

HOW DO PARTICIPATION BANKS DIFFER FROM CONVENTIONAL BANKS?
A COMPARATIVE ANALYSIS OF THEIR FINANCIAL STATEMENTS AND
RESILIENCE TO MACROECONOMIC CHANGES

A Thesis

By

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*To my wife Betül Özyürür for supporting me throughout the process with
patience and kindness...*

ABSTRACT

This study investigates differentiations between conventional and participation banks and provides comparative analysis of their financial statements and resilience to macroeconomic changes. I examine largest commercial banks in Turkey between 4th quarter of 2013 and 4th quarter of 2020 with quarterly statements. I also study the macroeconomic variables at the same period and investigate how changes in macroeconomy affect conventional and participation banks.

My analysis indicate there are some evidence that conventional and participation banks differ from each other with respect to product structure, asset composition and efficiency. My analysis also demonstrate that conventional and participation banks show different resilience levels to changes in macroeconomy. Those differences mainly are result of the sharia-compliant rules that participation banks need to obey and follow.

I conclude that participation banks seem more resilient and robust to macroeconomic changes. On average, they are affected less by the changes in macroeconomy compare to other banks in my data.

ÖZET

Bu çalışmada, konvansiyonel bankalar ile katılım bankaları arasındaki farklılıkları araştırılmaktadır. Bu kapsamda bankaların finansal tablolarının karşılaştırmalı analizi ve makroekonomik değişikliklere karşı dayanıklılığını araştırılmaktadır. Türkiye'nin en büyük ticari bankalarını 2013 yılının 4. çeyreği ile 2020 yılının 4. çeyreği arasındaki çeyreklik finansallarını inceliyorum. Aynı dönemde makroekonomik değişkenleri de analiz edip ve makroekonomideki değişimlerin konvansiyonel ve katılım bankalarını nasıl etkilediğini araştırıyorum.

Analiz sonuçların konvansiyonel ve katılım bankalarının ürün yapısı, varlık kompozisyonu ve verimlilik açısından birbirinden farklı olduğuna dair bazı kanıtlar olduğunu göstermektedir. Analizim ayrıca konvansiyonel ve katılım bankalarının makroekonomideki değişikliklere farklı direnç seviyeleri sergilediğini de göstermektedir. Bu farklılıkların birçoğu katılım bankalarının uyması ve takip etmesi gereken İslami Finans sisteminin getirdiği kurallardan kaynaklanmaktadır.

Çalışmamın sonucunda katılım bankalarının makroekonomik değişikliklere karşı daha dirençli ve sağlam görüldüğü sonucuna vardım. Veri setimdeki diğer bankalara kıyasla, makroekonomideki değişikliklerden ortalama olarak daha az etkilendiklerini söylemek mümkündür.

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I would like to express my deepest gratitude and thanks to my esteemed supervisor Dr. Levent Gntay for his endless support and invaluable supervision during the course of my master education and master thesis. I also would like to express gratitude to Department of Financial Engineering and Risk Management for providing me such unique opportunity, and I would like to thank administrative office, Ulku Kknel and Bahar Hısım for their patience and guidance throughout the process. Lastly, I would like to thank my colleagues for their counseling when I needed.

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CHAPTER I

I. INTRODUCTION

For a very long period of time, the financial system is mainly dominated by conventional banks and other financial institutions which serve under similar principles. During several crises, the efficiency and performance of these dominant players has been questioned. As a result of that, the Islamic Banking Industry acquired an opportunity to grow and spread around the market. Gradually, it attracted more and more people and gained a strong momentum to grow across many countries. Figure 1 and 2 demonstrate that while the global economy grew 3.48% on average, the Islamic Banking Industry grew 6.61% between the period of 2013-2019.

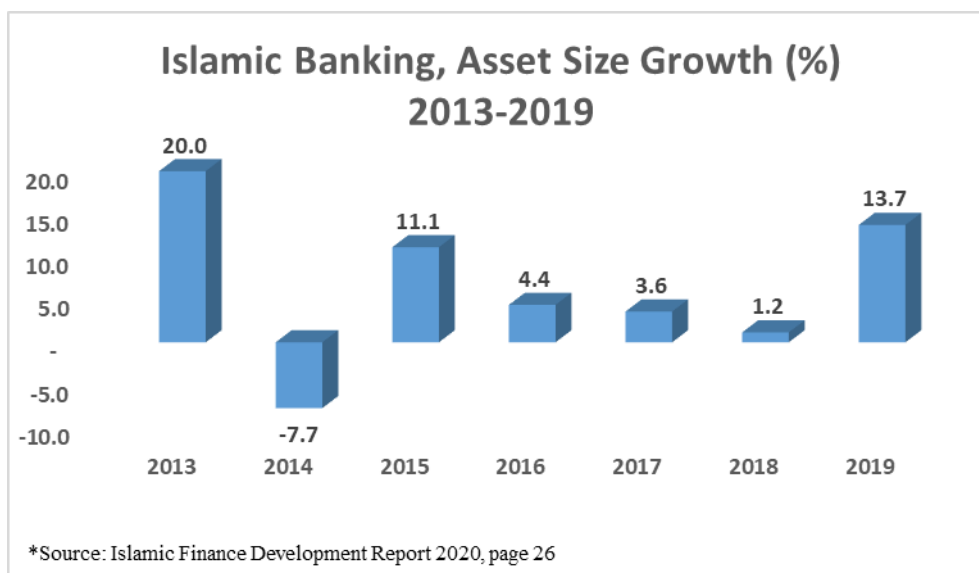


Figure 1: Islamic Banking Asset Size Growth (%), 2013-2019

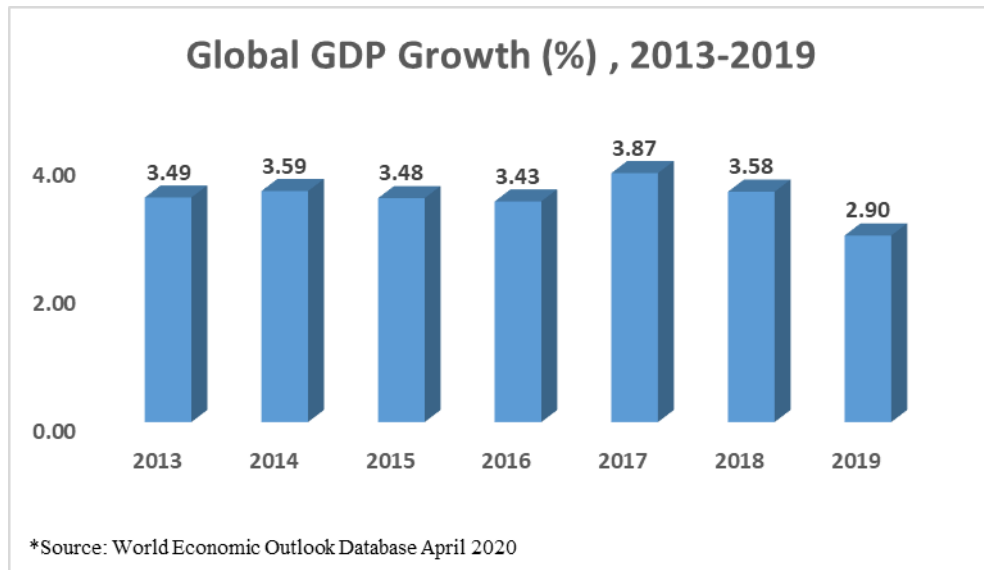


Figure 2: Global GDP Growth (%), 2013-2019

Despite the fact that it is a growing industry among many regions, there is a shortage of academic papers on this matter. Sharia-compliant products are in demand not only in Muslim countries but in also Europe, U.S and Asia. Apart from religious aspect, Islamic Banking Industry may be more resistant to shocks in economy and considered more supportive to real economy due to dynamic of their products based on anecdotal evidence. Among many, Murabaha, Mudaraba, Ijara, Sukuk and Mushakara are the most common products being used in Turkey. Section 2 provides description for those products.

Before 2000's conventional banks heavily dominated Banking Industry in Turkey. Starting from 1980's , the establishment of Albaraka and Kuveyt Türk jumpstarted the Islamic Banking Industry in Turkey. As Figure 3 illustrates, in 2021, of the 6 participation banks in Turkey, 3 of them are state-owned bank and the 3 of them are privately owned.

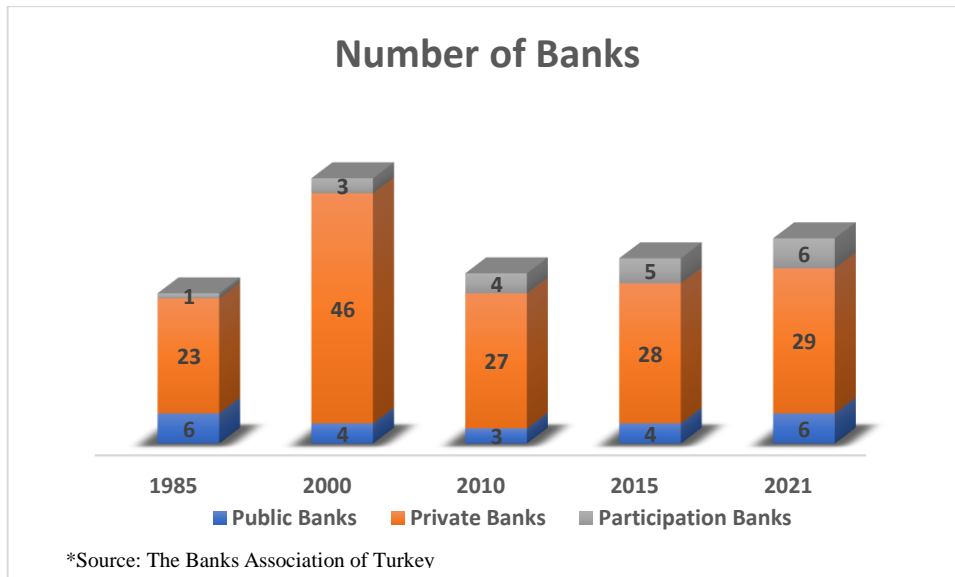


Figure 3: Number of Banks in Turkey between 1985 and 2021

While the number of banks in the industry were fluctuating over time, the size of the industry didn't significantly increase until 2010-2011. After 2001 and 2008 economic crisis, there has been some regulations and improvements in infrastructure towards banking industry which boosted the growth. Local authorities started to monitor the industry more closely and often put significant pressure on banks to increase strength of their capital structure and provide more solid and comprehensive services.

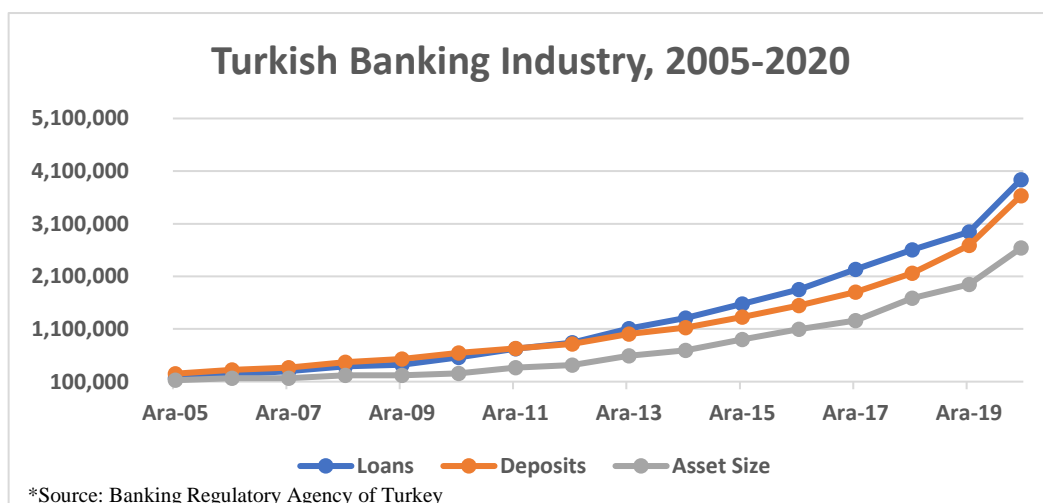


Figure 4: Turkey Banking Industry, Asset Size between 2005-2020

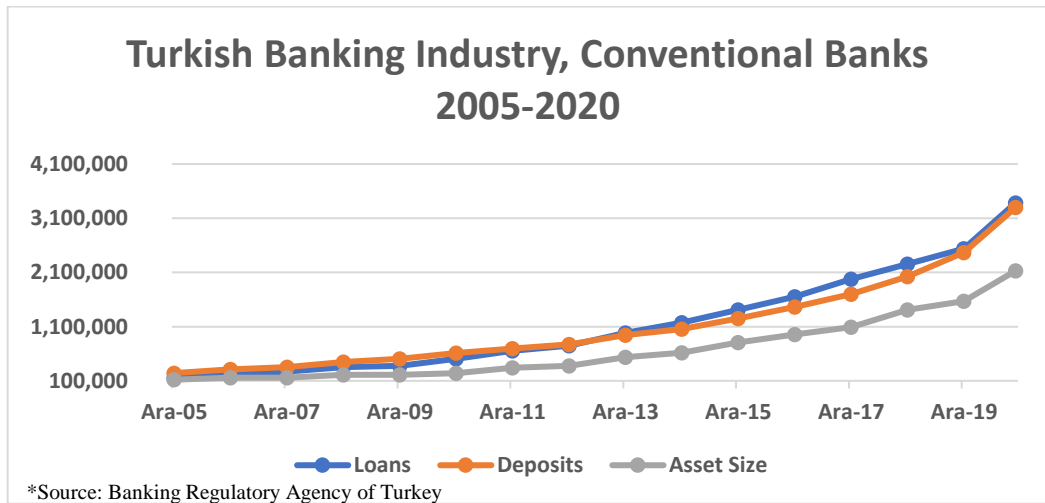


Figure 5: Turkey Conventional Banking Industry, Asset Size between 2005-2020

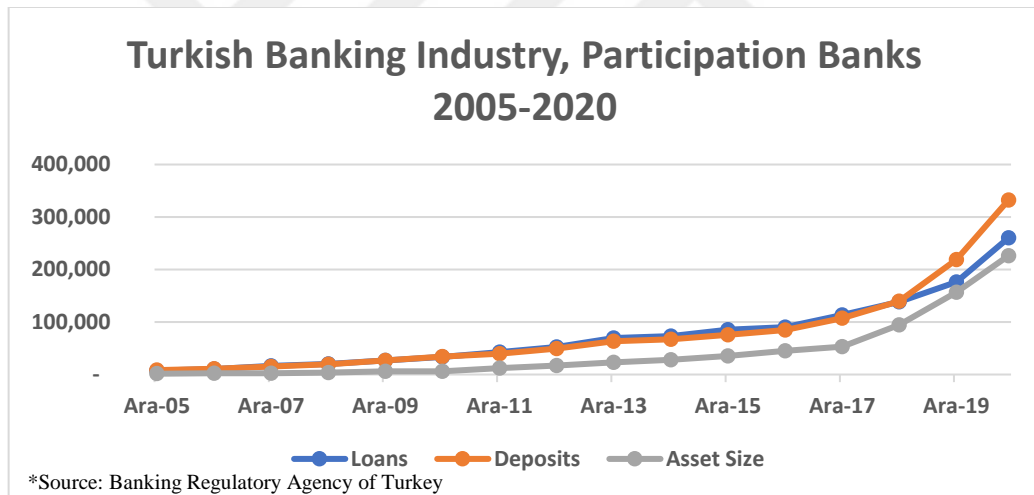


Figure 6: Turkey Participation Banking Industry, Asset Size between 2005-2020

Figure 4, 5 and 6 exhibit that Turkish Banking Industry showed significant momentum to grow around 2008 and 2009. However, the Islamic Banks followed this trend with 2-3 years lag. Starting from 2011 and 2012, they joined growth trend of Turkish Banking Industry.

In this paper, I examined the Islamic Banking Industry in Turkey with comparison to conventional banking. I focus on Turkey because Islamic Banking shows significant growth. The regulatory government agencies support the industry with comprehensive and functional legal infrastructure. In addition, the Turkish government significantly supports the industry by establishing new government owned Islamic Banks. Finally, since the population is predominantly Muslim, Islamic Banks are in a very advantageous position to grow and capture market share from conventional banks.

While there are many scholars and practitioner who study on Islamic finance, the most of the studies are qualitative regarding to products and regulations. There are limited number of academic papers on Islamic finance and Islamic Banking with mainly quantitative aspect. Cihak, Martin & Hesse, Heiko (2010) investigated and compared the stability of Islamic and conventional banks. Thorsten Beck, Asli Demirgüç-Kunt, Ouarda Merrouche (2013) studied comparison of Islamic and conventional banking with respect to business model, efficiency and stability. Faisal Alqahtani, David G. Mayes (2018) tested the stability of Islamic banking compare to conventional banks based on the evidence from Gulf Cooperation Council.

I investigate 15 conventional and 3 Islamic banks and compare and contrast them between 2013 and 2020 as Turkish economy grew but was exposed to macroeconomic shocks. This paper covers the period after 2013 due to availability of IFRS compliant standard financial institutions statements. In this study Emlak Katılım and Ziraat Katılım are excluded because there they are recently established and there is not enough financial data to analyze them in this study.

The structure of this study is as follows. In chapter 2, Islamic Products (Sharia-Compliant) are described and the usage of those products in Turkey is discussed. In addition, fundamental problems Islamic Banks face in the industry such as lack of regulation and lack of product structures are explained. Data and methodology are presented in chapter 3. Finally, the results are discussed in chapter 4.



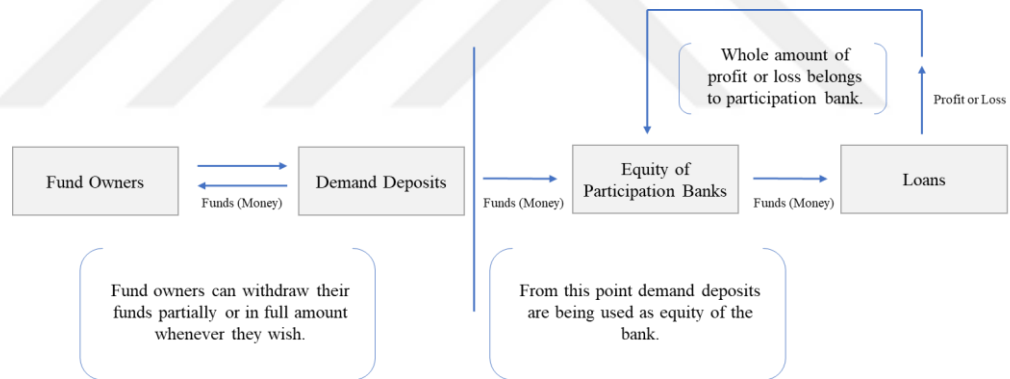
CHAPTER II

II. MOST COMMON SHARIA-COMPLIANT PRODUCTS IN ISLAMIC BANKING IN TURKEY

In the most basic definition, Sharia can be described as set of set of rules and legal framework which regulates the Muslim's life. Whether living under Sharia-based legal system or outside of such regulations (Muslims who doesn't live in such countries), by their belief Muslims needs to follow the rules of Sharia. While Sharia regulates many aspects of life including social and daily life, in this section the parts related to Islamic Banking Industry will be examined.

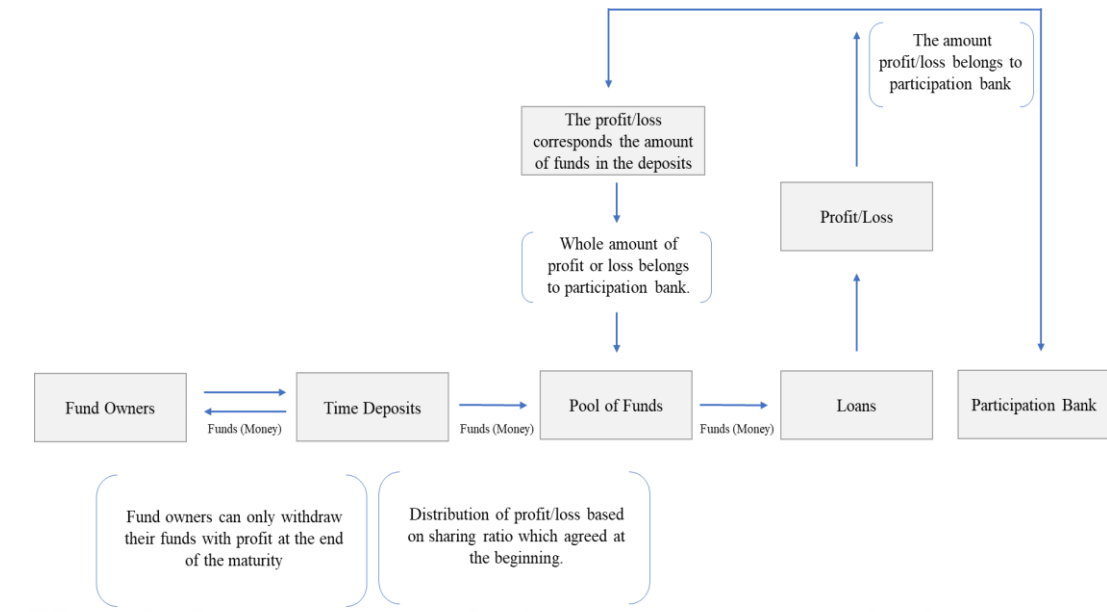
The teachings of Islam mainly come from two source; Koran and the Prophet Muhammad. While Koran provides mostly written rules, with the living of the Prophet Muhammad those rules showed how to apply in life. Furthermore, Sharia-compliant & Islamic banking products can be described as financial products or transactions which does not violate and contradict with teachings and the rules which is coming from the sources that is explained previously. In Islam, any type of payment or transaction that includes interest (Riba) with fixed rate is strictly prohibited. Islam requires risk sharing, profit-loss arrangements, the acquisition and resale of goods or products and the delivery of services for a fee. In addition, Islamic Banks are also prohibited to trade financial risk products like derivative products. Under this circumstances, Islamic Banks uses the Sharia-Compliant products which avoids interest and includes some level of risk-sharing elements.

As previously explained, interest is prohibited in Islam. Therefore, dynamics of relation between depositor and borrower are different than conventional banks. While conventional banks can promise or provide certain fixed returns to depositors, Islamic Banks cannot make such promise, they are required to establish a system that disperses the risk between both depositors and borrower. In Turkey, Islamic Banks use mainly Musharaka contracts. In this contract, investors including the bank provides funds and the profits and losses are shared among all investors. Profits are shared with a ratio that is determined at the beginning of the contract. The profits that is being shared in this contract are coming from the other operations of the bank such as loans. Figure 7 and 8 illustrate the basic process of demand and time deposits in participation banking.



Source: 'Katılım Bankacılığına Giriş, Kuveyt Türk (2012)

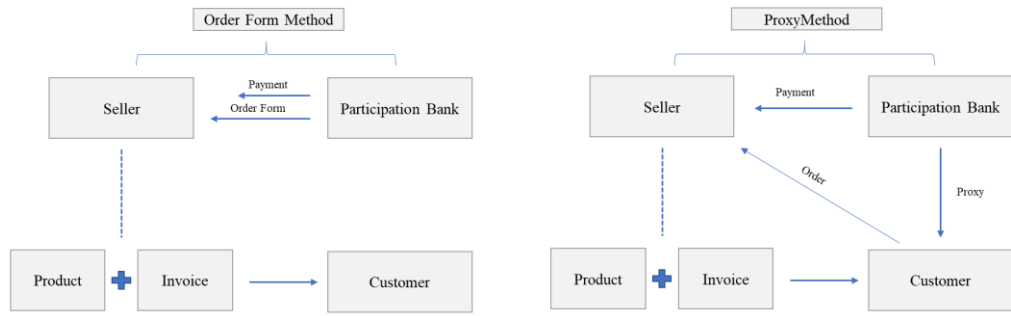
Figure 7: Scheme of Demand Deposits in Participation Banking



Source: 'Katılım Bankacılığına Giriş, Kuveyt Türk (2012)

Figure 8: Scheme of Time Deposits in Participation Banking

While Musharaka contracts mostly covers the Islamic Banks dynamics which they gather funds, Murabaha contracts can be considered as the main products Islamic Banks uses in terms of loan. Murabaha is a form of a product that involves purchase of the goods or services that customer needs, then selling that product or service to customer with installments. This transaction can be completed with order form method or proxy method. Figure 9 presents the basic process of Murabaha transactions. Since, a product is directly involved in loan process, it is being protected by any form of interest related aspect. The bank can gain profit from the difference between the purchase and selling price of the goods or services which is subject to loan. In Turkey, Murabaha contracts are being used in retail customers mostly for loans on vehicles and houses and in corporate sector it can be used almost for every potential good that is needed.



Source: 'Katılım Bankacılığına Giriş, Kuveyt Türk (2012)

Figure 9: Scheme of Murabaha Product in Participation Banking

Ijara is one of the other contracts which Islamic Banks mostly prefer due to the fact that its dynamic is highly suitable for business purposes. Ijara is a contract in form of an operating leases. The bank holds the ownership rights of the goods and it rents goods to customer with a fee.

As explained above, while Islamic Banks provides similar services and products compare to conventional banks, the dynamics and processes of those services and products are almost completely different than each other. These differences mostly put Islamic Banks in a disadvantageous position. As example, while conventional banks promise certain return on deposit accounts and also can change those return (interest) level whenever they need, Islamic Banks cannot make such promise and also can't affect the return levels easily since those returns are coming from the projects or loans that is going on at that moment. However, there is numerous researches and attempts to developed sophisticated products to provide better services to customers, it is possible that Islamic Banks can get out of this situation.

CHAPTER III

III. DATA AND METHODOLOGY

3.1 Data Construction

I obtain the bank financial statements from KAP web site (Government regulated agency which publish audited financials). These are unconsolidated statements compliant with the Turkish Banking Regulation and Supervision Agency (BRSA). I cross checked the data with the reports shared on banks official web sites under investor relations to ensure the validity of the data. I retrieve the macroeconomic data for Turkey from TURKSTAT and Turkish banking sector statistics from the BRSA web site.

The largest 20 commercial banks comprise %85 of the assets in the Turkish Banking Industry. I exclude non-commercial banks investment and development banks such as Exim Bank and TSKB (Türkiye Sınai Kalkınma Bankası). Out of remaining 18 banks, 3 of them are Participation Banks.

The data covers the period between 4th quarter of 2013 and 4th quarter of 2020 with quarterly statements. I select this period because there was a significant change in accounting and reporting methodology of banks around 2013 due to IFRS regulations. Therefore, it is problematic to compare data before and after 2013.

I use the data to investigate efficiency in terms of size and number of staffs, to cluster the banks in the industry based on selected financials and to analyze and compare the endurance and stability of both Islamic and conventional banks via selected ratios and financial in case of changes in the economy and the industry.

3.2 Summary Statistics

In this section, I provide detailed figures and t- test results regarding the banks in my data set. Table 1 presents calculated selected ratios with each bank and also provides t-test results which I investigate whether the mean values of conventional and participation banks statistically different from each other. Based on results, (Stage 2 Loans / Loans), (Loans / Deposits) and (Demand Deposits / Total Deposits) have p-values of below the 5% and their mean values significantly differ from each other with respect to conventional and participation.

Table 1: Selected ratios with t-test results

Bank	ROAA	ROAE	Non-Performing		Loans / Deposits	Equity / Total		Demand Deposits / Total Deposits
			Loans / Loans (NPL Ratio)	Stage 2 Loans / Loans		Assets	Cost/Income	
C1	1.55%	10.69%	6.83%	10.39%	94.32%	16.40%	31.82%	32.31%
C2	0.30%	4.08%	4.52%	12.98%	125.14%	14.92%	53.78%	9.50%
C3	1.01%	8.83%	8.86%	19.60%	109.44%	15.22%	34.83%	25.81%
C4	1.41%	10.77%	4.56%	17.68%	98.00%	14.73%	29.08%	42.58%
C5	0.46%	6.92%	3.76%	8.39%	98.35%	8.98%	44.13%	19.24%
C6	1.10%	13.09%	2.36%	27.12%	84.96%	11.78%	56.79%	46.99%
C7	1.06%	7.29%	5.70%	13.54%	96.32%	20.14%	50.78%	24.13%
C8	1.28%	10.76%	5.57%	11.72%	99.09%	14.23%	39.35%	41.75%
C9	0.37%	3.97%	10.73%	30.48%	82.92%	14.93%	41.75%	17.89%
C10	1.22%	13.85%	6.11%	9.96%	114.40%	12.41%	43.16%	38.39%
C11	0.15%	2.28%	9.91%	10.24%	84.33%	10.21%	65.09%	17.31%
C12	0.95%	11.14%	4.22%	9.59%	88.44%	11.73%	60.21%	34.93%
C13	0.90%	12.60%	3.97%	7.74%	106.15%	9.35%	32.99%	19.45%
C14	1.20%	11.45%	6.40%	15.83%	115.59%	13.58%	35.03%	35.61%
C15	0.98%	9.58%	2.31%	6.32%	95.36%	11.84%	33.34%	31.49%
P1	0.42%	6.48%	4.82%	8.28%	82.18%	8.04%	45.47%	44.87%
P2	1.09%	18.90%	3.71%	8.94%	64.71%	8.41%	30.59%	59.11%
P3	1.01%	13.09%	5.56%	8.26%	83.18%	9.16%	40.31%	50.20%
C (Average)	0.93%	9.15%	5.72%	14.10%	99.52%	13.36%	43.48%	29.16%
P (Average)	0.84%	12.82%	4.70%	8.49%	76.69%	8.54%	38.79%	51.39%
T-Test, P-Values	73.08%	41.53%	25.54%	0.81%	3.85%	0.00%	42.19%	1.03%

** Type P represents participation banks while type C represent conventional banks.

Table 2 presents selected financial figures of each bank and also provides t-test results which I investigate whether the mean values of conventional and participation banks statistically different from each other. According to my results, all of the selected variable has p-values of below the 5% and their mean values significantly differ from each other with respect to conventional and participation. Since participation banks are relatively young and have lower penetration to banking industry, current status supports my findings.

Table 2: Selected financial figures with t-test results

Bank	Assets	Loans	Deposits	Equity	Net Profit	Number of Employees	Number of Branches
C1	446,101	253,319	268,570	73,158	6,267	12,459	715
C2	35,598	23,029	18,403	5,310	95	866	44
C3	199,256	135,018	123,366	30,330	1,793	11,932	696
C4	492,798	315,085	321,512	72,578	6,238	18,540	884
C5	680,026	449,745	457,286	61,045	2,600	20,171	1,013
C6	43,482	26,329	30,990	5,124	430	1,948	77
C7	61,225	38,725	40,205	12,328	627	3,442	191
C8	593,898	365,519	368,874	84,540	6,811	23,518	1,227
C9	40,036	21,260	25,639	5,977	134	1,109	48
C10	227,253	149,358	130,560	28,207	2,487	11,555	475
C11	37,504	25,927	30,744	3,827	53	3,272	238
C12	140,048	82,932	93,773	16,429	1,177	8,850	455
C15	942,601	600,660	629,874	111,583	7,825	24,638	1,752
C13	698,897	439,487	414,044	65,380	5,010	16,748	936
C14	459,694	293,927	254,280	62,438	5,080	16,037	835
P1	69,316	42,416	51,613	5,570	255	3,390	230
P2	152,290	79,054	122,173	12,812	1,400	6,000	435
P3	81,371	47,740	57,391	7,453	676	3,740	319
<u>C (Average)</u>	339,894	214,688	213,875	42,550	3,109	11,672	639
<u>P (Average)</u>	100,992	56,403	77,059	8,612	777	4,377	328
<u>T-Test, P-Values</u>	0.94%	0.64%	2.31%	0.23%	1.01%	0.54%	4.12%

** Type P represents participation banks while type C represent conventional banks.

Table 3 presents selected per branch and per employee figures of each bank and also provides t-test results which I investigate whether the mean values of conventional and participation banks statistically different from each other. According to my results, all of the selected variable except (Deposits/Number of Employees) has p-values of below the 5% and their mean values significantly differ from each other with respect to

conventional and participation. Since participation banks are relatively young and have lower penetration to banking industry, current status supports my findings.

Table 3: Selected per branch & per employee figures with t-test results

Bank	Deposits / Number of Branches (Million TL)	Credits / Number of Branches (Million TL)	Deposits / Number of Employees (Million TL)	Credits / Number of Employees (Million TL)
C1	376	354	22	20
C2	418	523	21	27
C3	177	194	10	11
C4	364	356	17	17
C5	451	444	23	22
C6	402	342	16	14
C7	210	203	12	11
C8	301	298	16	16
C9	534	443	23	19
C10	275	314	11	13
C11	129	109	9	8
C12	206	182	11	9
C13	442	470	25	26
C14	305	352	16	18
C15	360	343	26	24
P1	224	184	15	13
P2	281	182	20	13
P3	180	150	15	13
<u>C (Average)</u>	330	329	17	17
<u>P (Average)</u>	228	172	17	13
<u>T-Test, P-Values</u>	<u>4.38%</u>	<u>0.02%</u>	<u>94.72%</u>	<u>1.68%</u>

** Type P represents participation banks while type C represent conventional banks.

3.3 Efficiency Analysis (DEA Models)

Selection of numerous variables has been used to compare and analyze dynamics of Islamic and conventional banks. Firstly, by using the Data Envelopment Analysis Models (DEA) as suggested by Cooper, William W. Seiford, Lawrence M. Tone, Kaoru (2007), I analyze and compare the efficiency of banks in my data set. There are numerous applications of DEA models in different industries. I run the model via R with the package called “deaR” the generalization and efficient application of DEA models has been suggested in “Basic (Radial) Models (Envelopment and Multiplier Forms)” by Vicente Coll-Serrano, Rafael Benítez, Vicente J. Bolós (2018).

In DEA model I use equity number of employees and branches as inputs while total assets, total loans and net profit as outputs. The figures belong to period of 31/12/2020. In my data for input values, equity values vary from 2.9 billion to 111.5 billion TL with the average value of 32.1 million TL. Number of staff figure varies from 24,638 to 814 with the average value of 9,135. Number of branches vary from 1,752 to 44 with the average value of 513. As output values, total assets vary from 942 billion to 20 billion TL with the average of 262 billion TL. Total loans vary from 600 billion to 13 billion TL with the average of 165 billion TL. Net profit values vary from 7.8 billion to 50 million with the average of 2.3 billion TL. In order to prevent scaling problems, all the input and output values transformed into logarithmic base and the model is created based on those log value. Table 4 and 5 demonstrate the actual and logarithmic values which has been used in my data envelopment analysis.

Table 4: DEA model variable values as of December 2020, actual values

Type	Equity	Number of Staff	Number of Branches	Total Assets	Total Loans	Net Profit
C1	73,158	12,459	715	446,101	253,319	6,267
C2	5,310	866	44	35,598	23,029	95
C3	30,330	11,932	696	199,256	135,018	1,793
C4	4,163	1,549	50	27,225	19,626	230
C5	72,578	18,540	884	492,798	315,085	6,238
C6	61,045	20,171	1,013	680,026	449,745	2,600
C7	5,124	1,948	77	43,482	26,329	430
C8	12,328	3,442	191	61,225	38,725	627
C9	84,540	23,518	1,227	593,898	365,519	6,811
C10	5,977	1,109	48	40,036	21,260	134
C11	28,207	11,555	475	227,253	149,358	2,487
C12	3,827	3,272	238	37,504	25,927	53
C13	16,429	8,850	455	140,048	82,932	1,177
C14	65,380	16,748	936	698,897	439,487	5,010
C15	62,438	16,037	835	459,694	293,927	5,080
C16	111,583	24,638	1,752	942,601	600,660	7,825
P1	5,570	3,390	230	69,316	42,416	255
P2	2,909	814	50	20,390	13,599	81
P3	12,812	6,000	435	152,290	79,054	1,400
P4	7,453	3,740	319	81,371	47,740	676
P5	4,708	1,261	105	60,187	43,360	639

** Type P represents participation banks while type C represent conventional banks.

Table 5: DEA model variable values as of December 2020, log values

Type	Equity	Number of Staff	Number of Branches	Total Assets	Total Loans	Net Profit
C1	4.86	4.10	2.85	5.65	5.40	3.80
C2	3.73	2.94	1.64	4.55	4.36	1.98
C3	4.48	4.08	2.84	5.30	5.13	3.25
C4	3.62	3.19	1.70	4.43	4.29	2.36
C5	4.86	4.27	2.95	5.69	5.50	3.80
C6	4.79	4.30	3.01	5.83	5.65	3.41
C7	3.71	3.29	1.89	4.64	4.42	2.63
C8	4.09	3.54	2.28	4.79	4.59	2.80
C9	4.93	4.37	3.09	5.77	5.56	3.83
C10	3.78	3.04	1.68	4.60	4.33	2.13
C11	4.45	4.06	2.68	5.36	5.17	3.40
C12	3.58	3.51	2.38	4.57	4.41	1.72
C13	4.22	3.95	2.66	5.15	4.92	3.07
C14	4.82	4.22	2.97	5.84	5.64	3.70
C15	4.80	4.21	2.92	5.66	5.47	3.71
C16	5.05	4.39	3.24	5.97	5.78	3.89
P1	3.75	3.53	2.36	4.84	4.63	2.41
P2	3.46	2.91	1.70	4.31	4.13	1.91
P3	4.11	3.78	2.64	5.18	4.90	3.15
P4	3.87	3.57	2.50	4.91	4.68	2.83
P5	3.67	3.10	2.02	4.78	4.64	2.81

** Type P represents participation banks while type C represent conventional banks.

While performing the analysis, in order to observe the results under different input and output combinations, I repeat the model with five different variations. First one is the full model which includes all the inputs and outputs as demonstrated in Table 4. Efficiency scores range from 100% to 89.9% with the average of 98.2% in the full model. I run the second model without only equity by assigning number of staffs and branches as new inputs. In this option, efficiency scores range from 100% to 84.2% with the average of %93.8. The following models are created to observe the results of model under one output as given at a time. When only total assets given as output, the efficiency scores range from 100% to 89.5% with the average of 94.9%. In the model which total loans given as output, the efficiency score ranges from 100% to 88.2% with the average of 94.1%. In the last model which net profit given as output, the efficiency scores range from 100% to 61.5% with the average of 93%. The mentality behind running different variation

of the model is to observe whether banks in the sample differentiate in terms of efficiency under different input and output sets. Especially, this aims to observe and analyze at which areas participation banks more or less efficient compare to conventional banks.

Apart from individual perspective, I categorize the result based on the distinction of conventional and participation banks. Depending on the model while average efficiency of participation banks varies from 99.1% to 90.9%, the efficiency of conventional banks varies from 97.9% to 93.6%. The both groups have at least one or more than one bank with %100 efficiency which can be conclude as both groups has efficient banks. Despite the fact that average efficiency levels of participation banks fluctuate more than conventional banks, it is mostly likely to caused by the sample size considering sample size of participation banks were 4 while the sample size of conventional banks 16. Table 6 and 7 display the individual efficiency scores of banks in different models and categorized results.

Table 6: DEA models results by banks, efficiency scores

Type	Full Model	Without Equity	Only Total Assets as Output	Only Total Loans as Output	Only Net Profit as Output
C1	100.0%	100.0%	89.5%	88.2%	100.0%
C2	100.0%	100.0%	100.0%	100.0%	86.3%
C3	94.3%	87.5%	90.9%	90.7%	93.0%
C4	100.0%	100.0%	98.6%	99.3%	99.5%
C5	100.0%	96.2%	90.0%	89.6%	100.0%
C6	93.7%	87.9%	93.7%	93.6%	91.4%
C7	100.0%	100.0%	98.4%	97.1%	100.0%
C8	89.9%	88.3%	89.9%	88.8%	89.1%
C9	99.7%	94.9%	90.1%	89.4%	99.6%
C10	100.0%	100.0%	99.5%	97.6%	90.6%
C11	98.6%	92.0%	92.5%	92.1%	97.7%
C12	98.1%	84.2%	98.1%	97.6%	61.5%
C13	95.1%	85.7%	93.8%	92.4%	93.3%
C14	99.3%	95.5%	93.3%	92.8%	98.4%
C15	99.3%	95.6%	90.7%	90.3%	99.0%
C16	99.2%	96.3%	91.0%	90.7%	98.8%
P1	99.3%	88.7%	99.3%	97.8%	82.3%
P2	98.9%	95.6%	98.9%	98.4%	80.4%
P3	99.7%	91.5%	97.0%	94.4%	98.1%
P4	97.4%	89.1%	97.4%	95.7%	93.6%
P5	100.0%	100.0%	100.0%	100.0%	100.0%
T-Test, P-Value	21.5%	69.6%	0.0%	1.1%	57.5%

** Type P represents participation banks while type C represent conventional banks.

Table 7: DEA models results by categorized as type of banks

Type		Full Model	Without Equity	Only Total Assets as Output	Only Total Loans as Output	Only Net Profit as Output
Conventional	Maximum	100.0%	100.0%	100.0%	100.0%	100.0%
Conventional	Minumum	89.9%	84.2%	89.5%	88.2%	61.5%
Conventional	Average	97.9%	94.0%	93.7%	93.1%	93.6%
Participation	Maximum	100.0%	100.0%	100.0%	100.0%	100.0%
Participation	Minumum	97.4%	88.7%	97.0%	94.4%	80.4%
Participation	Average	99.1%	93.0%	98.5%	97.3%	90.9%

3.4 Clustering Analysis (K-Means)

I investigate the question of whether there is an alignment or grouping among participation and conventional banks. This analysis also aims to differentiate and demonstrate the current structural status in the whole banking industry. In order to perform the analysis mentioned above I use a centroid based clustering method called K-Means. This method looks for fixed number of groups or cluster in dataset. It categorizes variable based on their distance to cluster centers under non-hierarchical method with only considering input vectors. The algorithm originally developed by MacQueen (1967), however I use the algorithm later developed by Hartigan and Wong (1976) which includes that the algorithm repeats itself randomly to acquire better results via iteration. For each bank, I use data belongs to 4th quarter of 2020. Table 8 shows the summary statistics of the data used in the analysis.

Table 8: Summary statistics of the date used in clustering models

Item Name	Average		Max		Min		Standard Deviation	
	Conventional	Participation	Conventional	Participation	Conventional	Participation	Conventional	Participation
Fees and Commissions Received	3,211	495	7,551	785	102	304	2,581	255
Operating Income	15,537	4,713	36,265	7,779	810	2,768	12,885	2,687
OPEX	5,653	1,695	12,092	2,379	436	1,259	4,120	600
Interest (Profit Share) Income	25,078	5,806	69,476	9,328	2,232	3,585	21,774	3,085
Interest (Profit Share) Expense	12,331	2,340	34,985	3,119	1,146	1,879	11,879	678
Net Profit/Loss	3,109	777	7,825	1,400	53	255	2,802	579
ROAA	0.93%	0.84%	1.55%	1.09%	0.15%	0.42%	0.42%	0.37%
ROAE	9.15%	12.82%	13.85%	18.90%	2.28%	6.48%	3.53%	6.21%
Total Assets	339,894	100,992	942,601	152,290	35,598	69,316	296,796	44,832
Precious Metal Deposits	14,582	19,515	43,975	36,599	226	6,204	13,019	15,544
Financial Assets	71,966	19,430	230,648	35,027	4,752	9,806	71,474	13,630
Total Loans	214,688	56,403	600,660	79,054	21,260	42,416	188,898	19,796
Total Deposits	213,875	77,059	629,874	122,173	18,403	51,613	191,414	39,177
Total Equity	42,550	8,612	111,583	12,812	3,827	5,570	35,052	3,758
Consumer Loans	43,136	7,593	161,956	12,853	200	3,859	45,187	4,687
NPL Ratio	5.63%	5.16%	10.73%	5.70%	2.31%	4.22%	2.56%	0.82%
Interest (Profit Share) Bearing Assets	316,395	88,677	898,624	131,673	33,375	58,351	280,372	38,268
Proportion of Assets in TL	204,518	59,515	604,633	100,684	16,362	38,653	190,888	35,655
Proportion of Deposit in TL	97,793	28,119	306,746	49,619	7,915	15,485	98,011	18,714
Number of Staff	11,672	4,377	24,638	6,000	866	3,390	8,205	1,417
Number of Branches	639	328	1,752	435	44	230	490	103

First step of the clustering analysis is determining the optimal number of clusters. I use the elbow method that minimizes the total within-cluster sum of square which also known as total cluster variation. When the values corresponding the k values (number of cluster) plotted, the location of a bend (knee) in the plot mostly considered as indicator of the optimal number of class.

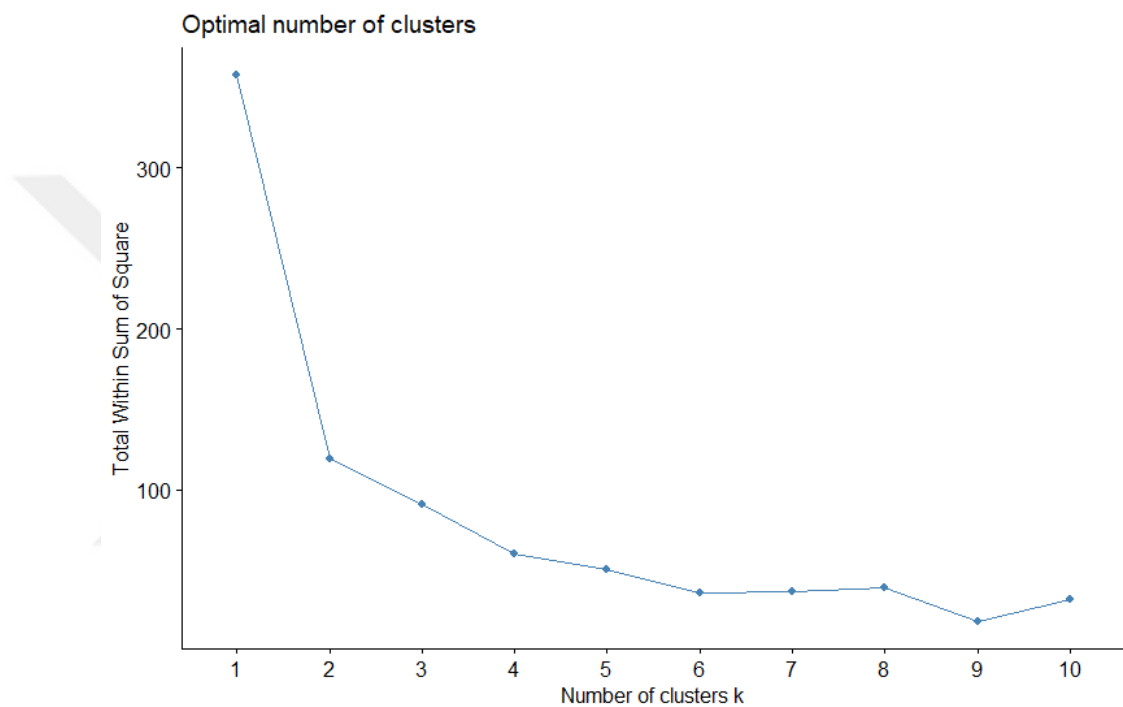


Figure 10: Elbow method of optimal number of clusters

Figure 10 demonstrates that total within sum of square values significantly decrease until the point where k is equal to 4. After that point the graph continues straight without significant change in total within sum of squares. Therefore, I create k-means algorithm with 4 clusters and 1000 repetitions. The algorithm concludes with the total sum of squares values of 357 and total within cluster sum of squares values of 60. Figure 11 presents the visualization of clusters. Dimensions displayed in the table selected based

on principal component analysis and dimension 1 and 2 explains and represents respectively 9.3% and 79.2% of the variables in the algorithm in terms of clustering.

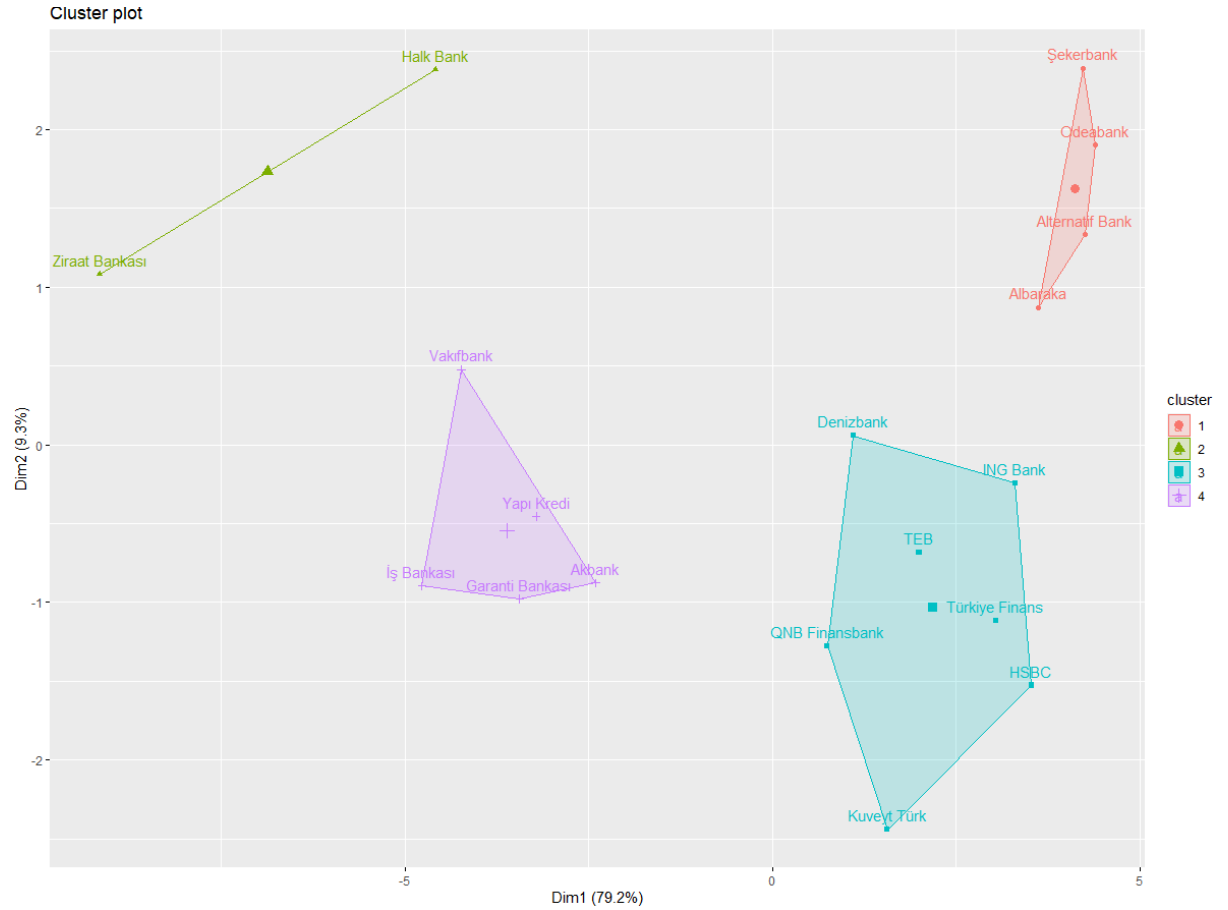


Figure 11: Visualization of clusters

Cluster 1 consists of 4 banks and the average asset size of the sample is 45 Billion TL. The average NPL value of the cluster is 7.68% and average number of staffs is 2,159. Cluster 2 consists of 2 banks and the average asset size of the sample is 811 Billion TL. The average NPL value of the cluster is 3.04% and average number of staffs is 22,405. Cluster 3 consists of 7 banks and the average asset size of the sample is 129 Billion TL. The average NPL value of the cluster is 5.11% and average number of staffs is 6,781. Cluster 4 consists of 5 banks and the average asset size of the sample is 538 Billion TL. The average NPL value of the cluster is 5,47% and average number of staffs is 17,460.

Corresponding average values of variables according to cluster presented at table 8. As a comment, cluster 1 represents a group of banks with relatively low assets size and net profit. Noticeably, the average NPL value of the cluster is also significantly higher than other clusters and average of the whole group. Cluster 2 represents a group of banks with significantly higher assets size net profit. It also has the lowest NPL value among clusters. One worthy point to mentioned is that the cluster consists of 2 banks and they are state owned banks with very high assets. Cluster 3 represents a crowded group with slightly below the average asset value. Biggest two of the participation banks are in this cluster. Lastly, Cluster 4 represents the group with biggest banks after cluster 1 which includes two of the biggest state-owned banks.

3.5 Regression Models

I select 6 macroeconomic and 3 bank specific variables to examine the effect of macroeconomic factors on conventional and participation banks between the period of 31/12/2013 and 31/12/2020. Those macroeconomic variables are BIST 100 Index, currency basket (USD and TL, equally weighted), 2-year base interest rate, real gross domestic product (GDP), CPI and economy confidence index. They are selected among over 20 indicators after detailed correlation analysis. BIST 100 Index and currency basket represents the general circumstance of the market while GDP, CPI and economy confidence index represents the situation in macroeconomy and 2-year base interest rate reflects the dynamics of the economy which influences the banks cost structure.

I transform the variables in terms of quarterly change in order to both match the reporting periods of banks which is quarterly and to examine changes in selected variables how significantly effects the conventional and participation banks. Table 9, 10 and 11 display detailed summary statistics of selected variables.

Table 9: Summary statistics of macroeconomic variables, actual values

Actual Value, Quarterly	BIST 100	Currency Basket	2-Year Base Interest Rate	Real GDP (1 Year Trail Sum)	CPI (2003=100)	Economy Confidence Index
Number of observation	29	29	29	29	29	29
Mean	927.18	4.47	12.75	645.62	334.24	99.09
Max	1476.72	8.43	25.87	716.78	504.81	107.31
Min	678.02	2.51	7.97	548.18	229.01	81.21
Standard Deviation	184.49	1.85	4.53	55.00	83.94	6.38

Table 10: Summary statistics of macroeconomic variables, changes in quarterly (%)

Change (%), Quarterly	BIST 100	Currency Basket	2-Year Base Interest Rate	Real GDP (1 Year Trail Sum)	CPI (2003=100)	Economy Confidence Index
Number of observation	29	29	29	29	29	29
Mean	2.34%	4.97%	3.63%	1.02%	2.69%	-0.30%
Max	29.99%	31.11%	40.72%	2.91%	9.34%	16.07%
Min	-21.66%	-12.50%	-28.13%	-2.47%	0.69%	-14.34%
Standard Deviation	10.54%	7.78%	18.72%	1.08%	1.77%	5.63%

Table 11: Correlation matrix of macroeconomic variables (changes in quarterly)

Correlation Matrix	BIST 100	Currency Basket	2-Year Base Interest Rate	Real GDP (1 Year Trail Sum)	CPI (2003=100)	Economy Confidence Index
BIST 100	1					
Currency Basket	-0.19952*	1				
2-Year Base Interest Rate	-0.29103*	0.71836*	1			
Real GDP (1 Year Trail Sum)	-0.1868*	0.10246*	0.36391*	1		
CPI (2003=100)	0.18432*	0.58621*	0.4265*	0.02117*	1	
Economy Confidence Index	-0.13719*	-0.34431	-0.03733*	0.36544*	-0.43541	1

The bank specific variables are (Loan/Deposit) ratio, (Cost/Income) ratio and NPL (Non-performing loans) ratio. The reasons why I select those variables is and the definitions as follow; I calculate Loan/Deposit ratio as total gross loans divided by total amount of deposits. It assesses liquidity levels of banks and also it indicates that how much of the collected funds (deposits) are being transformed to loans, in other words I'm also examining the differences in capability of creating loans with the usage of funds (deposits) that is being collected. I calculate the Cost/Income ratio as operational expenses divided by total operation income. It is a measure of banks efficiency in terms

of how much cost is created at the process of generation income. With this ratio I aimed to investigate the differences between conventional and participation banks in cost structure. I calculate NPL ratio as non-performing loans (above 90 days) divided by total gross loans. It assesses the banks asset quality and it also has some indications over the risk profile of the loans given by the bank. 3 of the banks out 18 are participations banks and the remaining 15 banks are conventional banks. 3 of the conventional banks out of 15 are state-owned. Despite there are state-owned participation banks in the industry, they are not included in this study as they are relatively young banks which established over the last 4-5 years. For each 18 banks, I collect the data related to variables between the period indicated as quarterly from the published financials. Table 12 and 13 exhibit detailed summary statistics of variables.

Table 12: Bank specific variables, conventional banks

Conventional Banks	Loan/Deposit Ratio	Cost/Income Ratio	NPL Ratio
Number of observation (for each bank)	29	29	29
Mean (Whole sample)	110.10%	47.21%	4.43%
Max (Whole sample)	166.58%	137.27%	14.52%
Min (Whole sample)	62.26%	25.05%	0.41%
Standard Deviation (As average of each bank)	9.15%	7.58%	1.52%

Table 13: Bank specific variables, participation banks

Participation Banks	Loan/Deposit Ratio	Cost/Income Ratio	NPL Ratio
Number of observation (for each bank)	29	29	29
Mean (Whole sample)	100.63%	45.45%	4.05%
Max (Whole sample)	136.63%	61.48%	8.01%
Min (Whole sample)	64.71%	29.07%	1.62%
Standard Deviation (As average of each bank)	13.62%	6.77%	1.43%

As I explain above I select 3 bank specific variables and I put each of them into the regression model individually for each bank. Following regression models has been run for each bank in the data.

$$(\text{Loan/Deposit})_t = \alpha + c_{1,t}V_{1,t} + c_{2,t}V_{2,t} + c_{3,t}V_{3,t} + c_{4,t}V_{4,t} + c_{5,t}V_{5,t} + c_{6,t}V_{6,t} + \varepsilon_t$$

(1)

$$(\text{Cost/Income})_t = \alpha + c_{1,t}V_{1,t} + c_{2,t}V_{2,t} + c_{3,t}V_{3,t} + c_{4,t}V_{4,t} + c_{5,t}V_{5,t} + c_{6,t}V_{6,t} + \varepsilon_t$$

(2)

$$(\text{NPL})_t = \alpha + c_{1,t}V_{1,t} + c_{2,t}V_{2,t} + c_{3,t}V_{3,t} + c_{4,t}V_{4,t} + c_{5,t}V_{5,t} + c_{6,t}V_{6,t} + \varepsilon_t$$

(3)

In the equations 1, 2 and 3, Loan/Deposit , Cost/Income and NPL are the outputs while α represents the intercept value, c and V represents regression coefficient and variables and t represent the time. I used the macroeconomic variables with one lag, since development in the macro environment mostly reflects the banks financials in following quarter. However, model with different lag alternatives also has been tried yet the best results are provided by one period lag. Since both side of the regression models consist of either change in percentage values or ratios in percentage values, I eliminate the size and scale effect so that coefficient values can be examined to assess and determine the effect of corresponding macroeconomic variables. After the regression models which is provided in the equation 1, 2 and 3 run for each bank, I examine the results and group them based on the distinction of conventional and participation in order to interpret.

As the number of banks in data is 18, there is 18 different models for each bank specific variable with respect to same macroeconomic variables. For each bank specific variable, 3 of those models belong to participation banks while remaining 15 models belong to conventional banks. In order the interpret results, I calculate the average coefficient values for each macroeconomic variable for 3 models. I categorize results as conventional and participation banks.

Table 14: Loan/Deposit ratio models, coefficient results, ranking by absolute values

Type(**)	2-Year Base Interest Rate	BIST 100 (*)	CPI (2003=100) (*)	Currency Basket (*)	Economy Confidence Index (*)	Real GDP (1 Year Trail Sum Change) (*)
P1	14	2	2	15	11	12
P2	15	3	5	2	2	2
P3	17	4	15	3	4	3
C1	12	2	1	5	3	4
C2	10	6	8	7	5	5
C3	4	11	7	8	6	6
C4	5	17	17	4	8	7
C5	2	12	18	6	10	8
C6	16	15	12	15	11	9
C7	18	7	10	10	7	10
C8	13	16	2	17	9	11
C9	6	18	14	11	12	12
C10	8	14	13	12	13	13
C11	11	13	4	14	14	14
C12	7	10	11	16	17	15
C13	1	5	6	13	18	16
C14	9	8	9	9	16	17
C15	3	9	16	18	15	18

* Variables which at least 2 out of 3 participation bank has lower coefficient value in corresponding models.

** Type P represents participation banks while type C represent conventional banks.

Table 15: Loan/Deposit ratio models, coefficient results, absolute values

Type(**)	2-Year Base Interest Rate	BIST 100	CPI (2003=100)	Currency Basket	Economy Confidence Index	Real GDP (1 Year Trail Sum Change)
P1	0.288	0.038	0.183	0.840	0.736	4.158
P2	0.360	0.177	0.383	1.228	1.301	8.064
P3	0.495	0.180	1.981	1.302	1.840	9.913
C1	0.229	0.133	1.593	0.523	0.776	3.377
C2	0.184	0.047	3.340	0.148	0.664	3.140
C3	0.047	0.117	0.196	0.102	0.164	0.043
C4	0.064	0.049	1.152	0.243	0.589	3.403
C5	0.016	0.107	1.278	0.211	0.072	0.725
C6	0.479	0.335	6.696	0.753	1.585	7.382
C7	0.655	0.471	3.299	1.861	2.497	14.484
C8	0.249	0.072	0.066	0.682	0.602	3.931
C9	0.121	0.132	1.730	0.527	0.099	0.056
C10	0.154	0.011	0.556	0.434	0.382	2.471
C11	0.218	0.153	1.754	0.659	0.844	6.012
C12	0.149	0.088	1.805	0.556	0.805	5.329
C13	0.011	0.176	1.947	0.276	0.040	0.444
C14	0.164	0.054	0.835	0.285	0.299	1.482
C15	0.041	0.072	2.693	0.261	0.236	0.916

** Type P represents participation banks while type C represent conventional banks.

Table 14 and 15 presents results of Loan/Deposit ratio models. 2-Year Base Interest Rate variable has an average coefficient value of 0.185 for conventional banks while the average coefficient value for participation banks is 0.381. BIST-100 variable

has an average coefficient value of 0.135 for conventional banks while the average coefficient value for participation banks is 0.132. CPI (2013=100) variable has an average coefficient value of 1.929 for conventional banks while the average coefficient value for participation banks is 0.849. Currency basket variable has an average coefficient value of 0.502 for conventional banks while the average coefficient value for participation banks is 1.124. Economy Confidence Index variable has an average coefficient value of 0.644 for conventional banks while the average coefficient value for participation banks is 1.292. Real GDP variable has an average coefficient value of 3.546 for conventional banks while the average coefficient value for participation banks is 7.378.

Since participation banking group in our data has only 3 banks, statistically it is influenced greatly by each observation. As the number of banks in conventional and participation groups are significantly different, comparison of ranking by absolute coefficient values has been used instead of comparison of average coefficient values. By this method, results are being deviated by outliers at a relatively lower rate and more comprehensive and wider perspective of investigation has been provided.

I mark with star “*” the variables where corresponding coefficient values of at least 2 out of 3 participation banks which has either equal or lower values compare to median value. In other words, those marked variables are the ones where participation bank’s coefficient values are higher from at least values of the half of the whole sample. In Loan/Deposit ratio models, 5 variables out of 6 has been marked based on the definition above except from 2-Year Base Interest Rate.

Table 16: Cost/Income ratio models, coefficient results, raking by absolute values

Type(**)	2-Year Base Interest Rate (*)	BIST 100 (*)	CPI (2003=100)	Currency Basket (*)	Economy Confidence Index (*)	Real GDP (1 Year Trail Sum Change)
P1	8	2	16	3	14	10
P2	2	18	15	7	3	15
P3	17	7	3	17	2	1
C1	16	15	14	16	15	17
C2	5	12	18	5	18	18
C3	4	8	2	9	4	5
C4	1	3	4	1	6	3
C5	15	16	11	10	9	7
C6	18	6	7	18	17	14
C7	3	5	9	2	8	4
C8	12	17	17	6	16	16
C9	10	13	12	11	12	12
C10	14	10	10	14	11	9
C11	13	14	13	13	13	13
C12	9	9	6	15	5	6
C13	6	4	8	8	10	8
C14	11	1	1	12	7	11
C15	7	11	5	4	1	2

* Variables which at least 2 out of 3 participation bank has lower coefficient value in corresponding models.

** Type P represents participation banks while type C represent conventional banks.

Table 17: Cost/Income ratio models, coefficient results, absolute values

Type(**)	2-Year Base Interest Rate	BIST 100	CPI (2003=100)	Currency Basket	Economy Confidence Index	Real GDP (1 Year Trail Sum Change)
P1	0.070	0.021	2.741	0.059	0.728	2.999
P2	0.023	0.190	2.317	0.101	0.076	3.916
P3	0.243	0.084	0.545	0.547	0.065	0.356
C1	0.165	0.137	2.316	0.468	0.769	4.747
C2	0.043	0.110	4.494	0.086	1.271	9.328
C3	0.032	0.085	0.061	0.205	0.084	1.871
C4	0.003	0.038	0.860	0.031	0.157	1.159
C5	0.139	0.139	1.598	0.224	0.347	1.963
C6	0.302	0.068	1.253	0.731	0.828	3.443
C7	0.031	0.047	1.337	0.032	0.196	1.277
C8	0.128	0.175	4.452	0.086	0.812	4.448
C9	0.099	0.111	2.084	0.227	0.516	3.350
C10	0.133	0.091	1.443	0.362	0.382	2.771
C11	0.132	0.125	2.241	0.279	0.556	3.377
C12	0.083	0.089	1.094	0.415	0.134	1.944
C13	0.046	0.044	1.260	0.174	0.350	2.072
C14	0.128	0.017	0.045	0.255	0.190	3.231
C15	0.064	0.106	0.941	0.072	0.005	0.471

** Type P represents participation banks while type C represent conventional banks.

Table 16 and 17 show the results of Cost/Income ratio models. 2-Year Base Interest Rate variable has an average coefficient value of 0.102 for conventional banks while the average coefficient value for participation banks is 0.112. BIST-100 variable

has an average coefficient value of 0.092 for conventional banks while the average coefficient value for participation banks is 0.098. CPI (2013=100) variable has an average coefficient value of 1.699 for conventional banks while the average coefficient value for participation banks is 1.868. Currency basket variable has an average coefficient value of 0.243 for conventional banks while the average coefficient value for participation banks is 0.236. Economy Confidence Index variable has an average coefficient value of 0.440 for conventional banks while the average coefficient value for participation banks is 0.290. Real GDP variable has an average coefficient value of 3.030 for conventional banks while the average coefficient value for participation banks is 2.424.

As I explain previously, I mark variables according to their median ranks. In Loan/Deposit ratio models, 4 variables out of 6 has been marked based on the definition above except from CPI (2003=100) and Real GPD (1 Year Trail Sum).

Table 18: NPL ratio models, coefficient results, ranking by absolute values

Type(**)	2-Year Base Interest Rate (*)	BIST 100 (*)	CPI (*)	Currency Basket (*)	Economy Confidence Index (*)	Real GDP (1 Year Trail Sum Change) (*)
P1	1	3	4	1	6	3
P2	18	6	7	18	17	14
P3	4	8	2	9	4	5
C1	17	7	3	17	2	1
C2	3	5	9	2	8	4
C3	7	11	5	4	1	2
C4	6	4	8	8	10	8
C5	14	10	10	14	11	9
C6	13	14	13	13	13	13
C7	15	16	11	10	9	7
C8	2	18	15	7	3	15
C9	8	2	16	3	14	10
C10	16	15	14	16	15	17
C11	9	9	6	15	5	6
C12	11	1	1	12	7	11
C13	5	12	18	5	18	18
C14	12	17	17	6	16	16
C15	10	13	12	11	12	12

* Variables which at least 2 out of 3 participation bank has lower coefficient value in corresponding models.

** Type P represents participation banks while type C represent conventional banks.

Table 19: NPL ratio models, coefficient results, absolute values

Type(**)	2-Year Base Interest Rate	BIST 100	CPI (2003=100)	Currency Basket	Economy Confidence Index	Real GDP (1 Year Trail Sum Change)
P1	0.003	0.038	0.860	0.031	0.157	1.159
P2	0.302	0.068	1.253	0.731	0.828	3.443
P3	0.032	0.085	0.061	0.205	0.084	1.871
C1	0.243	0.084	0.545	0.547	0.065	0.356
C2	0.031	0.047	1.337	0.032	0.196	1.277
C3	0.064	0.106	0.941	0.072	0.005	0.471
C4	0.046	0.044	1.260	0.174	0.350	2.072
C5	0.133	0.091	1.443	0.362	0.382	2.771
C6	0.132	0.125	2.241	0.279	0.556	3.377
C7	0.139	0.139	1.598	0.224	0.347	1.963
C8	0.023	0.190	2.317	0.101	0.076	3.916
C9	0.070	0.021	2.741	0.059	0.728	2.999
C10	0.165	0.137	2.316	0.468	0.769	4.747
C11	0.083	0.089	1.094	0.415	0.134	1.944
C12	0.128	0.017	0.045	0.255	0.190	3.231
C13	0.043	0.110	4.494	0.086	1.271	9.328
C14	0.128	0.175	4.452	0.086	0.812	4.448
C15	0.099	0.111	2.084	0.227	0.516	3.350

** Type P represents participation banks while type C represent conventional banks.

Table 18 and 19 presents results of NPL ratio models are reported. 2-Year Base Interest Rate variable has an average coefficient value of 0.102 for conventional banks while the average coefficient value for participation banks is 0.112. BIST-100 variable has an average coefficient value of 0.079 for conventional banks while the average coefficient value for participation banks is 0.063. CPI (2013=100) variable has an average coefficient value of 0.620 for conventional banks while the average coefficient value for participation banks is 0.725. Currency basket variable has an average coefficient value of 0.494 for conventional banks while the average coefficient value for participation banks is 0.322. Economy Confidence Index variable has an average coefficient value of 0.326 for conventional banks while the average coefficient value for participation banks is 0.356. Real GDP variable has an average coefficient value of 1.890 for conventional banks while the average coefficient value for participation banks is 2.158. In NPL ratio models, all variables fit the criteria for being marked so 6 variables out of 6 has been marked based on the definition.

Table 20 and 21 presents significance-f and r-square results of the models. In total, 14 model has Significance-F score lower than %1, score of 15 models are between %1 - %5 and scores of 7 models are between %5 - %10. Score of 18 models are above %10 which is statistically questionable. From those 18 models, 6 of them belong to regression models of state-owned banks, 8 of them belong to conventional banks and remaining 2 belong to participation banks. In total more than %65 of the regression models has the Significance-F value below %10 which is considered as acceptable in this study.

In total, 14 model has R-Square score higher than %50, score of 15 models are between %30 - %50 and scores of 24 models are between %0 - %30. There is only one model which has R-Square score lower than %10. Chin, Wynne & Marcoulides, G.. (1998) recommended that R-Square values can be described and categorized as follows for endogenous latent variables: %67 represents substantial level, %33 represents moderate level and %19 represents weak level. Based on that, the regression models that is being used in this study can be considered as moderate level on average as more than %50 of the models has higher R-Square value of %33.

Table 20: Regression model significance-f results and r-squares

Number of Regression Models			
Significance-F	Loan/Deposit	Cost/Income	NPL
Below %1	4	1	9
Between %1 - %5	7	5	3
Between %5 - %10	2	3	2
Between %10 - %20	0	1	0
Above %20	5	8	4
<i>Total</i>	<i>18</i>	<i>18</i>	<i>18</i>

Number of Regression Models			
R-Square	Loan/Deposit	Cost/Income	NPL
Above %50	4	1	9
Between %30 - %50	5	7	3
Between %10 - %30	9	10	5
Below %10	0	0	1
<i>Total</i>	<i>18</i>	<i>18</i>	<i>18</i>

For detailed investigation, I also run panel regression on the variable. Table 22 demonstrates the result of panel regression. For each category, coefficient values are provided with corresponding t-test and p-values with distinction of conventional and participation. Contrary to my previous analysis, panel regression results indicate that conventional banks seem to have lower coefficient values for selected macroeconomic variables. However, it is important to keep in mind that number of participation banks in my sample is significantly lower compare to conventional banks. In addition, among that small sample one of the participation banks one of them is significantly outlier which disrupts the results of participation banks. I added panel regression to my study as an informative general section, however the main results will be driven from the analysis in previous sections.

Table 21: Panel regression results

		BIST 100	Currency Basket	2-Year Base Interest Rate	Real GDP (1 Year Trail Sum)	CPI (2003=100)	Economy Confidence Index	Constant	
Loan/Deposit Ratio	Conventional	Coefficients	0.049	-0.373	0.167	3.299	-0.904	-0.510	1.103
		<i>T-Test</i>	0.670	-2.150	2.590	4.180	-1.590	-2.370	65.970
		<i>P-Values</i>	0.506	0.032	0.010	0.000	0.113	0.018	0.000
	Participation	Coefficients	0.141	-1.298	0.363	6.892	0.519	-1.061	0.931
		<i>T-Test</i>	0.600	-2.320	1.740	2.700	0.280	-1.520	17.230
		<i>P-Values</i>	0.550	0.023	0.086	0.009	0.779	0.132	0.000
Cost/Income Ratio	Conventional	Coefficients	0.106	-0.071	0.054	2.971	-1.335	-0.120	0.461
		<i>T-Test</i>	1.510	-0.430	0.870	3.900	-2.430	-0.580	28.630
		<i>P-Values</i>	0.131	0.669	0.383	0.000	0.015	0.565	0.000
	Participation	Coefficients	0.074	-0.199	0.093	3.472	-1.968	-0.145	0.477
		<i>T-Test</i>	0.530	-0.600	0.760	2.310	-1.810	-0.350	14.970
		<i>P-Values</i>	0.596	0.548	0.450	0.024	0.074	0.725	0.000
NPL Ratio	Conventional	Coefficients	-0.019	0.081	-0.035	-0.767	0.142	0.081	0.044
		<i>T-Test</i>	0.158	0.011	0.004	0.000	0.173	0.040	0.000
		<i>P-Values</i>	-0.045	0.019	-0.058	-1.050	-0.062	0.004	0.038
	Participation	Coefficients	-0.033	0.096	-0.053	-0.759	0.376	0.128	0.034
		<i>T-Test</i>	0.349	0.254	0.092	0.050	0.175	0.223	0.000
		<i>P-Values</i>	-0.103	-0.070	-0.115	-1.517	-0.171	-0.079	0.018

CHAPTER IV

IV. COMPARISON OF PARTICIPATION AND CONVENTIONAL BANKS

Table 6 presents the efficiency scores which has been calculated under DEA (Data Envelope Analysis) models. As I explain in data methodology section, I repeated the model with pairings of different variables in order to assess different perspectives. Based on full model results, 7 banks out of 21 has the efficiency score of 1 and only one of them is participation bank. However, it is also worth the mention that most of the remaining participation banks scores are around %99. The downside of the full model results is that having more than 3-4 variables as output is makes it difficult to determine which variables have the higher contribution to the efficiency score therefore models with only one outputs have been run. When only assets or loans are given as outputs, participation banks demonstrate either efficiency scores around the average of the sample group or above the average.

One of the main reasons behind that is participation banks operates with relatively lower number of branches and number of staffs compare to their asset and loan size. Compare to conventional banks, they have less branches out side of major cities and most participation bank's branches grouped around major big cities. That provided them to focus on areas where the most of the population lives which lead to operating with relatively higher asset and loan size compare to their number of branches and staffs. Until recently, participation banks were continuing to open branches oppose to the industry

where most of the major conventional banks are downsizing by closing and merging their branches. However, with the advancement in digitalization and changes in the regulations which allows people to open bank account from remote via video talk systems participation banks also started slow down their branching processes. Therefore, it is possible to say that the rest of the industry will increase their efficiency with respect to managing larger size of asset and loans with less resources. When only net profit is given as output, it can be said that the situation presented on previous case turns opposite which efficiency scores of participation banks performs below the average of conventional banks. One of the major reasons for that is composition of consumer loans of participation banks. Among consumer loans personal finance loans has the shortest dept duration with the relatively higher interest / profit share ratio. While share of personal finance loans are higher in consumer loans for conventional banks, it is relatively lower for participation banks. Housing loans has higher proportion in consumer loans for participation banks since it is more convenient for sharia-compliant Islamic procedures in Turkey. However, as housing loans has higher dept duration and relatively lower interest / profit share ratio, they negatively affect the income levels of participation banks. One of the other points to mention is that participation banks mostly have relatively lower fee and commission income due to the fact that mostly they don't charge account maintenance fees, remittance or bank wire fee which is a significant portion of income for conventional banks. All these mentioned aspects limit the income stream of the participation banks and negatively effects the result of efficiency model where net profit is considered as only output.

After efficiency analysis, I conducted series of clustering studies. Table 8 presents the detailed information about variables that is being used and figure 11 demonstrates the results of final clustering algorithm. Clustering results include more than %90 of the

components of model. Based on results, banks are distributed among 4 clusters. Clusters shows significant different characteristics. Cluster 1 and 2 can be described as outlier clusters which cluster 2 includes biggest 2 state-owned banks and cluster 1 includes 4 out of the smallest 5 banks in the industry. Biggest 2 participation banks fall in the cluster 3 with the total of 7 banks. As clustering results doesn't provide an enough evidence to differentiate participation banks, it can be said that participation banks don't significantly differentiate from conventional banks based on model results under the given variables.

Lastly, I conducted series of regression analysis in order to determine how the changes in selected macroeconomic variables influences the selected financials of conventional and participation banks. Table 14 and 15 shows the results of Loan/Deposit models. Coefficient values of participation banks are lower compare to at least half of the banks in the sample for 5 variables out of 6. Based on that I conclude that participation banks seem more resilient to changes in the selected macroeconomic variables with respect to their Loan/Deposit ratio. This finding can be supported with the fact that most of the loans provided by participation banks are asset-backed which indicates more solid asset structure. In addition, the profit share payments on deposits are linked to sharia-compliant profit-risk sharing agreements, therefore profit share can't shift rapidly in case of shifts in the economy which also leads more steady Loan/Deposit ratio.

Table 16 and 17 exhibit the results of Cost/Income models. Coefficient values of participation banks are lower compare to at least half of the banks in the sample for 4 variables out of 6. Despite the fact that the results don't indicate that participation banks seem more resilient to changes in the selected macroeconomic variables with respect to their Cost/Income Ratio compare to Loan/Deposit ratio, overall results still indicate that

participation banks more resilient compare to the average of the sample .As I explain in the previous chapter Cost/Income ratio formulated as OPEX divided by operational income. Since the income stream of banks influenced by loans the comment on Loan/Deposit ratio applies this part as well, however there is no adequate evidence that OPEX significantly differentiates for conventional and participation banks. This might be one of the reasons why Cost/Income ratio seems less resilient that Loan/Deposit ratio.

Table 18-19 provides the results of NPL models. Coefficient values of participation banks are lower compare to at least half of the banks in the sample for 6 variables out of 6. Based on that it can be concluded as participation banks seem more resilient to changes in the selected macroeconomic variables with respect to their NPL ratio. There are several factors which some of them is explained previously that contributes to this result. Firstly, participation bank's consumer loan's composition includes significantly lower amount of personal finance loans which mostly creates higher NPL and it doesn't require collateral. Secondly, participation banks require real assets transaction in case of providing loan, therefore it provides higher likelihood of that the loan will be used as it is asked for and also mostly those real assets are treated as collateral which lowers the possibility of that given loans will turn into NPL at the end.

CHAPTER V

V. CONCLUSION

In this study, considering the different operating procedures and offered sharia-compliant products, I investigate that how participation banks differentiate from conventional banks based on fundamental financial figures and whether they are more resilient to shifts in the economy compare to conventional banks. The claim has been tested from several aspects including efficiency analysis, clustering models and regression models.

My empirical results indicate that there is not enough evidence to conclude that participation banks slightly differentiate from conventional banks in terms of efficiency. That is mainly caused by that participation banks mostly operate with lower number of branches and number of employees compare to conventional banks. However, my clustering analysis shows that there is not a enough evidence to indicate that participation banks significantly differ from conventional banks, according to results participation banks are clustered with other conventional banks. On the other hand, empirical results indicate that participation banks demonstrate substantial differences compare to conventional banks in terms of their resilience levels towards shifts in the macroeconomic conditions. I investigate stability in asset structure with Loan/Deposit ratio, cost and income streams with Cost/Income ratio and asset quality with NPL ratio and among all these areas empirical results indicates that participation banks on average more resilient to shifts in macroeconomic conditions.

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