be two. They are classified as large and

small-scale banks. Seven banks, consisting of state-owned and some privately-owned banks, were clustered in the first group. In the other group, some banks are not included in the first group. They also stated that the groups are likely to change if a different variable is included in the application.

Çalış and Baynal (2016) examine the determination of sales strategies in the banking sector by using the cluster analysis technique. Data mining is a way of extracting meaningful information from large amounts of data. They stated that data mining is also used in the field of banking. They aimed to cluster two hundred customers of a bank branch operating in Turkey into twelve different variables and to develop sales strategies according to the customer profiles in the clusters. For businesses to succeed in a competitive environment, they need to implement effective and low-cost marketing strategies. The correct information is needed for correct marketing. In order to obtain accurate information, tools such as VMs that can analyze data in multidimensional ways are needed. VM tools are also used in the banking sector. Their studies aim to evaluate the existing customers by dividing them into clusters with KA, one of the VM techniques. The first cluster consists of retired male customers, aged 45-51, who do not have their own houses and vehicles, and whose monthly income is between 751-1400 TL. The second cluster includes public and private sector employees aged 24-30 who are unmarried. The number of women in this cluster is higher than in the other cluster. Most of them have their own home. They also have normal payment status. The third cluster consists of retired male customers between the ages of 38 and 44 who own a house and a car, with a monthly income between 1401 and 2050 TL. Their salaries come from the bank they have a loan from. 98% of the people in this cluster have a spouse income and have regular payments. They suggested that it would be more appropriate to market banking products and services, taking into account the characteristic features of the groups.

Aksarayli and Pala (2017) conducted a study on performance ranking, clustering and productivity analysis according to capital structure in the Turkish banking sector. Their study determined the relative efficiency of 28 deposit banks between 2010 and 2014 and set targets for ineffective banks using reference sets. They examined the similarities and divergences of banks with cluster analysis, ranked the banks with the multi-criteria decision-making methods PROMETHEE and TOPSIS, and obtained important information by making detailed comparative analyzes. In the study, clustering and MCDM results provide information that will help in target setting. The analysis results are important for banks to have information about the future. In addition, it provides a resource to help managers determine their strategies.

Bekci, Köse and Aksoy (2020) estimate the economic impact of the Covid-19 virus on banks in Turkey. After the adverse developments with Covid-19, interest rates were reduced in the short term, and the demand for loans increased in the banking sector. Their studies tried to get information about the future periods of the banks selected over the total loans/total deposit ratio, which shows the banks' asset quality. They analyzed nine banks and used quarters in the range of 2019/1 – 2020/2. The application was made with the GM (1,1) estimation model. Until the second quarter of 2021, the

measurement of the asset quality of selected banks was carried out. At the end of their analysis, they predicted that there would be a decreasing trend in the ratios showing the asset quality of state-owned deposit banks for the following four periods. In addition, Turkey İş Bank, Kuwait Turkish Participation Bank and Finance Participation Bank of Turkey have also predicted that they will have a decreasing trend in the subsequent four periods. Apart from these, Turkey Garanti Bank, Yapı ve Kredi Bank and Albaraka Turkish Participation Bank have predicted an increasing trend in the next four quarters.

Yetiz (2021) measures the impact of the pandemic process on its employees and customers in the banking sector with a SWOT Analysis. In his study, he included the measures taken for the banking sector during the pandemic, support packages and service items that changed in banking activities. In the face of the threat posed by Covid-19, the banking sector has started to take many precautions. Some of the measures and precautions taken include making arrangements in the employees' working hours in the sector; remote connection solutions for new customer acquisition; positioning the customers according to social distance; updating the information technology systems of the banks, and creating a healthy and hygienic environment. Thanks to the systems developed, many banking activities have been made available via the internet and mobile banking. The measures taken in the banking sector supported the banking sector's technological infrastructure and systemic development. Therefore, it can be said that the regulations brought to the banking sector do not impose an excessive burden on the sector and do not reduce the mobility of banks.

Karaatlı and Yıldız (2021) analysed the financial structures of deposit banks and classified them using cluster analysis. As of 2017, they performed clustering analysis with the financial data of 20 active deposit banks. They used the Expectation-Maximization Algorithm. They concluded that the ownership of banks (public, private, foreign) in the clusters they obtained does not affect cluster formation. It has been determined that two banks with fewer branches are in the first cluster, while the other cluster includes banks with a high sector share and two public banks. This cluster includes both private and foreign capital banks. In another cluster, privately owned banks that are not very popular are clustered. In the last cluster, it has been determined that banks with many branches with public and foreign capital are clustered. It reveals that working with the banks in the cluster, which is strong in terms of asset size, will be more reliable in crisis environments. They also stated that a bank experiencing a financial crisis might also affect other cluster members.

4. DATA AND METHOD

The study examines the activity reports of 6 deposit banks included in the BIST Liquid Bank Index between 2019 and 2020. Data obtained on the financial values of the banks were analyzed in the SPSS program. The 2019 year-end and 2020 year-end reports of the analyzed banks were obtained from the banks' official websites. Consolidated data were used in the analysis. The number of groups was set at 2 and 3 using the k-means method. It was observed that there was a significant distribution in the

analysis where the number of groups was 3. Information on the variables that make up the study are as follows:

Table 2: Data Set

Formula	Explanation
Net Profit / Total Assets	Profitability rate of total assets
Net Profit / Equity	Rate of return on equity
Loan / Deposit	Conversion ratio of total deposit to loan
Branch / Total Assets	Branch ratio by total assets
ATM / Total Assets	ATM ratio by total assets
Capital Adequacy Ratio	Capital Adequacy Ratio
Number of Personnel / Total Assets	Personnel ratio by total assets
Housing Loan / Deposit	Housing loan ratio by total deposit
Vehicle Loan / Deposit	Automotive loan ratio by total deposit
Consumer Loan / Deposit	Consumer loan ratio according to total deposit
Interest income / Interest expense	Ratio of interest income to interest expenses

Source: Authors' Compilation

A more accurate analysis can be made by proportioning the data obtained from the year-end activity reports published by the banks on their official websites, as in Table 2. Otherwise, it is not possible to make a fair comparison. For example, it would be wrong to evaluate the banks subject to the analysis only on net profit figures. This is because the size of each bank is different. If we compare a large bank in the banking market with a small bank only on net profit, the numerically small bank may seem left behind. However, considering how much profit it has made according to its total asset size, it can be seen that the smaller bank performs better than the larger bank. For this reason, K-means analysis was performed over the SPSS program according to the ratios in Table 2.

4.1 Findings

Results show that only Akbank is in the first group according to the financial values of the banks for 2019. In the second group, only İş Bank is present. The third group included Garanti Bank, Halk Bank, VakıfBank and Yapı ve Kredi Bank. When we examine the financial values of banks, one observes that Akbank lags behind other banks in many values in 2019. The analysis explains why Akbank is separated from the others and is in the first group on its own.

When we re-examine the financial indicators, it is observed that İş Bank is superior to other banks on many values. This explains the reason why İş Bank is alone in the second group. According to financial indicators in 2019, the other four banks are close to each other. This situation enabled these four banks to gather in a single group.

The analysis results made with the k-means technique over SPSS are presented in Table 3.

Table 3: Clustering Results of 2019

Case Number	Bank	Cluster	Distance
1	Akbank	1	,000
2	Garanti Bank	3	3,290
3	Halk Bank	3	2,611
4	İş Bank	2	,000
5	VakıfBank	3	1,380
6	Yapı ve Kredi Bank	3	1,089

Source: Authors' Compilation

Akbank is clustered in the first group. İş Bank is clustered in the second group. Garanti Bank, Halk Bank, VakıfBank, Yapı ve Kredi Bank are clustered in the third group. The K-means analysis results for 2020 are given in Table 4.

Table 4: Clustering Results of 2020

Case Number	Bank	Cluster	Distance
1	Akbank	1	,000
2	Garanti Bank	2	1,389
3	Halk Bank	3	2,921
4	İş Bank	2	4,216
5	VakıfBank	3	2,921
6	Yapı ve Kredi Bank	2	2,911

Source: Authors' Compilation

According to the first analysis, one observes differences in clusters. As in 2019, Akbank was clustered again in the first group alone. In the third group, Garanti Bank and Yapı ve Kredi Bank were separated from the other two banks and clustered next to İşbank in the second group. Finally, in the third group, Halk Bank and VakıfBank take place together.

In the clustering in 2019, Akbank was clustered alone due to its lower financial values when compared to other banks. İş Bank, on the other hand, has been clustered alone due to its higher values compared to other banks. The other four banks are clustered together as they have similar values. In 2020, Akbank continued to have lower values than the others and clustered alone. Governments have taken many measures to reduce the impact of the pandemic on the economy. With the significant effect of the Social Life Support Loans given through public banks, VakıfBank and Halk Bank gained more financial value than other banks due to the growth in their total assets, the increase in the number of

loans, and the increase in the number of deposits. As a result of this increase, VakıfBank and Halk Bank were separated from other banks and clustered in the third group in the 2020 K-means analysis. Since the 2020 financial values of Yapı ve Kredi Bank and Garanti Bank are closer to those of İş Bank, three banks are clustered in the second group.

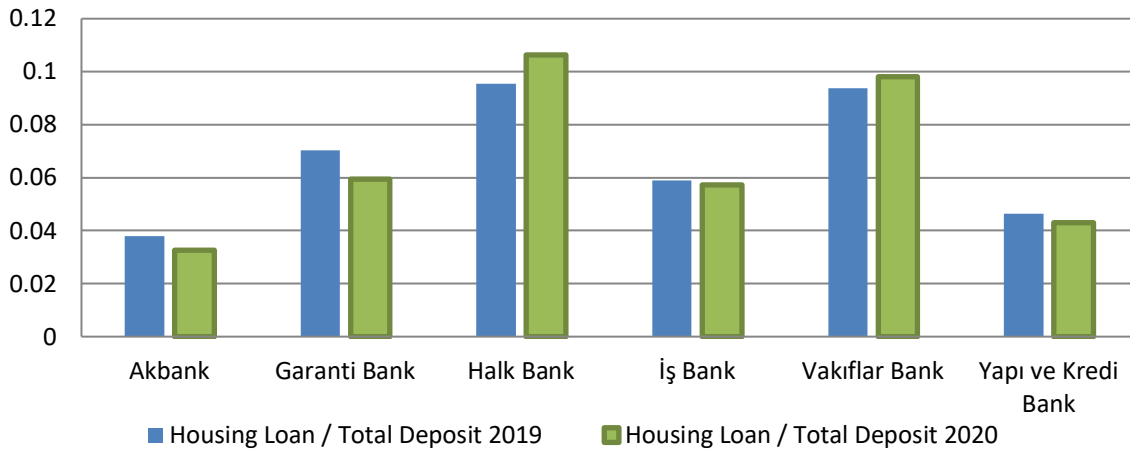


Figure 1: Conversion Ratio of Total Deposits to Housing Loans

Source: Authors' Compilation

The conversion rates of total deposits to housing loans for 2019 and 2020 are shown in Figure 1. The blue column shows the rate for 2019, while the green column shows the conversion rate for 2020. Comparing Akbank's conversion rate in 2020 and 2019, one notes that it has given fewer housing loans than its total deposits in 2020 compared to 2019. If we compare the conversion rate of İş Bank, Yapı ve Kredi Bank, Garanti Bank and Akbank in 2020 with the conversion rate of 2019, in 2020, they gave fewer housing loans than their total deposits. We found that SPSS K-means analysis resulted in different clusters in 2020. The graphic above shows one reason why Halk Bank and VakıfBank are in a different cluster. The rate of conversion of Halk Bank and Foundations Bank deposits to housing loans in 2020 has increased compared to 2019. State-supported low-interest housing loans provided by public banks constituted the source of this differentiation.

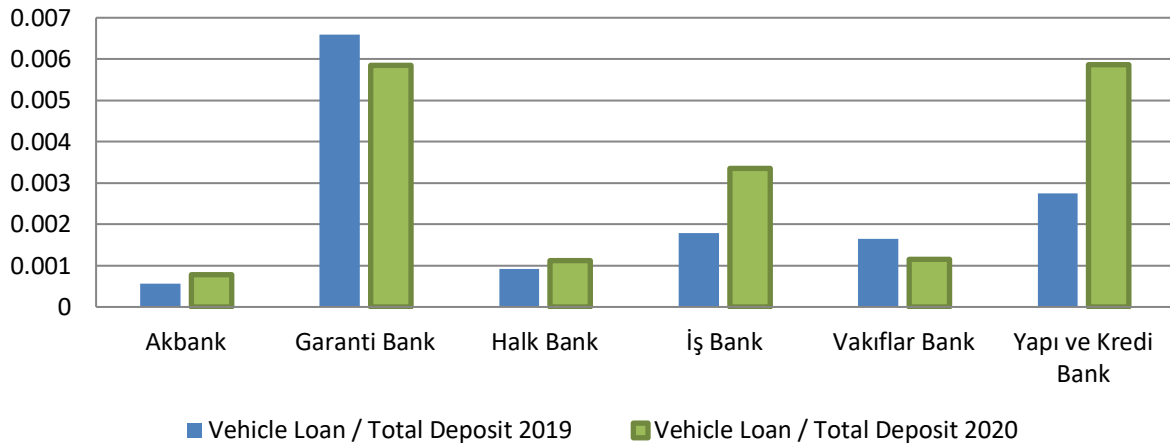


Figure 2: Ratio of Conversion of Total Deposits to Vehicle Loans

Source: Authors' Compilation

The conversion rates of the total deposits of 2019 and 2020 to vehicle loans are given in Figure 2 above. The blue column represents 2019, and the green column represents 2020. Akbank increased its conversion rate to vehicle loans at a low level in 2020 compared to 2019 and lagged behind other banks in terms of total conversion rate, revealing one reason for its clustering on its own. Compared to 2019, İş Bank and Yapı ve Kredi Bank have significantly increased their conversion rates to vehicle loans. At Garanti Bank, on the other hand, there was a decrease in the rate of conversion to vehicle loans in 2020 compared to 2019. When the total transformation levels are considered, Yapı ve Kredi Bank, İş Bank and Garanti Bank are at very close levels. While Halk Bank experienced a slight increase in its conversion rate to vehicle loans in 2020 compared to 2019, VakıfBank experienced a decrease. However, the conversion rates for 2020 were almost at the same level in these two public banks. Another reason why they were included in the same cluster emerged here.

The conversion rates of total deposits to consumer loans in 2019 and 2020 are shown in Figure 3. The year 2019 is shown in blue, and 2020 is shown in green. While the conversion rates of private and foreign banks increased more in 2020 compared to 2019, this rate of change increased less in public banks. This is one of the reasons why Halk Bank and VakıfBank are in the same cluster.

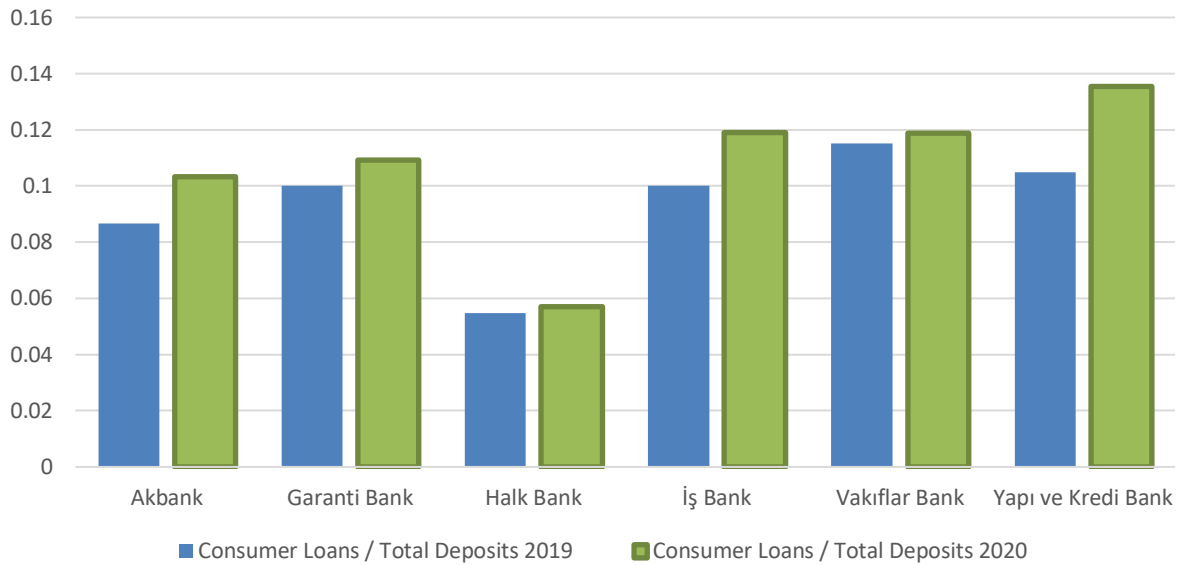


Figure 3: Conversion Ratio of Total Deposits to Consumer Loans

Source: Authors' Compilation

5. CONCLUSION

The Covid-19 virus affected the economies of all countries and brought many sectors to a standstill. The banking sector has also been affected by this epidemic in different ways. Governments have taken many measures to reduce the negative impact of the epidemic on the economy. The downward pull in interest rates increased the liquidity in the market. State-supported housing loans were introduced to support the construction industry affected by COVID-19. State-supported vehicle loans were introduced to revive the automotive sector. In addition, small amounts of low-interest consumer loans were given to meet the needs of consumers. These loans were made available to those who requested them through public banks.

The study aims to investigate how the banking sector has been affected by the Covid-19 pandemic. Six deposit banks included in the BIST Liquid Bank Index were used. There are two public banks and four private and foreign capital deposit banks in the index. The test was carried out using the K-means analysis using the SPSS program. In addition, the financial values and size data obtained from the year-end annual reports published by the banks in 2019 and 2020 were used.

It was thought that objective results could not be obtained when the data obtained from the year-end activity reports were included in the analysis, and it was concluded that a more accurate analysis would be made by proportioning the data to each other. Comparisons were made, such as loans given by the banks according to their asset size, profits they obtained, the number of personnel, the number of branches, and the number of ATMs. Only capital adequacy ratios are included in the analysis as is. Data obtained from year-end activity reports are consolidated data.

As a result of the analysis, Akbank clustered alone in 2019 due to its lower financial and size values compared to other banks. On the other hand, due to its higher values compared to other banks in 2019, İşbank is clustered alone in the second cluster Yapı ve Kredi Bank, Garanti Bank, Halk Bank and VakıfBank clustered together in the third cluster since they had the same average values in 2019.

The analysis results obtained with the data of 2020, it was determined that Akbank is again in the first cluster alone. Yapı ve Kredi Bank, Garanti Bank, and İş Bank clustered together in the second cluster according to their 2020 financial and size values. Following the growth in the financial values of Halk Bank and VakıfBank, due to the support loans given through public banks to reduce the impact of the epidemic, it has been determined that they cluster together in the third cluster.

The Covid-19 virus has caused many things to change all over the world. The banking sector has invested more in internet and mobile banking. People started to use more virtual banking instead of branches. There have been significant changes in the working conditions of banks and their balance sheets. Social Life Support Loans caused the assets of public banks to grow. This change has enabled public banks to separate from private and foreign banks and merge into a different cluster.

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