

**IBN HALDUN UNIVERSITY  
SCHOOL OF GRADUATE STUDIES  
DEPARTMENT OF ECONOMICS**

**MASTER THESIS**

**THE RELATIONSHIP BETWEEN SELECTED  
DETERMINANTS OF MARKET RISK AND THE FINANCIAL  
PERFORMANCE OF PARTICIPATION BANKS IN TURKEY:  
A COMPARATIVE STUDY WITH CONVENTIONAL BANKS**

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**THESIS SUPERVISOR  
ASSIST. PROF. OMAR KACHKAR**

**ISTANBUL, 2021**



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CONVENTIONAL BANKS**

by

**QAZIJE SHEHI**

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fulfillment of the requirements for the degree of Master of Arts in  
Economics**

**THESIS SUPERVISOR  
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**ISTANBUL, 2021**

## APPROVAL PAGE

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Arts in Economics.

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This is to confirm that this thesis complies with all the standards set by the School of Graduate Studies of Ibn Haldun University.

Date of Submission

Seal/Signature

## PLAGIARISM CLEARANCE PAGE

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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## ÖZ

### TÜRKİYE’DE KATILIM BANKALARININ FİNANSAL PERFORMANSI İLE PİYASA RİSKİNİN SEÇİLEN BELİRLEYİCİLERİ ARASINDAKİ İLİŞKİ: KONVANSİYONEL BANKALARLA KARŞILAŞTIRMALI BİR ÇALIŞMA

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Bu çalışmanın temel amacı, piyasa riskinin seçilen belirleyicileri ile Türkiye'deki katılım bankalarının finansal performansı arasındaki ilişkiyi araştırmak ve konvansiyonel bankalarla karşılaştırmaktır. Piyasa riski belirleyicileri, faiz oranı (INT), döviz kuru (FX), enflasyon (INFL) ve kişi başına GSYİH'dir ve her iki banka için finansal performans belirleyicileri, varlıkların getirisi (ROA) ve özkaynak getirisidir (ROE). Türkiye'de faaliyet gösteren 3 katılım bankası ve 5 konvansiyonel banka için kullanılan ikincil veriler bulunmaktadır. Çalışmanın dönemi 2010-2019 yılları arasındadır. Çalışmada uygulanan testler, Artırılmış Dickey Fuller Birimi Kök testi, Johansen eş-bütünleşme testi ve Granger Nedensellik testi gibi panel veri testleri uygulanmıştır. Çalışmanın sonuçları, Türkiye'deki katılım bankalarının aktif getirisi ve özkaynak karlılığı ile faiz oranı, döviz kuru, enflasyon oranı ve kişi başına GSYİH'nin son derece önemli pozitif uzun dönemli bir ilişkiye sahip olduğu sonucuna varmaktadır. Ancak, değişkenler kısa vadede birbirleriyle önemli ölçüde ilişkili değildir. Geleneksel bankalar için uzun vadede katılım bankalarına kıyasla daha az önemli olumlu etki görülmektedir. Türkiye'deki katılım ve konvansiyonel bankaların finansal performansının belirlenmesinde örneklem büyüklüğünün artırılması ve daha fazla belirleyici faktörlerin yer alması ilerideki çalışmalar için önerilmektedir.

**Anahtar Kelimeler:** Aktif Getirisi, Katılım Bankaları, Kovansiyonel Bankaları  
Özkaynak Getirisi, Piyasa riski,, Türkiye.

## ABSTRACT

### THE RELATIONSHIP BETWEEN SELECTED DETERMINANTS OF MARKET RISK AND THE FINANCIAL PERFORMANCE OF PARTICIPATION BANKS IN TURKEY. A COMPARATIVE STUDY WITH CONVENTIONAL BANKS

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The main purpose of this study is to investigate the relationship between the selected determinants of market risk with the financial performance of participation banks in Turkey and compare it with conventional banks. The market risk determinants are interest rate (INT), the exchange rate (FX), inflation (INFL), and GDP per capita. The financial performance determinants for both participation and conventional banks are, return on assets (ROA) and return on equity (ROE). There are secondary data used for 3 participation banks and 5 conventional banks performing in Turkey. The time period of this study is from the year 2010 to 2019. The tests applied in the study are panel data tests like the Augmented Dickey-Fuller Unit Root test, Johansen co-integration test, and Granger Causality test by using the E-views program. The study results conclude that interest rate, exchange rate, inflation rate, and GDP per capita have a highly significant positive long-run relationship with return on assets and return on equity of participation banks in Turkey. However, the variables are not significantly related to each other in the short run in the interval time of lag 2. There is less significant positive effect shown for conventional banks compared to participation banks in the long run. It is recommended for future studies to increase the sample size and include more determinant factors to determine the financial performance of participation and conventional banks in Turkey.

**Keywords:** Conventional Banks, Market Risk, Participation Banks, Return on Assets, Return on Equity, Turkey.



## DEDICATION

I dedicate my master's dissertation to my family and friends who encouraged and supported me morally throughout the writing process. Special gratitude goes for my lovely friend Douaa Abbara too. I will always be grateful for all they have done.



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Qazije Shehi

Istanbul, 2020



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# CHAPTER I

## INTRODUCTION

### 1.1. Overview

The banking system in Turkey opened to the world market in 1980 and it became a liberated banking system where the interest rate was not controlled anymore by the government (Denizer et al., 2000). This transition reduced credit programs and competitiveness with outside participants and made banks achieve higher efficiency. However, these legislative changes increased the risk that the banks may encounter in the market (Denizer et al., 2000). Banks, in general, are financial institutions very exposed to risks, which are primarily separated into financial risk and non-financial ones. Financial risk is a component that brings uncertainty, where its operations are reflected in the capital of the bank. These risks should be understood by bank management on time and the most important thing is to control and confront them properly, also to manage them in the right way because risks are connected and a misleading into its control will lead to a range of other risks (Raghavan, 2003).

Banks operating according to Sharia rules are called Islamic banks and in Turkey, they are known as Participation banks. Islamic Banks have a stronger reason to expand their risk management strategies, since uncertainty is considered as one of the prohibitions in their financial transactions COMCEC (2016), and this makes Islamic banks to have a limited area of investment, where its transactions cannot be exposed to risk too much. Furthermore, Islamic banks make transactions based on sharing the profit and loss (PLS), and the returns that they achieve from their investment become volatile when there are fluctuations in the market. One of the main components of risk that Islamic banks are exposed to is market risk, (Iqbal & Mirakhor, 2007). Market risk itself is a component of financial risk, however, it is also separated into exchange risk, interest rate risk, risk coming from the fluctuation of financial assets, and risk which shows up in the fluctuations of commodity prices (Murithi et al., 2016). The fluctuations in the

market risk components affect the income of the bank because it creates mismatches in their balance sheet (assets and liabilities).

Islamic banks shown to be very exposed to the risk of commodity prices because some of their financial contracts like Murabaha are trade based contracts and the return that Islamic banks take is fixed and does not change if there is a change in the price of the product. Moreover, the volatility in specific assets of the market values for the current and future period, for instance “the commodity price of Salam asset, the market value of Sukuk, the market value of Murabaha assets, which are purchased to be delivered in a specific time” affect the returns of investment of Islamic banks (Misman & Bhatti, 2010). Many researchers stated that market risk appears as a result of fluctuations in prices, risk in stock prices, exchange rate risk and interest rate risk (Muriithi et al., 2016). Furthermore, interest rate is considered as one of the main indicators of market risk in the banking sector of Turkey (Ekinici, 2016). Therefore, the determinants of market risk chosen in this study are interest rate, exchange rate, inflation rate and GDP per capita, and the latter is a fundamental determinant of stock market prices and returns.

The determinants of financial performance of participation and conventional banks chosen in the study are return on assets (ROA) and return on equity (ROE). Since financial performance analyzes the transformation of assets into profit, its key financial indicators are: return on assets (ROA), which is defined by net income over the total assets of the bank, and return on equity (ROE), which is equal to net income divided by shareholders equity, (Frimpong et al., 2019; Athanasoglou et al., 2005; and Salameh & Abu-Eid, 2017).

The method used in this study is panel data regression, because there are different banks taken into study over a period of different years, (Darmofal, 2015). The panel data tests Augmented Dickey Fuller Unit Root Test, Johansen Co-integration Test, and Granger Causality Test are applied to this study to investigate the relationship of the chosen market risk indicators with the financial performance of Participation banks in Turkey. The dependent variables in the same time indicators of the financial performance of Participation banks are ROA and ROE. The independent variables, in the same time the determinants of market risk are interest rate (INT), the foreign

exchange rate (FX), inflation (INFL), and GDP per capita. The results obtained are analyzed from a comparative perspective between participation and conventional banks that are performing in Turkey. The reason of the comparison between participation and conventional banks is to show literally and empirically the operational difference between the banks and how much they are related to the indicators of the market risk. There are three participation banks and 5 conventional banks taken into the study as shown in table 1 below.

**Table 1.1. List of the Banks Taken into Study**

<b>Participation Banks</b>	<b>Conventional Banks</b>
KuveytTürk Participation Bank	Ziraat Bank
Albaraka Participation Bank	İş Bank
Türkiye Finans Participation Bank	Halk Bank
	Garanti Bank
	Vakıf Bank

## **1.2. Problem Statement**

Islamic banks are financial institutions operating with Sharia rules and their transactions are based on profit and loss sharing (PLS) Chong & Liu (2007). Sharia prohibits the presence of interest rate in financial transactions, however they still use the conventional interest rate LIBOR as a benchmark in determining their profit rate in a lot of transactions such as in murabahah and ijarah (Hussain & Mehboob, 2008). This leaves Islamic banks exposed indirectly to the risk of interest rate which is considered as one of the major components of market risk (Misman & Bhatti, 2010). Other limitations are not being able to take a fixed return from their clients, which makes Islamic banks volatile in their returns on assets (ROA) and return on equity (ROE) compared to conventional banks (Bashir, 1999). Furthermore, Islamic banks are also exposed to commodity price risk and exchange rate risk (Wahyudi et.al. 2015), which are also determinants of market risk. Apart from the fact that Islamic banks also are exposed to risk they cannot use financial derivatives to mitigate the risks because

these derivatives lead to speculations and they are not Sharia compliant (Ariffin, Archer and Kerim, 2009).

Worldwide researchers investigated the market indicators that affect the financial performance of Islamic banks and conventional ones. From the literature, Muriithi et al. (2016); Bashir (2003), Frimpong et al. (2019); Abu Eid and Salameh (2017), and Alper AND Anbar (2011) shed light on variant market indicators like interest rate, exchange rate, and inflation, affecting the financial performance of both Islamic and conventional banks. Besides, Kirui, Wawire, and Onono (2014) stated that GDP is a fundamental determinant of stock market returns because it impacts cooperate profitability.

In term of conventional banks, Murithi et. al. (2016) has performed a similar research on “the effect of market risk in banks' performance for the case study of Kenya”. They studied the effect of market risk on the financial performance of commercial banks in Kenya by using only return on equity as the determinant of financial performance.

However, this research extends the study investigation more by including other dependent variables, return on assets (ROA), and independent variables like GDP and inflation. Based on the recommendations of different research papers (Chowdhury & Eskandar, 2015; Rini & Burhany, 2020), to incorporate more internal indicators and external ones of market risk that have an effect on the financial performance of Islamic banks, would make the study more comprehensive and reliable. Moreover, a comparative method is used to show the relationship of the market risk with the financial performance of participation and conventional banks.

Furthermore, to the author's knowledge, no comparative studies has been done before for the study case of Turkey. Therefore, this study extends the existing literature by investigating the relationship between the different dependent and independent indicators of market risk like interest rate, inflation rate, foreign exchange rate, and GDP per capita and indicators of financial performance like return on assets (ROA) and return on equity (ROE). This study aims to examine the relationship of market risk indicators with the financial performance of participation and conventional banks in Turkey and compare between them

### **1.3. Research Objectives**

#### **The main objective of the study**

- To determine the relationship of market risk with the financial performance of participation banks in Turkey.

#### **The sub objectives are the following:**

- To examine an overview of risk management in general and market risk in specific in participation and conventional banks in Turkey.
- To investigate the relationship that interest rate and exchange rate have with return on asset and return on equity for participation banks in Turkey.
- To examine the relationship that GDP per capita and inflation rate have with return on assets and return on equity for participation banks in Turkey.
- To compare the relationship of market risk with financial performance between conventional and participation banks in Turkey.

### **1.3. Research Questions**

#### **Main research question**

- What is the relationship between the selected determinants of market risk and the financial performance of participation banks in Turkey?

#### **The sub-research questions**

- 1) How do participation and conventional banks manage risk in general and market risk in specific in Turkey?
- 2) What is the relationship that interest rate and exchange rate have with return on asset and return on equity of participation banks in Turkey?
- 3) How is GDP per capita and inflation rate related with the return on assets and return on equity of participation banks in Turkey?
- 4) What is the relationship of the selected determinants of market risk and the financial performance of participation banks compare to conventional ones in Turkey?

**The hypothesis formulated in this research are;**

H1: Interest rate is not related with the return on assets of Participation Banks

H2: Interest rate is not related with the return on equity of Participation Banks

H3: Inflation rate is not related with the return on assets of Participation Banks

H4: Inflation rate is not related with the return on equity of Participation banks

H5: Exchange rate is not related with the return on assets of Participation banks

H6: Exchange rate is not related with the return on equity of Participation Banks

H7: GDP per capita is not related with the return on assets of Participation banks

H8: GDP per capita is not related with the return on equity of Participation banks

**1.5. Outline of the Thesis**

The following chapter explains the theoretical framework for this study. It includes the consistent literature review on risk management in general, the banking system in Turkey, the historical background of Islamic Banks and the Participation Banks in Turkey, operation of market risk in the banking system, market risk in Islamic banks, and banks' financial performance. The third chapter outlines methodology, which consists of the data and model specification, sample and time period, study variables, and econometrical tests. Chapter four represents the introduction, empirical analysis of panel data tests results (ADF Unit Root Test, the Johansen Co-integration test, and the Granger Causality test), and summary of panel data tests. The fifth and final chapter includes the interpretation of the results, the conclusions of the study, recommendations, implications of the study, and limitations and future research.

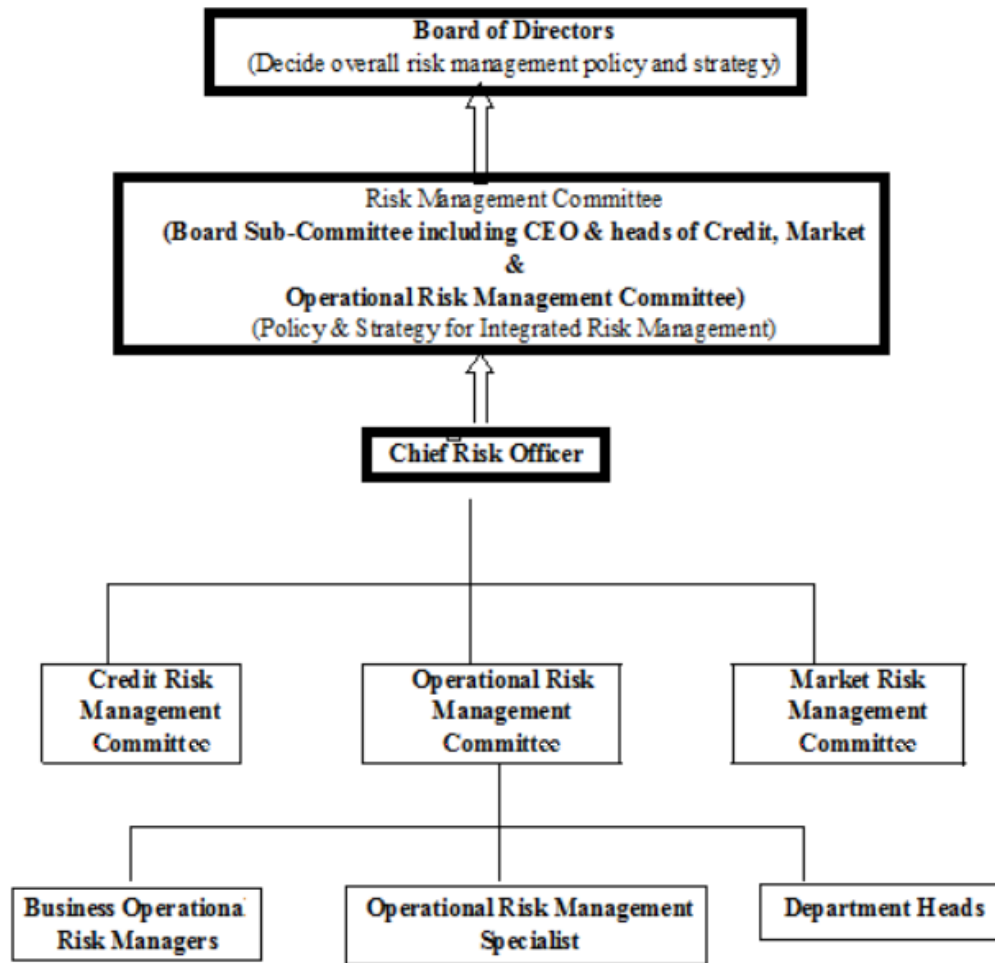
## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1. Risk Management**

Risk is a component that brings uncertainty, where its operations are reflected in the capital of the bank. These risks should be understood by banks on time and the most important thing is to control and confront them properly, also to manage them in the right way because risks are connected and a misleading into its control will lead to a range of other risks. Banks are financial institutions very exposed to risks, which are primarily separated into financial risk and non-financial ones.

Risk management has the function of identifying, monitoring, and measuring the capital of the bank. It is also divided into credit, operational, and market risk (Raghavan, 2003). Moreover, Kithinji (2010) defined risk management in her paper as a process that controls the bank's financial exposure. In this process there are several functions included like the identification of the risk, its analysis, risk monitoring, and the way risk is treated or controlled. Furthermore, the risk is categorized by a study made about conventional banks in Tanzania as financial risk, an operational one, and strategic risk, which have different influences in their general performance, (Peterson, et al., 2008). Rather, in a study made in (1997) by Santomero, from the aspect of management, risk has been separated into three categories as well. These categories include risk which is possible to be eliminated through business processes, the transportable risk from the bank to its participants, the risk which has to be controlled and managed directly by the institution itself. To understand its departments and functions, the outline of the risk management operating in banks has been made by Kumar and Yadav (2013) in their paper named "Liquidity risk management in the bank", wherein figure 2.1 departments of risk are shown.



**Figure 2. 1. Risk Management Schedule of Banks (Kumar & Yadav, 2013)**

In a case study of Bangladesh, Alam and Masukujjaman (2011) argued that risk management is classified in:

- i) Credit risk which is called the oldest risk in the banking system, where banks, in general, seem to fail to manage this risk and greater risk in this occasion will increase the net interest rates that the banks will be giving as a premium for credit.
- ii) Market risk is the risk that comes up as a result of mismatching of the financial rates in the market like interest rate, the price level of commodities, bonds, and exchange rate.
- iii) Equity risk shows the risk that comes from the change of equity market prices that the bank possesses.

iv) Money cleaning risk is the risk coming from hiding the origin of illegal money.

v) IT risk is the risk coming from technological failures, hacking, etc.

vi) Liquidity risk is the type of risk coming from the insufficiency of the cash in the bank to fulfill its financial obligations.

vii) Marketing risk, which is a risk coming from the promotion of a bank and its products.

viii) Human resource risk is the risk coming from the mismatch of the employers with their working place, improper training, and over-trust on their abilities.

Shafiq & Nasr (2010) stated that risk management does not only reduce the probability of damage coming from inside or outside operations but it also raises the tendency of good things happening since people prefer to take a risk rather than to experience a certain loss.

## **2.2. Banking System in Turkey**

The economy in Turkey until the period of 1980 has applied inward economic policies by restricting itself from outside competitiveness. The banking system was having a high share (more than 50%) at that time as a result of no competition in the market since it was hard to enter the market because of restrictions (Denizer, Dinç & Tarımcılar, 2000).

The change in the economic system of Turkey in the last 20 years, switching from an inward economy to an outward-liberal one, has also contributed to the liberalization of the banking system. Firstly, the banking system eliminated control over interest rates and took away the obstacles to enter the market. The credit programs were reduced and the competitiveness with outside participants was opened to achieve higher efficiency (Denizer et al., 2000). In this period of time, an increase of total assets was observed in the banking system, which brought growth with it. The number of foreign banks increased, as a result of the Turkish economy to be open in the market, but still, the banking market was dominated by public banks. Furthermore, the share of assets that foreign banks possessed was very small (Gunalp & Celik, 2006).

Zaim (1995) argued that the banking sector gave a quick response with the coming of the liberalization period, where banks because of the competition decreased their operational costs. Some of the branches that could not achieve profit were closed. Within a decade (1981-1990) a tremendous increase in profitability of banks was observed, also liberalization of interest rate was emphasized in this era of Turkish financial post-liberalization.

The financial crisis of 1994 in Turkey, which had deep consequences in the economy, (Turkish lira got devalued strictly compared to the US dollar, inflation rate exceeded two digits and interest rate increased extremely), firstly started in the finance sector after that spread in the real one. The Banking System had a dramatic loss in its total assets by 30% (Isik & Hasan, 2002). In their paper, Isik& Hasan (2002) concluded that there was a decrease in the productivity of banking by 17% because of the financial crisis. From their perspective of productivity and size, foreign banks and small ones were mainly affected, while state banks remained basically unharmed.

Moreover, the 2000-2001 financial crisis broadly affected the banking system in Turkey. In addition to the policies taken by the International Monetary Fund (IMF) to mitigate financial crisis, a restructuring program has been organized by Turkish authorities too, such as; developing the supervising system of banks, improving the operation of central banks and private ones, rescuing banks from Savings Deposits Insurance Fund (SDIF) and they prepared new rules to deal with non-performing loans, which are the basic norms to help on the improvement of the banking system (Altioik & Yilmaz, 2013). Furthermore, Conkar et al. (2009) argued that the 2001 worldwide financial crisis, which affected the Turkish banking system too, had roots from the 90's crises. The Turkish banking system was influenced mostly by the Russian financial crises of the period 1998, where the economy of Turkey had an outflow of their foreign capital of about 10.5 billion dollars, which of course affected the value of their domestic money in particular.

However, in that period with the coming of general elections, a new time started for the Turkish economy, which was followed by new reforms taken to overcome the financial crises. The new arrangement includes not only economic reforms, the banking system, and the capital market, but also social ones like social security, strengthening the relationship with outside countries, and privatization (Kocabay,

2009). The transition program invented for a strong economy after the financial crises had a remarkable improvement in the economy.

Aras (2010) in his paper “Effects of Global Economic Crisis on the Turkish Banking Sector” argued that 2008 global economics firstly started in the USA and after that spread in European countries. That global crisis had also a strong effect on the Turkish economy since its Gross Domestic Product (GDP) is mostly based on foreign trade (it constituted %50 of the GDP) and a high percentage of this trade is with countries of European Union (EU). Aras (2010) highlighted that despite the effect that this financial crisis had on the economy of Turkey, the banking system was not as much affected as the banking system in the USA and EU countries. The reason was that the capital adequacy of Turkish banks was strong enough to overcome that financial shock.

Nevertheless, the Turkish banking sector was ranked the first among G-20 countries for their equity and profitability in their assets. Dincer et al. (2011) also reported that the global crises of 2007-2008 had such a limited effect on the Turkish banking system. The reason behind this was supported by the regulations done in the 2001 crisis, where the transactions were purchased and merged, and since that time growth was observed in the Turkish banking sector.

### **2.3. Islamic Banking System**

Islamic financial institutions are institutions operating according to Sharia rules (Tatiana, Igor & Liliya, 2015). The history shows the operation of this financial activity in century 10th to 15th, among Middle Eastern people (where most of them were Muslim living their lives based on Sharia rules) and European ones. These transactions were based on sharing the profit and loss (PLS) which means no interest (Riba) in it and this was respected from both sides. The European financial institutions became stronger over time and of course, most of their transactions were based on interest but still, there was a small area where the Sharia-based transactions were applied. These institutions formally appear in the modern financial history in the 19th century with the first company in Egypt “Mit Ghamr savings project”, which took the example of a savings bank called ‘German Bank’, operating that time (Khan& Bhatti, 2008; Goncuoglu & Karaahmetoglu, 2014; Kozuharov, Ilieva & Ristovska, 2017).

The investors of this institution were mostly from the rural areas and since there was no interest applied to make it more profitable their transactions were based on profit and loss sharing (PLS). Furthermore, their holders could take back freely their deposits any time they want (Khan & Bhatti, 2008). Moreover, in 1971, a Sharia-based institution named “Nasser Social Bank” was established in Egypt to serve with small loans to people that have low income and support small businesses (Alharbi, 2016). Along with this, in 1975, to make this institution bring a surplus, some people with high incomes came up with the idea to create the first Islamic Bank of that time, in Dubai. The formal establishment of these Sharia-based financial institutions made 23 OIC (Organization of the Islamic Conference) member countries to come all together and in 1975 they founded the “Islamic Development Bank” (IDB) (Kozuharov, Ilieva & Ristovska, 2017; Alharbi, 2016; Goncuoglu & Karaahmetoglu, 2014; Khan & Bhatti, 2008; Arabaci, 2007).

According to (Kozuharov, Ilieva & Ristovska, 2017), the foundation of IDB had importance for the acceptability and credibility of Islamic Banking in the world market.

Many other Sharia-based financial institutions were founded in that time in other Islamic countries. Some of them like Sudan, Iran, and also Pakistan started to apply the operation of interest-free financial institutions all over their country's economy not only in the banking system. That was because the banking system not only prohibits Riba but it also shares income equally among those who invest based on profit and loss sharing in the financial activity and gives more importance to support fairness and a project's worthiness than taking back their loans (Goncuoglu & Karaahmetoglu (2014).

At this time, in the 1990s, the World Bank and the IMF recognized Islamic banks, they even supported these banks by producing financial papers based on Sharia rules (Goncuoglu & Karaahmetoglu, 2014). Moreover, some financial Islamic institutions were established at that time to support the growth and development of Islamic finance. These institutions were “The Accounting and Auditing Organization for Islamic Financial Institutions” (AAOIFI), “International Islamic Financial Market” (IIFM), “The Islamic Financial Services Board” (IFSB) and “The International Islamic Rating Agency” (IIRA), which continue their operation to the present (Sole, 2007).

### **2.3.1. Historical Development of Islamic (Participation) Banks in Turkey**

The first interest-free financial product in Turkey was shown up in 1975, under the name of DESİYAB, (State Industry and Workers Investment Bank). It operated by releasing partnership certificates to domestic and foreign savers. Because of the lack of a legal framework in that period, it moved away from Islamic principles. Nevertheless, DESİYAB had an essential role in the establishment of interest free banking and contributed to the establishment of Islamic banking in Turkey (Yılmaz & Bağış, 2020).

In the 1980s, the export-led growth strategy including "financial liberalization, privatization of state-owned companies, deregulation of economic sectors dominated by state monopolies, promotion of free trade, and attraction of foreign direct investment" started to be used. Consequently, foreign banks' numbers began to grow. In 2008, 18 foreign banks were launched in Turkey out of 46 banks that have more than 2000 branches across the country (Yavan, 2010). Besides, in 1984, interest-free Special Finance Houses were established in Turkey with the approval of the Central Bank to engage further capital from the Middle East (Yılmaz & Bağış, 2020; Sümer & Onan, 2015). Nevertheless, the secular bureaucracy was highly controlling the Special Finance Houses, unlike conventional banks' conditions. Therefore, the Central Bank insurance scheme of Turkey did not insure these special finance houses, and also they were not authorized to invest in government securities. This led to competitive disadvantages to them with conventional banks (Hardy, 2012). Sequential banking acts were later performed that led to enhance this situation between 1999 and 2001. The Turkish (Islamic) Participation banking system has improved significantly since 2000 (Egresi & Belge, 2015). Figure 2.2 shows a summary of the "main events that affect the development" of participation banks in Turkey.

Date	Event
1983	Legal framework that allowed the operation of Islamic banks established. These were named “Special Finance Houses”
1985	Al Baraka (Bahrain) opened its first subsidiary in Turkey
1985	Faisal Finans (Saudi Arabia) opened its first subsidiary in Turkey
1989	Kuveyt Turk (Kuwait) started operations in Turkey.
1991	Anadolu Finans (domestic capital) started operations.
1995	Ihlas Finans (domestic capital) started operations.
1996	Asya Bank (domestic capital) started operations
1999	Finance houses become subject to the Banking law no 4389 which regulates the banking system in Turkey
2000	Turkish holding Ülker bought Faisal Finans and changed its name into Family Finans House.
2001	Ihlas Finance House went bankrupt
2001	Creation of the Association of Special Finance Houses
2004	The state extended its 50,000 lira guarantee on deposits to Special Finance Houses
2005	Special Finance Houses re-named “participation banks” and the Association of Special Finance Houses re-named Participation Banks’ Association
2005	Türkiye Finans Participation Bank was established by merging of Family Finans and Anadolu Finans
2008	National Commercial Bank (NCB) from Saudi Arabia acquired 60% of Türkiye Finans shares for US\$ 1billion
2010	Framework for corporate sukuk was set up
2010 (August)	Kuveyt Turk issued Turkey’s first sukuk, US\$ 100 million
2011	first participation index was launched by the Istanbul Stock exchange
2012 (September)	first dollar denominated sovereign sukuk issuance, US\$ 1.5 billion
2012 (October)	lira denominated sovereign sukuk issuance US\$ 904 million
2013 (March)	Bank Asya issues the first lira denominated sukuk out of Turkey.
2014 (July)	Newly adopted mutual fund regulation, “participation umbrella fund” (katılım şemsiye fonu) will include funds with no interest bearing securities.

**Figure 2. 2. Summary of the Main Events That Affect the Development of Participation Banks in Turkey (Egresi & Belge, 2015)**

In 2005, “special finance house” was replaced with “participation bank” and the Union of Special Finance Houses was replaced by the “Participation Banks’ Association of Turkey” (TKBB in Turkish) based on the banking law no. 5411. (Sayım, 2012). Besides, extending the guarantee on deposits to participation banks (50,000 TL) by state. (Alpay, 2007). Also, harmonizing the law for conventional and Islamic banks. All of these changes motivated people to invest in the participation banks and formed a more convenient regulatory structure for participation banks in Turkey (Egresi & Belge, 2015).

Today there are six participation banks in Turkey which operate based on Sharia compliments: ‘Emlak Katılım Bankası’, ‘Vakıf Katılım Bankası’, and ‘Ziraat Katılım Bankası’ are three of them that are state-owned, while Albaraka Turk, Kuveyt Türk, and Türkiye Finans Participation Bank are privately owned. In 2019 the

Participation banks had around \$45 billion in assets whereas were the assets \$ 7.4 billion in 2005. Besides, Participation banks appointed 16,000 employees in 1154 branches (TPBA) (Uslu, 2020). Al Baraka Turk, the oldest Islamic bank operated in Turkey in 1984, (Uslu, 2020; Egresi & Belge, 2015). The bank is owned by "Al Baraka Banking Group (ABG), the Islamic Development Bank (IDB) (together holding 66.16% of the shares), a Turkish industrial group (11.06%), and the public (22.78%)" (Egresi & Belge, 2015).

Kuveyt Türk Bank was founded in 1989. It is a subsidiary of Kuwait Finance House and around 80% of the shares are held by foreign parties. Türkiye Finans bank was founded in 2005 with an association of two interest-free corporates investing in the Turkish Islamic finance sector (Anadolu Finans and Family Finans). The National Commercial Bank of Saudi Arabia is the main shareholder of this bank (Uslu, 2020).

Emlak Katılım Bank, Vakıf Katılım Bank, and Ziraat Katılım Bank are entirely state-owned banks. Ziraat Katılım bank was established in 2015, and Vakıf Katılım bank was founded in 2016 with 100% state capital. Moreover, in 2019 the state-owned Emlak bank was converted to Emlak Katılım bank as a participation bank for the construction and real estate sector by the government (Uslu, 2020).

### **2.3.1. Comparison between Islamic banks and Conventional banks**

In fact, conventional banks' primary goal is to maximize profits while Islamic banks' goal is to be socially responsible whereas operating according to religious principles, prohibiting the use of interest and using the model of profit and loss sharing with their customers. (Cerović, Suljić Nikolaj, & Maradin, 2017).

The performance of Islamic and conventional banks varies with countries and different operational aspects, where a study based on the larger sample of 141 countries and 2,956 of both conventional and Islamic banks. It states that by taking bank and country controls in to account, Islamic banks are far more efficiently than conventional banks and have greater capitalization ratios. However, Islamic banks are not greatly stable or less stable, and they do not own largely various business models and have comparable asset quality. Besides, both banks types minimize their dependence on non-deposit financing as the market share of Islamic banks increases. Nevertheless, Islamic banks

are only decreasing the loan-to-deposit ratio while increasing the overall share of Islamic banks. (Beck, Demirgüç-Kunt, & Merrouche, 2010).

Another study of Erol, Baklaci, Aydog and Tunc (2014) about Islamic and conventional banks in Turkey argued that the performance of participation banks in Turkey better than conventional banks in term of earnings, asset quality, and foreign currency liquidity ratios. The reason based on this study is that the Gulf countries' firms work in Turkey choose to deal with participation banks, which in turn have help to rise their overall market share in the industry.

In term of stability, Čihák and Hesse (2008) study based on 20 OIC countries, points out that small size Islamic banks are more stable than small conventional ones. On other hand, large size conventional banks are more stable than large Islamic banks. Another study by Farooq and Zaheer (2015) states that Conventional banks are more subject to panic reactions of depositors (withdrawal of bank deposits) while Islamic banks' lending is less liable to change of deposits (withdrawal of bank deposits)

In term of efficiency levels, a study of Hassan, Mohamad, & Bader (2009) about the Islamic banks and Conventional banks in Middle East stated that the efficiency levels for both banks are same. However, both banks are in a recession because they do not use their resources at optimal level. Therefore, they can improve the performance to higher level. On the other hand, this situation is relatively favorable to Islamic banks, unlike conventional ones because of their shortage experience and smaller size and assets. Other studies such as Johnes et al., 2009 and Johnes et al., 2014 states that Islamic banks are less efficient than Conventional banks

In term of revenue efficiency, with considering the age of two types of banks, it seems that old conventional banks showed better cost-profit efficiency than the old Islamic banks (Hassan, Mohamad, & Bader, 2009).

In term of the trends and the impact of the crisis on the financial stability and efficiency for both types of banks. Before and at the time of the crisis, Islamic Banks show higher stability and efficiency. The reasons are because of " the "purity" of their business based on commissions and fees (but not interest), aversion to risk (profit/loss sharing due to risk-sharing model), promotion of partnership (interest in business endeavors of the clients), religious principles (help and share their clients' "destiny"), social

responsibility (not funding the industry of alcohol, tobacco, prostitution, etc.) and so on". However, after crisis, conventional banks show greater financial stability and efficiency in operating. The reasons can be the long history of conventional banks, thus their greater customer confidence, various financial products like Islamic windows, regulations modified to the specifics of the business of Conventional Banks (Cerović, Suljić Nikolaj, & Maradin, 2017).

#### **2.4. Risk Management in Islamic Banks**

Islamic banking systems, as well as conventional banks, give high importance to risk management (Swartz, 2012). According to COMCEC (201), Islamic Banks have a stronger reason to expand their risk management strategies, since uncertainty is considered as one of the prohibitions in financial transactions made by Islamic Banks. The management of risk is taken over by the boards of Sharia, where they control carefully every financial transaction, to be sure that they comply with Islamic rules. The monitoring mechanisms used for risk management are also applied by the governance of that region or state.

Furthermore, Kahf (2005) stated that because Islamic banks operate based on Shariah rules, they face “new and unique risk as a result of their structure of asset and liability”. Besides, the conventional risk that influences Islamic Banks differs from the effect that it has on conventional banks. Kahf (2005) came up with the argument that risk management can be mitigated by following various processes of management and supervision of it. Moreover, Kahef (2006) claimed that Islamic Banks face internal risk and risk coming from outside factors or external ones. External risk is separated into credit risk, which includes the risk coming from debts; regulatory risk, which comes from new regulations in the banks' policies and operational risk, which includes the disoperation of the staff, the technology used, and errors in the banking system.

Shaikh & Al Jalbani (2009) stated that the risk that Islamic Banks take is higher because of their limitations coming from Shariah rules and this negatively affects their return on asset ROA). The risk faced by Islamic banks has been specified into seven different groups as follows; exchange risk, market risk, liquidity risk, default risk, concentration risk, religious risk, and reputation risk.

According to Misman & Bhatti (2010), the figure 2.3 below shows the risk that financial contacts of Islamic banks face during their transaction.

Types of Contract	Major Risks	Risk Classification
Murabahah	Credit risk	Unsystematic risk
Musharakah	Market risk Agency risk	Systematic risk
Mudarabah	Market risk Agency risk	Systematic risk
Ijarah Thumma Al-Bay	Credit risk	Unsystematic risk
Ijarah Wa Iktina	Operational risk Payment risk	Unsystematic risk
Salam	Delivery risk	Systematic risk
Istisna'	Delivery risk	Systematic risk
Bay' Al-Enah	Credit risk	Unsystematic risk
Tawarruq	Credit risk	Unsystematic risk
Commodity Murabahah	Credit risk	Unsystematic risk

**Figure 2. 3. Main Risk Faced by Islamic Banking Products (Misman & Bhatti, 2010)**

## **2.5. Market Risk in Banks**

### **2.5.1. Definition**

Market risk, defined by Savvides and Savvidou ( 2012), shows the effect that the fluctuations of market prices have on the value of cash flows. It is a component of financial risk, however, it is also separated into exchange risk, interest rate risk, risk coming from the fluctuation of financial assets, and risk that shows up in the fluctuations of commodity prices. Furthermore, market risk is the cost that comes from the opposite movement of financial norms in the market like interest rate, exchange rate, commodity prices, and bonds. Muriithi et al. (2016); Alam and Masukujjaman (2011), and Hasan, Unsal, and Tamer (2016) stated in their study that the exposure of market risk in banks can be defined from the fluctuations of basic factors that create it and how sensitive are the bank portfolio towards these movements of risk factors. The

risk created by the fluctuation of interest rates in the market affects the income of the bank because it creates mismatches in their assets and liabilities.

### **2.5.2. Determinants of Market Risk**

Market risk's essential component is the fluctuation in prices and all financial institutions are affected by those fluctuations despite the kind of currency they use on their financial performance in the market. Because market risk appears as a result of fluctuations in prices, it consists of risk in stock prices, exchange rates (including gold), and interest rate (Muriithi et al., 2016).

According to Chen and Scott (2020), market risk comes up as a result of factors that affect the market including fluctuations in the interest rate, natural disasters, economic recession, terrorist attacks, and political issues, which makes the investors face losses in their investments. They also indicated that the types of the commonly shown market risks are; “interest rate risk”, “equity risk”, “exchange risk”, and “commodity risk”. Raghavan (2003) reported in his study that the movements in market risk indicators such as goods prices, interest rate, equity, and exchange rate does not have a positive effect on the balance sheet of banks. Moreover, market risk is considered as a risk of capital and bank’s returns, due to the risk coming out from fluctuations in the price level of interest rate, exchange rates, volatilities, and equities.

Aruwa and Musa (2014), Muriithi et al. (2016), and Kelvin (2015) reported that market risk is a risk coming from outside and it is not able to be controlled by banks management. They also stated that inflation rate, foreign exchange rate, financial leverage, and interest rate are determinants of market risk and these determinants affect the banks' financial performance.

However, as reported by Muriithi et al, (2016), in the case study of Kenya there is a strongly negative effect of market risk on the financial performance of conventional banks. He empirically proved in his paper that the determinants of market risk like interest rate, exchange rate, and financial leverage are significantly related to the indicator of financial performance return on equity.

On the other hand, Ekinici (2016) empirically concluded that the profitability of the conventional banking system in Turkey is significantly positive affected from the foreign exchange rate (FX) and credit risk. However, the interest rate does not show any significant effect on the bank's profitability.

A case study conducted by Zainnol and Kassim (2010), reported that interest rate has a positive and long-run relationship with the rate of return in Islamic and conventional banks. Furthermore, Bashir (2003) reported GDP per capita and inflation rate have a significant positive effect on the indicators of the financial performance of Islamic banks. An increase in GDP and inflation increases the financial performance measures of Islamic banks.

In a case study of Turkey, Anbar and Alper (2011) empirically concluded that interest rate has a positive effect on the financial performance measure ROE of commercial banks in Turkey. However, there is not an important effect shown for the macroeconomic determinants like GDP and inflation rate of the financial performance of the commercial banks.

As reported by Rini and Burhany (2020), banks internal like factors capital adequacy ratio and net performing financing (NPF) show a positive effect on return on assets (ROA), whereas a negative effect is shown between other internal factors like operational expenses per operating income (BOPO) and financing to deposit ratio (FDR) and ROA of Islamic banks in Indonesia.

Furthermore, Ali, Maamor, Yaacob and Gill (2018) reported that macroeconomic variables GDP, inflation rate, and oil prices have a more significantly positive effect on the profitability of Islamic banks ROA and ROE. Besides, money supply and foreign exchange rate less significantly affect the profitability of Islamic banks in Brunei. Also, Yousafi (2016); Alharabi (2017); Noor and Hayati (2012); and Ali et al. (2018) concluded that macroeconomic factor GDP has a significantly positive effect on the profitability of the Islamic banks.

The selected determinants of market risk used in this study includes:

### **2.5.2.1 Interest Rate**

Interest rate is a market variable, which indicates the charged percentage of the amount loaned by the lender as use of the assets Maamor et al. (2018). The interest rate used in this study is weighted average interest rate for bank loans, which is calculated as the division of the “accrued amount of interest income on loans and interest expense on deposits” with “the average position in loans and deposits” in the same time period, (IMF, 2006). As reported by Ekinici (2016) one of the main indicators of market risk in the banking sector of Turkey is the interest rate. Furthermore, the flexibility of the interest rate affects the lending and borrowing process of the bank, which means that it affects their financial performance. If there is not full flexibility in the interest rate, a case of long-term lending and short-time borrowing will produce the curve risk and bring new prices for the bank. This situation shows that bank profitability has a negative relationship with the short-time rate of interest, Ekinici (2016). However, Anber & Alper (2011) in their study of banks specifics and the impact of macroeconomics determinants concluded that real interest has a positive effect on return on equity (ROE).

### **2.5.2.2 Inflation Rate**

The inflation rate is a macroeconomic variable that measures the fluctuations of the prices of the goods in the economy and shows a continuous increase in the price level, Rini & Burhany (2019). Due to the fluctuations in the prices, the costs and the revenue of the banks get obviously affected. According to Bashir (2003) inflation has a positive effect on conventional bank's profitability. Moreover, Bashir (2003) reported that inflation has a negative effect on the financial performance of Islamic banks when there is a more rapid increase in the costs of the bank than the inflation rate. Eskander & Chowdhury (2015), stated that this effect depends on the predictions of the banks related to the inflation rate. If there is a prediction of the inflation from the banks, they can manage profit and loss sharing (PLS) of the bank, which increases the profit, but there could be a decrease in their profits if there is not a prediction of the inflation from the banks.

### **2.5.2.3 Exchange Rate**

The exchange rate is a market variable that shows the trade between currencies, or better said the value of one currency compared to another. The changes in the value of the local currency, in our study case of Turkish Lira (TL), has a direct effect on the profits of a bank because it changes the value of the foreign currency that banks possess, Ekinçi (2016). If banks have a large amount of foreign currency in their possession, a decrease in the value of the local currency brings profit for the bank, but an increase in the local currency would bring a decrease in their gain. Since Turkey is a developing country, Ekinçi (2016) stated that the fluctuations of the exchange rate have also an effect on the interest rate and inflation, so banks are going to use different techniques to mitigate the exchange rate fluctuations same as they do for the interest rates. The effect of the exchange rate on the performance of the banks is a special result for each different country. Maamor et al. empirically concluded in their study for Bruneian Islamic banks that the exchange rate is significant and has a positive effect on bank's profitability. However, the exchange rate is observed to have a negative impact on Islamic banks financing capability, Nahar & Sarker (2016).

### **2.5.2.4 GDP per Capita**

Gross domestic product is a significant macroeconomic variable that measures the well-being of the economy of a state. A positive change in the GDP means that people's well-being increases and this brings also an increase in the supply of the deposits on banks, Bashir (2003) & Eskandar & Chowdhury (2015). Furthermore, Ali et al. (2018) affirmed that GDP has a significant impact on the Islamic bank's financial returns. According to Eskandar & Chowdhury (2015) and Teng, Wei, Yong & Siew (2012), a decrease in the GDP per capita of a country will decrease the wealth of people, which brings a lack of money in the market and this will decrease the profits of the Islamic banks. Therefore they conclude that there is a positive effect dictated from GDP per capita to the financial performance of the Islamic banks based on empirical results. Moreover, Wasiuzzaman and Tarmizi (2010) reported that progress in economic growth will upgrade the credit quality and this indicates a higher probability to pay back loans and reduces the default rate therefore, the profitability of banks will increase.

Regarding market risk, Kirui, Wawire, and Onono (2014) stated that GDP is a fundamental determinant of stock market returns because it influences cooperating profitability.

## **2.6. Market Risk in Islamic Banks**

Islamic banks are financial institutions that face many restrictions in the market because of their Sharia compliance operation (Iqbal & Mirakhor, 2007). One of the major prohibition in Islamic banks is interest rate, (Riba), which Islamic banks face so much in the markets using the interest rate in their financial transactions. Because of the fact that interest rate is not the only risk occurring in the market, there are other market risk components affecting the Islamic banks financial performance like currency fluctuations and exchange rates risk. Therefore, this study investigates the relationship of the market risk with the financial performance of Islamic (participation) banks in Turkey. Islamic banks offering Islamic solutions use more tricky financing frameworks and offensive client needs (Hussain, 2008).

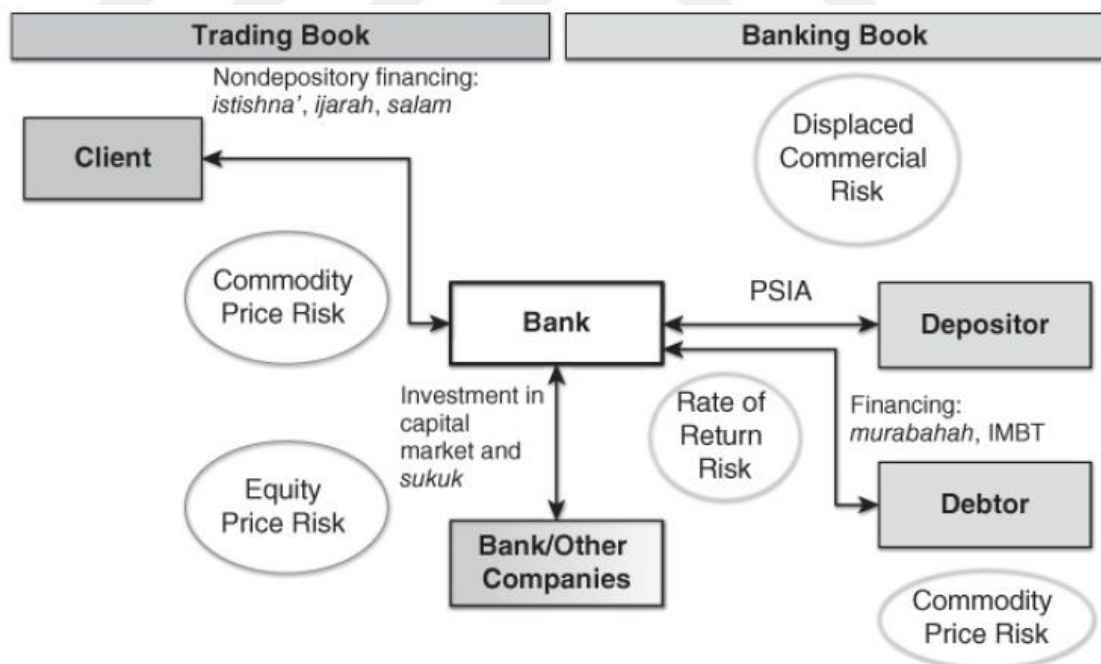
Market risk is one of the main components of risk which Islamic banks are exposed to and affects banks' financial performance (Iqbal & Mirakhor, 2007 and Wahyudi et.al. 2015). It is one of the key risks faced by Islamic banks. "Market risks can be systematic, arising from macro sources, or unsystematic, being asset or instrument-specific" (Ahmed, Islam, Zuqibeh & Alabdullah, 2014 and Ahmed & Khan, 2007). To clarify, the currency and equity price risks fall within the systematic category, and movement in prices of commodity or asset that the bank is conducting will fall within certain market risks (Ahmed & Khan, 2007). Moreover, IFSB.1 (2005) states that market risk comprises the losses in the banks' balance sheet due to price fluctuations in the market like the value of tradable assets, sale or leasing ones, and restrictions in the investment accounts of individual portfolios.

Islamic banks are exposed to market risk not only when they are active in the market (changes in commodity prices), but also they got affected from market risk even when they stay passive in the market. This is due to the fact that the fluctuations in the exchange rates, which is one of the main indicators of market risk, will affect the assets that bank's own in foreign currency (Wahyudi et. al., 2015). Furthermore, Wahyudi et. al. (2015) stated that market risk in Islamic banks is composed of mark-up risk, the

risk of commodity and equity prices and foreign exchange rate risk. In addition Ahmed et. al. (2014) claimed that the components of market risk in Islamic banks are the risk of profit rate, which is also called as risk of return rate in Islamic financial institutions, exchange rate risk, and the risk of commodity and equity prices.

According to Fleifel (2009), the activity of market risk is mainly focused in banking book for the Islamic banks differing from conventional ones. “The banking book consists of all banking activities, such as transforming third-party funds into financing loans” (Wahyudi et. al., 2015). Moreover, Fleifel (2009) claimed that market risk may occur even when there is a diminishing return in the investment accounts. In such cases Islamic banks use special funds like Investment Risk Reserves (IRR) and Profit Equalization Reserve (PER) if there are outcomes not favorable for the clients. The contributors of special funds are Takaful companies, a part from the profits of the bank and investors.

The figure 2.4 below shows the scope of the market risk in the financial activity of Islamic banks.



**Figure 2. 4 Scope of Market Risk in Islamic Banks (Wahyudi et. al. 2015).**

Moreover Makiyan (2008) reported that Islamic banks are exposed to the components of market risk (interest rate, commodity prices, exchange rates and equity values) to

some extends compared to conventional banks. Due to the fact that interest rate is prohibited in Islamic banks, there is an indirect effect of interest rate risk on leased and delayed sale based contracts through the mark-up price.

Further researchers stated that risks in Islamic methods of financing are complicated and still evolving. Table 2.3 shows the result of Ahmed & Khan's (2007) study about market risk expectations of different Islamic methods of financing for 18 Islamic bankers.

**Table 2.1 Market Risks in Various Islamic Methods of Financing (Ahmed & Khan, 2007)**

<b>Islamic Methods of Financing</b>	<b>Market risk</b>
Murabaha	2.75 (12)
Mudaraba	3.56 (9)
Musharaka	3.67 (9)
Ijara	3.17 (6)
Istisnaa	2.75 (4)
Salam	3.25 (4)
Diminishing Musharaka	3.5 (6)

It is clear from the table 2.1 above that market risk is comparatively high in most methods of finance. The highest rank was musharaka with (3.67), followed by mudaraba (3.56), and diminishing musharaka (3.5). The lower market risks are murabaha and istisna (2.75), then ijara (3.17).

Market risk includes the risk of the volatility in specific assets of the market values for the current and future period. For instance, the commodity price of Salam asset, the market value of Sukuk (Islamic bonds), the market value of Murabaha assets, which are purchased to be delivered in a specific time, and the risk of exchange rates (Misman & Bhatti, 2010). Thus, “market risk included exchange rate risk, commodity price risk, and equity price risk as well as benchmark rate risk” ( Wahyudi, Rosmanita, Prasetyo, & Putri, 2015).

Nevertheless, Islamic banks are very exposed to the risk of commodity prices due to the fact that they have to keep inventory products in order to make the leasing or other financial transactions. Besides, Islamic banks are disclosed to the risk of equity prices directly because they are financed with profit and loss sharing (PLS) method and they are also affected by foreign exchange rate risk same as conventional banks do (Makiyan, 2008).

In addition, even though Sharia prohibits interest rate in Islamic banks, there is an indirect effect of the interest rate risk in the banks' transactions based on increased prices of deferred leasing or selling contract, (Misman & Bhatti, 2010). Rosly (1999) claimed that Islamic banks are exposed to interest rate due to the fact that they operate highly dependent on murabaha (a fixed rate asset financial instrument). Moreover, Minny & Görmüş (2017), concluded that Islamic banks are moving together with conventional banks. If the interest rate increases, credit rate for Islamic banks will increase too and the profit increases lightly therefore, the banks return will increase. Wahyudi et. al., (2015) stated in their book that the components of market risk, “like interest rate, stock price fluctuations and the exchange rate itself, correlate and influence each other”. A fortify exchange rate guaranties the fall of the stock prices and the industrial commodity prices too. Because of the fact that Islamic banks usually achieves a fix rate in their financial contracts they definitely get exposed from both interest rate and commodity prices risk (inflation).

## **2.7. Financial Performance of Banks**

### **2.7.1. Definition**

Financial performance is defined as the strategies being used by financial institutions to utilize their assets to achieve profit (Frinpong et al., 2019). Moreover, Richard (2009) stated that financial performance shows how effective the capital managed to create profit. The measurement of financial performance is based on determining the banks' liquidity, the effectiveness of their costs, and creditworthiness.

### **2.7.2. Determinants of Financial Performance**

Since financial performance analyzes the transformation of assets into profit, its key financial indicators are: return on assets (ROA), which is defined by net income over

the total assets of the bank, and return on equity (ROE), which is equal to net income divided by shareholders equity, (Frimpong et al., 2019; Athanasoglou et al., 2005; and Salameh & Abu-Eid, 2017). Moreover, Kelvin (2015) reported that the bank-specific indicators of the financial performance of commercial banks are capital adequacy (CAR), market power, macroeconomic factors (inflation, interest rate, GDP, political instability), and bank size.

According to Bashir (2003) and Alper & Anbar (2011), essential indicators to measure the financial performance of a bank are profit margin, return on equity, net interest margin and return on assets. However, some studies such as Rini & Burhany (2020), Frimpong & Guoping (2019), and Chowdhury & Eskandar (2015) declined that the best indicator of the financial performance of a bank is Return on Assets (ROA). On the other hand, Murithi et al. (2016) stated that the return on Equity is the indicator of the financial performance of the banks.

Moreover, Rini & Burhany (2020) declared that the indicators of the financial performance of participation banks are separated into internal and external factors. The factors influenced by the banks' management policies and decisions are internal factors, whereas factors not related directly to bank management but do have an indirect effect on the financial performance of the bank are external ones. Banks' internal determinants are net performing financing (NPF), Capital adequacy ratio (CAR), return on assets (ROA), return on equity (ROE), financing to deposit ratio (FDR), and operational expenses per operating income (BOPO).

Based on the fact that ROA and ROE are defined by the net profit and the total assets and the shareholders' equity of the bank respectively. This research defined ROA and ROE as the indicators of the financial performance of participation banks in Turkey. Nevertheless, many researchers claim that return on assets and return on equity are the best financial indicators of the financial performance of a bank, Bashir (2003) and Hassan& Bashir (2005).

Bashir( 2003), stated in his study of the determinants of profitability in Islamic banks for the case study of the Middle East that return on assets and return on equity is positively affected by GDP per capita and inflation rate. However, he declared that indicators of financial performance for Islamic banks (ROA, ROE) may be negatively

affected by the inflation rate if banks' wages and different costs grow faster than the increase in the rate of inflation.

Furthermore, Abu Eid & Salameh (2017), in the case study of GCC countries proved that Islamic banks' profitability indicators ROA and ROE are significantly positively related to economic growth GDP. However, return on assets and return on equity are not significantly related to the inflation rate.

According to Chowdhury & Eskandar (2015), it is empirically concluded for the case study of Asian and African countries that the return on assets of Islamic banks is significantly positively affected by the inflation rate. However, the return on assets is not affected by economic growth.

Besides, Zhongming et al.(2019) stated that financial performance measures of commercial banks in Ghana, return on assets(ROA), and return on equity (ROE) are not significantly affected by the inflation rate and exchange rate risk. Moreover, Adebola (2011) empirically proved that the foreign exchange rate does not significantly impact banks' profitability in the long run. However, Javaid and Alalawi (2017) stated that the exchange rate significantly impacts the market stock for Islamic banks.

Nahar & Sarker (2016) and Ali et al. (2018), reported that the financial performance of Islamic banks is significantly positively correlated with macroeconomic indicators, inflation rate, and GDP. However, there is an insignificant negative relationship shown between the exchange rate and the financial performance of Islamic banks.

The determinants of financial performance of participation and conventional banks used in this study are:

#### **2.7.2.1 Return on Assets (ROA)**

Return on asset is a financial indicator that shows how profitable is a bank regarding its total assets. According to Bashir (2003) and Hassan and Bashir (2005), ROA highlights the ability of the bank managers to use the financial resources of the bank in order to achieve profit. As many bank regulators claim, return on assets is the best financial indicator of a bank. Furthermore, due to the fact that ROA is a close measure

of the net income, it is used broadly in studies with a structure-performance nature (Hassan & Bashir, 2005).

### **2.7.2.2 Return on Equity (ROE)**

Return on equity is a financial indicator, which measures the financial performance of a bank as a ratio of net income and shareholder's equity. As reported by Bashir (2003) and Hassan and Bashir (2005), ROE shows how efficient is the management of a bank to use their shareholder's funds to achieve profit. Moreover, ROE is the essential indicator to measure the financial performance of a bank, by reflecting the abilities that the banks have, to achieve net income from non-traditional services (Hassan & Bashir, 2005).

The dependent variables ROA and ROE are chosen as indicators of financial performance of participation and conventional banks due to the fact that both ROA and ROE are considered as the most important financial indicators of financial performance of banks from many researchers. Also, return on assets is an important indicator of financial performance of the banks due to the fact that it measure the profit archived from banks total assets, and return on equity is one of the important indicators of financial performance and this is the reason of being the selected determinant of financial performance of the banks.

## CHAPTER III

### METHODOLOGY

This chapter describes the methodology used to analyze the relationship of market risk with the financial performance of both participation and conventional banks. The nature of the data used, the empirical model, sample size, and time template of the variables are explained in the following sections.

The study is based on the quantitative relation between dependent and independent variables. According to Basias, N., & Pollalis, Y. (2018), situations observed to have a high probability to happen, when the reason for that probability and the explanation is inside that situation, are examined by quantitative research. Furthermore, quantitative research is used because the objectives of the study contain a cause and effect response better to empirical investigations through statistics and numerical data analysis Frimpong et. al. (2019). The explanation of the selected variables, the expected relationship between them, and the sources from where the data has been collected are also illustrated below.

#### **3.1. Data and Model Specification**

The data collected in this research corresponds to three participation banks operating recently in Turkey, Kuveyt Türk Participation bank, Albaraka Participation bank, Türkiye Finans Participation bank which start their operation in 2005. Vakıf and Ziraat Participation banks, which start their operation in 2015 and Emlak Participation bank are not included in the study due to the fact of the data limitation and their late entrance on the market. The conventional banks taken into study are Ziraat Bankası, İş Bankası, Garanti Bankası, Halkbank and Vakıf Bankası. The reason of choosing the mentioned conventional banks is because these banks are ranked in the Banks Association of

Turkey (TBB) with the highest financial performance and total assets for year 2019. The corresponding total assets for banks are; Ziraat Bankası (610360, 24 milion TL), İş Bankası (432780,32 milion TL), Halkbank (428974,072 milion TL), Garanti Bnakası (383650,57 milion TL) and Vakıf Bankası (380525,36 milion TL) (TBB, 2019).

The variables chosen are plugged into a linear equation to represent the relationship between the dependent and independent variables with each other. The data analysis used in this research is panel data, because there are different banks taken into study over a period of different years, (Darmofal, 2015).

- i) Equation to show the relationship between dependent variables (ROA, ROE) and independent ones (GDP per capita, interest rate, inflation rate, exchange rate) for Conventional Banks

$$ROA_{ct} = \beta_0 + \beta_1GDP + \beta_2INT+ \beta_3FX+\beta_4INFL + \varepsilon_{ct}$$

$$ROE_{ct} = \beta_0 + \beta_1GDP + \beta_2INT + \beta_3FX + \beta_4 INFL + \varepsilon_{ct}$$

- ii) Equation of the relationship between dependent variables (ROA, ROE) and independent ones (GDP per capita, interest rate, inflation rate, exchange rate) for Participation Banks

$$ROA_{pt} = \beta_0 + \beta_1GDP + \beta_2INT+ \beta_3FX+\beta_4INFL + \varepsilon_{pt}$$

$$ROE_{pt} = \beta_0 + \beta_1GDP + \beta_2INT+ \beta_3FX+\beta_4INFL + \varepsilon_{pt}$$

$i$  = represent the nature of the bank, participation or conventional.

$t$  = represent the year

$\beta_0$  = represent constant

$(\beta_1, \beta_2, \beta_3, \beta_4)$  = represent the coefficients of the variables

$\varepsilon_{it}$  = standard error

Dependent variable Y, is represented by ROA and ROE.

**ROA** = return on assets

**ROE** = return on equity

**INT** = interest rate

**FX** = foreign exchange rate

**GDP** = gross domestic product

**INFL** = inflation rate

### **3.2. Sample and Time Period**

In Turkey, only six Participation banks are operating currently and one of them started its operation in 2019. In this study, only three participation banks are taken into analysis and to make a comparison, five conventional ones are included in the analysis. There are quarterly data used, due to lack of a long yearly term of data availability. The time period is from 2010- 2019. The short period of ten years is because participation banks in Turkey are so new in the market and this brings restriction in the availability of the data. The data has been obtained from the annual reports of the Participation Banks in the portal of the Association of Participation Banks in Turkey (TKBB), while the data related to conventional banks have been obtained by the annual report of banks registered in the Banks Association of Turkey (TBB). A further collection of the data is provided, from other sources like the Central Bank of Turkey (TMB) and the Turkish Statistical Institute (TÜİK).

The database used is the most reliable portal of data collection in Turkey, which is also under the control of the legislation of the Turkish state.

### **3.3. Study Variables**

As mentioned above the data used in this comparative study are secondary data. The variables used are specified as dependent and independent variables. The dependent variables return on assets (ROA) and return on Equity (ROE) are defined as indicators of the financial performance of the banks, both participation, and conventional ones. ROA is a financial indicator that shows how profitable is a bank regarding its total assets and ROE is a financial indicator, which measures the financial performance of a bank as a ratio of net income and shareholder's equity. These two dependent variables in this study will show the relationship that the chosen independent variables will have with the financial performance of both participation and conventional banks in Turkey.

The independent variables included in this study are four, Gross Domestic Product (GDP) per capita, Inflation (INFL), under the name of the consumer's price index (CPI), interest rate (INT), weighted average interest rate for bank loans, and exchange rate (FX), which are all expressed as growth rate (%). GDP per capita is a significant macroeconomic variable that measures the well-being of the economy of a state and it is also a fundamental determinant of stock market returns because it influences cooperating profitability. Inflation rate is a macroeconomic variable that measures the fluctuations of the prices of the goods in the economy and shows a continuous increase in the price level and it is one of the major components of market risk. The interest rate variable used in this study is weighted average interest rate for bank loans and it is a market variable, which indicates the charged percentage of the amount loaned by the lender as use of the assets. The last independent variable is exchange rate, which is a market variable that shows the trade between currencies, or better said the value of one currency compared to another.

#### **3.4. Econometrics Tests**

In this research, there are three Participation banks and five conventional banks taken into study. The data collected is analyzed by using panel data econometrics tests applied in the E-views program. Firstly, the Augmented Dickey-Fuller Unit Root test is applied to the data to test for the stationary of the variables, as a non-stationary variable cause results of regression analysis to be spurious, Frimpong et al. (2019). Then, the Johansen Co-integration test, which checks the integration among variables and their long-run relationship Frimpong et al. (2019). Furthermore, Kennedy et al. (2016) stated that the multi-collinearity problem shows a reduction with the operation of the co-integration test. After testing to determine the long-run relationships among dependent and independent variables, the Granger Causality test is applied to check for the directions of these long-run relations and system breakdowns, Zhongming et al. (2019). Moreover, Granger causality determines if the variables are contemporaneous with each other in the sense that if a variable can be explained by using the lag series of the other variable, Salman and Shukur (2004).

## CHAPTER IV

### RESULTS AND ANALYSIS

#### 4.1. Introduction

In this chapter, the description of the data, analysis and the obtained results will be given. There are eight banks taken into the study, three of them participation banks and five conventional ones, which their financial performance will be measured by using the selected secondary data to a time period of 2010 to 2019. The proxies gathered for this measurement are return on assets, return on equity, GDP per capita, inflation, exchange rate and interest rate.

**Table 4. 1. Descriptive Statistics of Participation Banks**

<b>Variables</b>	<b>Number of Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>
Return on Assets	120	0.011936	0.004631
Return on Equity	120	0.128251	0.040148
GDP per capita	120	3.932041	2.612199
Inflation	120	0.012248	0.008384
Interest Rate	120	18.09287	4.022758
Foreign Exchange Rate	120	100.0730	14.40435

The variables descriptive statistics in table 4.1 show the mean and standard deviation of 120 observations of the Participation Banks in Turkey. Return on assets (ROA)

standard deviation is 0.0046 and mean value of 0.011936 (%1,19) among all the participation banks, whereas ROE has the mean and standard deviation values respectively of 0,128251 (%12,83) and 0.0401. Further, the mean value of GDP per capita is 3,932041, and its standard deviation of 2.6121. Inflation's mean value and standard deviation are respectively 0.012248 and 0.0083. Lastly, interest rate and exchange rate have their mean values 18.0928 and 100.0730 and their standard deviations are 4.0227 and 14.4043 respectively. According to descriptive analysis, mean shows that the data points for all dependent and independent variables for Participation banks are symmetric and according to standard deviation values it is convenient to say that the data points are closely spread from their mean.

**Table 4. 2. Descriptive Statistics of Conventional Banks**

<b>Variables</b>	<b>Number of Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>
Return on Assets	200	0.015946	0.004512
Return on Equity	200	0.153030	0.043459
GDP per capita	200	3.932041	2.612199
Inflation	200	0.012248	0.008384
Interest rate	200	18.09287	4.022758
Foreign Exchange Rate	200	100.0730	14.40435

Table 4.2 above shows the mean of 200 observations of selected conventional banks in Turkey. From the results, the mean value of the ROA is shown to be 0.011936 (%1.2) and its standard deviation 0.0045 among all the selected conventional banks. Moreover, ROE has the mean and standard deviation values of 0.128251 (%12.83) and 0.0434 respectively. Other variables like GDP per capita, inflation rate, interest rate, and exchange rate have the same mean values and standard deviations as they do for Islamic banks, where their mean values are (3.932041), (0.012248), (18,09287), and (100,0730) and standard deviation values (2.6121), (0.0083), (4.0227), (14.4043), respectively. The values of standard variation and mean implicit that the data points are closely spread from their mean and the data are symmetric respectively for

conventional banks. Further information on the descriptive statistic is shown in Appendix A.

#### 4.2. Empirical Analysis

The tests applied to the data are ranged below, which are running by using E-views program.

- Augmented Dickey Fuller Unit Root Test,
- Johansen Co-integration Test
- Granger Causality Test

##### 4.2.1. Unit Root Test

Augmented Dickey Fuller (ADF) unit root test is applied in order to check if the data we are using are stationary or non-stationary. Null hypothesis states that there is a Unit Root, (meaning non-stationary in the data).

$H_0$ : There is a Unit Root (non-stationary) if  $p > 0.05$ , fail to reject  $H_0$   
 $P < 0.05$ , reject  $H_0$

**Table 4. 3 ADF Unit Root Test for Islamic Banks (Level)**

Variables	ADF - Fisher Chi-square	
	Level	
	Statistics	Probability( %5)
ROA	-2.465325	0.1266
ROE	-1.718868	0.4192
GDP	-4.044088	0.0017
INFL	-4.857196	0.0001
INT	-2.165485	0.2200
FX	-2.771705	0.0654

Table 4.3 contains the results of the ADF unit root test of the data corresponding to Participation banks at the level. The significance level is %5 in this study. According

to the results, the probability of ROA is 0.1266 which is greater than %5, so the null hypothesis cannot be rejected. This shows the existence of a unit root in the series. The presence of unit root indicates that the series are non-stationary at the level.

The following variables ROE, INT, and FX, with probabilities, 0.4192, 0.22, and 0.654 respectively obtain the same explanations, where their probabilities are shown to be greater than 0.05 and in this case, too null hypothesis fail to be rejected. Furthermore, their series are non-stationary at the level.

However, INFL and GDP are significant at the level, where their probabilities are less than 0.05. In this case, the null hypothesis is rejected, which means that there is not a unit root observed and the data for INFL and GDP are stationary at level.

**Table 4. 4. ADF Unit Root Test for Islamic Banks (1<sup>st</sup> difference)**

Variables	ADF - Fisher Chi-square	
	1 <sup>st</sup> Difference	
	Statistics	Probability (%5)
ROA	-10.45251	0.0000
ROE	-9.788230	0.0000
GDP	-7.894629	0.0000
INFL	-5.506493	0.0000
INT	-9.160715	0.0000
FX	-10.06457	0.0000

Table 4.4 shows the result of the ADF Unit Root test at the 1<sup>st</sup> difference for Participation banks. The results of the test show that the probabilities of all the variables are zero at 1<sup>st</sup> difference. According to these results it is concluded that all the variables are significant. Since the probability of the ROA, ROE, GDP, INFL, INT, and FX are less than 0.05, the null hypothesis is rejected and the series is stationary at the 1st difference.

To conclude we can say that for Participation banks, the dependent variables ROA, ROE, and the independent variables GDP, INT, INFL, and FX are all stationary at the

1<sup>st</sup> difference. The null hypothesis is rejected due to the fact that their probability is less than the significance level %5.

**Table 4. 5. ADF Unit Root Test for Conventional Banks (Level)**

Variables	ADF - Fisher Chi-square	
	Level	
	Statistics	Probability (%5)
ROA	-4.284285	0.0006
ROE	-4.468555	0.0003
GDP	-4.044088	0.0017
INFL	-4.857196	0.0001
INT	-2.165485	0.2200
FX	-2.771705	0.0654

Table 4.5 contains the results of the ADF Unit Root test for conventional banks at the level. According to the results, ROA has a probability of 0.0006 which is less than the significance level of 0.05. Therefore it is concluded that the null hypothesis is rejected and the series is stationary. By looking at the probability of the second dependent variable ROE, again a significant result is shown. The probability of ROE is 0,0003, less than the significance level %5, so the null hypothesis is rejected and the variable is stationary at level.

The same explanation done for Participation banks if valid for the independent variables GDP, INT, INFL, and FX. According to the results, only GDP and INFL are stationary at the level. This is due to the fact that their probabilities are less than %5 and the null hypothesis is rejected.

Furthermore, the results for INT and FX have shown that these independent variables are not stationary at level, since the results obtained, show that the probability of the variables is greater than the significance level %5. As a result, the null hypothesis cannot be rejected and the variables are not stationary at level.

**Table 4. 6 ADF Unit Root Test for Conventional Banks (1<sup>st</sup> difference)**

Variables	ADF - Fisher Chi-square	
	1 <sup>st</sup> Difference	
	Statistics	Probability (%5)
ROA	-12.08409	0.0000
ROE	-11.88289	0.0000
GDP	-7.894629	0.0000
INFL	-5.506493	0.0000
INT	-9.160715	0.0000
FX	-10.06457	0.0000

The results of the ADF Unit root test for conventional banks at the 1st difference are shown at Table .4.6.

From the results obtained it is claimed that all the variables, dependent and independent ones are stationary at 1st difference. This result comes due to the fact that the probabilities of the variables are less than the significance level %5, where the null hypothesis, stating the presence of the unit root, is rejected. Appendix B shows further information related to the unit root test of the variables.

After the analysis is done, the condition for stationary is achieved. Johansen Co-integration test is applied in order to check for the integration of dependent and independent variables among them and their long-run relationship.

#### **4.2.2. Johansen Co- integration Test**

Johansen Co-integration test is used in order to check if a long relationship between dependent and independent variables exist. In this study, there are two dependent variables (ROA& ROE) which are chosen as an indicator of financial performance and there are four independent variables as indicators of market risk. Therefore, the running of the Johansen Co-integration test will check if there is a co-integrated relationship between chosen indicators of market risk and indicators of the financial performance of both participation banks and conventional ones.

**Table 4. 7. Johansen Co-Integration test for ROE, Participation Banks.**

<b>Series: ROE INT INFL GDP FX</b>				
<b>Hypothesized</b>	<b>Eigenvalue</b>	<b>Trace</b>	<b>%5 Critical</b>	<b>Probability</b>
<b>No. of CE(s)</b>		<b>statistic</b>	<b>value</b>	
None	0.638527	185.80	69.82	0.0000
At most 1	0.260351	68.78	47.86	0.0002
At most 2	0.148054	34.1	29.80	0.0150
At most 3	0.092490	15.67	15.49	0.0470
At most 4	0.038466	4.51	3.84	0.0337

Table 4.7 shows the result obtained from running the Johansen Co-Integration test for the first dependent variable of Participation banks. The first null hypothesis which states that there is no co-integration among dependent and independent variables are rejected. This is due to the fact that the statistic value 188.80 is greater than the critical value of significance level %5, 69.82. Besides, the probability of being less than 0.05 is a reason for the rejection of the null hypothesis.

The results for the second null hypothesis show that we reject the null hypothesis at %5 critical value, because the statistic value, 68.78 is greater than the critical value, 47.86, and also the probability of the test is less than the significance level %5. The null hypothesis is again rejected at most 2 null hypothesis due to the statistic value is greater than the critical value and probability is also less than 0.05. Again the same results are for the null hypothesis of at most 3 and at most 4, where the null hypothesis is rejected because the statistic values are greater than the critical values. The probabilities of the two hypotheses are less than the significance level of 0.05.

Therefore the rejection of the 5 co-integrating null hypotheses for the Johansen co-integration test indicates a long-run relationship existing among dependent and independent variables at the %5 significance level. Moreover, it is concluded that the indicator of the financial performance of Participation banks ROE has a long-run relationship with the indicators of market risk.

**Table 4. 8. Johansen Co-Integration test for ROA, Participation Banks.**

<b>Series: ROA INT INFL GDP FX</b>				
<b>Hypothesized</b>	<b>Eigenvalue</b>	<b>Trace</b>	<b>%5 Critical</b>	<b>Probability</b>
<b>No. of CE(s)</b>		<b>statistic</b>	<b>value</b>	
None	0.631180	199.37	69.82	0.0000
At most 1	0.274587	84.67	47.86	0.0000
At most 2	0.208953	47.75	29.80	0.0002
At most 3	0.128867	20.79	15.49	0.0072
At most 4	0.041951	4.93	3.84	0.0264

The table 4.8 above shows the results obtained from running the Johansen co-integration test for the 2nd indicator of the financial performance (ROA) and the indicators of the market risk. According to the results, it is possible to conclude that the five hypotheses are co-integrated. Furthermore, a long-run relationship exists between the dependent and independent variables at the %5 significance level. This is because the statistic value of 199.37 is greater than the critical value of 69.82 of the 1st null hypothesis and also probability is less than 0.05.

The same situation is observed for the 2nd null hypothesis where the statistical value of 84.67 is greater than the critical value of 47.86. In the 3rd null hypothesis, the statistic value of 47.75 is greater than the critical value of 29.80 whereas the statistical value of 20.79 is greater than the critical value of 15.49 for the at most 3 hypotheses. The probabilities also are less than the significance level of 0.05. Again the results for the fifth null hypothesis shows that the statistic value of 4.93 is greater than the critical value of 3.84 and the probability is less than 0.05, so null hypothesis is rejected for all the hypothesis stated in the table.

As a conclusion, there is a log run relationship existing between the chosen indicators of the financial performance for Participation banks ROA, ROE, and the indicators of market risk.

**Table 4. 9. Johansen co-Integration test for ROE Conventional Banks**

<b>Series: ROEC INT INFL GDP FX</b>				
<b>Hypothesized No. of CE(s)</b>	<b>Eigenvalue</b>	<b>Trace statistic</b>	<b>%5 Critical value</b>	<b>Probability</b>
None	0.564720	174.01	69.82	0.0000
At most 1	0.270852	78.36	47.86	0.0000
At most 2	0.178165	42.03	29.80	0.0012
At most 3	0.145403	19.47	15.49	0.0119
At most 4	0.012099	1.40	3.84	0.2367

The results in table 4.9 show the first four hypotheses are co-integrated and the fifth null hypothesis is not co-integrated. This conclusion is because the 1st null hypothesis statistic value of 174.01 is greater than the critical value of 69.82, whereas the second null hypothesis statistic value of 78.36 is greater than the critical value of 47.86, and also their probabilities are less than the significance level 0.05. Again the third and the fourth hypothesis with statistic values respectively of 42.03 and 19.47 are greater than the critical values of respectively 29.80 and 15.49. The statistic value of the fifth null hypothesis of 1.40 is less than the critical value of 3.84 and also the probability is greater than the significance level 0.05. In this case, the null hypothesis is not rejected rather is accepted, which concludes there are at most 4 integrated equations.

To conclude, the financial performance indicator of conventional banks ROE and the market risk indicators (INT, INFL, GDP, FX) are co-integrated and linked in a long-run relationship with each other.

**Table 4. 10 Johansen Co-integration test for ROA, Conventional Banks**

<b>Series: ROAC INT INFL GDP FX</b>				
<b>Hypothesized</b>	<b>Eigenvalue</b>	<b>Trace</b>	<b>%5 Critical</b>	<b>Probability</b>
<b>No of CE(s)</b>		<b>statistic</b>	<b>value</b>	
None	0.571701	187.72	69.82	0.0000
At most 1	0.296810	90.21	47.86	0.0000
At most 2	0.203021	49.71	29.80	0.0001
At most 3	0.183555	23.62	15.50	0.0024
At most 4	0.002575	0.30	3.8	0.5861

The results in table 4.10 show that there are four co-integrating equations at the 0.05 level, which denotes a rejection of the null hypothesis. The 1st null hypothesis is rejected because the statistic value of 187.72 is greater than the critical value of 69.82, whereas the second hypothesis statistic value of 90.21 is greater than the critical value of 47.86 and their probabilities are less than significance level 0.05. Again the third and the fourth null hypothesis are also rejected as their statistic value respectively of 49.71 and 23.62 is greater than their critical values of respectively 29.80 and 25.50.

The probabilities of the 3rd and 4th hypotheses are less than 0.05 which denotes a rejection of the null hypothesis. The fifth hypothesis statistical value of 0.30 is less than the critical value of 3.8 and the probability is greater than the significance level %5. This indicates that the null hypothesis cannot be rejected and there are at most four integrated equations. As a conclusion, the indicators of the financial performance for conventional banks ROA and ROE are linked with the indicators of the market risk INT, INFL, GDP, FX in a long-run relationship. Moreover, detailed information about the Johansen Co-integration test analysis is shown in Appendix C.

So far, the dependent and independent variables are proved to be stationary and the application of the Johansen co-integration test found the existence of a long-run relationship between the variables. To test the causal movement between dependent and independent variables Granger Causality test will be applied.



The null hypothesis that shows the relationship between INFL and ROE fails to be rejected too. The reason is that the value of probability is greater than the significance level %5, inflation does not lead to the return on equity. But the opposite hypothesis of ‘ROE does not Granger cause INFL’ is rejected meaning that ROE does Granger cause inflation. This is because the probability is less than %5.

The next null hypothesis of GDP does not Granger cause ROE failed to be rejected, rather accepted. The probability is greater than %5, accordingly, GDP does not lead to ROE. The opposite null hypothesis ‘ROE does not Granger cause GDP’ is also not rejected, due to greater probability value than %5.

Moreover, the null hypothesis ‘FX does not Granger cause ROE’, is not rejected rather accepted. Therefore FX does not lead ROE because the probability is greater than %5. The opposite hypothesis of ‘ROE does not Granger cause FX’ shows the same result. Due to a greater probability than %5, the null hypothesis fails to be rejected.

**Table 4. 12. Granger Causality Test (ROA), Participation Banks**

<b>Pairwise Granger Causality Tests</b>		
<b>Lags: 2</b>		
<b>Null Hypothesis</b>	<b>F-Statistics</b>	<b>Probability</b>
INT does not Granger Cause ROA	0.43262	0.6499
ROA does not Granger Cause INT	3.30315	0.0403
INFL does not Granger Cause ROA	0.16088	0.8516
ROA does not Granger Cause INFL	11.1545	4.E-05
GDP does not Granger Cause ROA	0.64577	0.5262
ROA does not Granger Cause GDP	4.78176	0.0102
FX does not Granger Cause ROA	0.73484	0.4819
ROA does not Granger Cause FX	0.85612	0.4275

Table 4.12 shows the Granger causality test results obtained for the second indicator of the financial performance of Participation banks, ROA, and the indicators of market risk. The first null hypothesis ‘INT does not Granger cause ROA’ fails to be rejected, rather accepted. This is because the probability is greater than the significance value

%5. Therefore, INT does not lead to ROA. The opposite, null hypothesis of 'ROA does not Granger cause INT' is rejected because the probability is less than %5. Accordingly, return on asset Granger cause interest rate. The null hypothesis of 'INFL does not Granger cause ROA' shows not to be rejected, rather accepted, because the probability is greater than %5. Thence, inflation does not lead to ROA. Nevertheless, the null hypothesis of 'ROA does not Granger cause INFL' is rejected. This is because the probability is less than the significance level %5, therefore return on assets does Granger cause inflation.

The probability of t-statistics for the null hypothesis of 'GDP does not Granger cause ROA' is greater than %5, that's why the null hypothesis failed to be rejected rather accepted. Therefore, GDP does not lead to the return on assets. However, the null hypothesis for the opposite relationship 'ROA does not Granger cause GDP' is rejected, because the probability is less than %5. Therefore ROA does Granger cause GDP.

The null hypothesis of 'FX does not Granger cause ROA' is not rejected. That is due to probability being greater than the significance level %5. Consequently, foreign exchange rates do not lead to the return on assets. The same results are shown for the opposite relationship, where the null hypothesis of 'ROA does not Granger cause FX' failed to be rejected. The reason is that the probability is greater than %5, therefore neither FX nor ROA leads each other.

**Table 4. 13. Granger Causality Test, (ROE), Conventional Banks**

<b>Pairwise Granger Causality Tests</b>		
<b>Lags: 2</b>		
<b>Null Hypothesis</b>	<b>F-Statistics</b>	<b>Probability</b>
INT does not Granger Cause ROE	0.98142	0.3779
ROE does not Granger Cause INT	1.84455	0.1628
INFL does not Granger Cause ROE	0.20624	0.8138
ROE does not Granger Cause INFL	10.8623	3.E-05
GDP does not Granger Cause ROE	1.48792	0.2302
ROE does not Granger Cause GDP	4.58237	0.0122
FX does not Granger Cause ROE	1.23402	0.2950
ROE does not Granger Cause FX	0.70845	0.4946

Table 4.13 shows the outcome of the Granger causality test for the first indicator of the financial performance of conventional banks (ROE) and the indicators of the market risk. The first null hypothesis of ‘INT does not Granger cause ROE’ cannot be rejected, due to greater probability than the significance level %5. Therefore interest rate does not cause the return on equity in the short run. The same result is shown for the opposite relationship between variables where the null hypothesis of ‘ROE does not Granger cause INT’ cannot be rejected, due to higher probability than %5. Thus, neither INT nor ROE leads each other.

The null hypothesis of ‘INFL does not Granger cause ROE’ cannot be rejected rather accepted because the probability is greater than %5. For this reason, inflation does not cause the return on equity in the short run. However, the null hypothesis of ‘ROE does not Granger cause INFL’ is rejected due to probability being less than %5. Therefore, ROE does Granger cause inflation.

Moreover, the null hypothesis of ‘GDP does not Granger cause ROE’ is not rejected, rather accepted. This is because the probability is greater than the significance level %5. That is why GDP does not cause the return on equity in the short run. However, the hypothesis of ‘ROE does not Granger cause GDP’ is rejected, because the probability is less than %5. Therefore, it is convenient to say that ROE does Granger cause GDP.

Both null hypotheses of ‘FX does not Granger cause ROE’ and the opposite relationship, the null hypothesis of ‘ROE does not Granger cause FX’ cannot be rejected, rather accepted, due to the fact that their probabilities are greater than the significance level %5. Therefore, neither foreign exchange rate nor return on equity leads to each other in the short run.

**Table 4. 14. Granger Causality Test, (ROA), Conventional Banks**

<b>Pairwise Granger Causality Tests</b>		
<b>Lags: 2</b>		
<b>Null Hypothesis</b>	<b>F-Statistics</b>	<b>Probability</b>
INT does not Granger Cause ROA	1.04927	0.3536
ROA does not Granger Cause INT	2.33975	0.1010
INFL does not Granger Cause ROA	0.34583	0.7081
ROA does not Granger Cause INFL	10.2666	6.E-05
GDP does not Granger Cause ROA	2.62894	0.0766
ROA does not Granger Cause GDP	6.68847	0.0018
FX does not Granger Cause ROA	2.13429	0.1231
ROA does not Granger Cause FX	1.18872	0.3084

Table 4.14 demonstrates the results obtained from the Granger causality test for the second indicator of the financial performance of the conventional banks (ROA) and the indicators of the market risk. The first null hypothesis of ‘INT does not Granger cause ROA’ cannot be rejected, rather accepted due to probability being greater than the significance level %5. Therefore, the interest rate does not cause the return on assets in the short run. The opposite relationship between the variables shows the same result, where the null hypothesis of ‘ROA does not Granger cause INT’ failed to be rejected because the probability is greater than %5. Hence, neither interest rate nor ROA leads each other.

Furthermore, the null hypothesis of ‘INFL does not Granger cause ROA’ also failed to be rejected. This is due to probability being greater than %5, so it is concluded that inflation does not cause the return on assets in the short run. However, the hypothesis

of 'ROA does not Granger cause INFL' is rejected, because the probability is less than the significance level %5. Therefore, return on assets does Granger cause inflation rate.

The null hypothesis of 'GDP does not Granger cause ROA', due to greater probability value than %5, cannot be rejected. So, GDP does not cause the ROA in the short run. But, the null hypothesis of 'ROA does not Granger cause GDP' is rejected. This is because the probability shows to be less than %5 and so it is convenient to say that ROA does Granger cause GDP.

Further, both the null hypothesis of 'FX does not Granger cause ROA' and 'ROA does not Granger cause FX' failed to be rejected, rather accepted. The reason is the probability being greater than the significance level %5. Therefore foreign exchange rate does not cause the return on assets in the short run and vice versa. Further information is shown in Appendix D.

#### **4.3. Summary of All Panel Data Tests**

Table 4.15 and 4.16 show the result of all panel data tests applied in order to examine the relationship between the market risk and financial performance of chosen participation and conventional banks operating in Turkey, respectively.

**Table 4. 15. Summary of All Tests for Participation Banks**

Participation Banks							
Hypothesis	Independent Variables	A-Dickey Fuller Unit Root test		Johansen Test		Granger Causality Test	
		Expected Sign	Actual Significance level at 95%	Expected Sign	Actual Significance level at 95%	Expected Sign	Actual Significance level at 95%
H1,H2: Interest rate is not related with ROA&ROE of PB	INT	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant
H3,H4: Inflation rate is not related with ROA&ROE of PB	INFL	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant
H5,H6: Exchange rate is not related with ROA&ROE of PB	FX	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant
H7,H8: GDP per capita is not related with ROA&ROE of PB	GDP	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant

Table 4.15 summarizes all the panel data I test results attained for participation banks. According to the empirical results achieved, all the dependent and independent variables for participation banks are stationary at the first difference. The co-integration test results of the long run relationship between dependent and independent variables consist to be significant and positive. The dependent variables ROA and ROE are positively related in long run relationship with independent variables INT, INFL, FX and GDP. Granger causality test results shows that independent variables do not lead dependent variables in the short-run (time period of lags 2).

**Table 4. 16. Summary of All Tests for Conventional Banks**

<b>Conventional Banks</b>									
<b>Hypothesis</b>	<b>Independent Variables</b>	<b>A-Dickey test</b>		<b>Johansen Test</b>		<b>Co-Integration</b>		<b>Granger Causality Test</b>	
		Expected Sign	Actual Sign Significance level at 95%	Expected Sign	Actual Sign Significance level at 95%	Expected Sign	Actual Sign Significance level at 95%	Expected Sign	Actual Sign Significance level at 95%
H1, H2: Interest rate is not related with ROA&ROE of CB	INT	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant	-	Both ROA and ROE are positive non-significant
H3, H4: Inflation rate is not related with ROA&ROE of CB	INFL	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant	-	Both ROA and ROE are positive non-significant
H5, H6: Exchange rate is not related with ROA&ROE of CB	FX	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant	-	Both ROA and ROE are positive non-significant
H7, H8: GDP per capita is not related with ROA&ROE of CB	GDP	-	Both ROA and ROE are negative significant	-	Both ROA and ROE are positive significant	-	Both ROA and ROE are positive non-significant	-	Both ROA and ROE are positive non-significant

The table 4.16 above conducts the outcome of the panel data tests applied to the variables taken into study for conventional banks. From the unit root test results, all the variables show to be stationary at the first difference. Further, co-integration test outcome approved that there is a positive long run relationship between dependent and independent variables taken into study. However, causality test conclusion signifies that there is not a significant directional relationship in the short run (lag 2) between the variables. The interpretation of the results in detail takes place in the following chapter.

## CHAPTER V

### DISCUSSION AND CONCLUSION

This chapter contains the interpretation of the results obtained, conclusion, the recommendations for expanding this research and for other research gaps related to the impact that market risk has on the financial performance of Islamic banks. Lastly, the study limitations will also take place.

#### **5.1. Interpretation of the Results**

The current state of participation banks in Turkey from the legislative overview is not favorable because there is not any adopted law to support their area of investment. Participation banks in Turkey operate according to the adoption of conventional financial instruments by fitting them to Sharia compliance. One of the main characteristics of participation banks is the prohibition of interest rates which, although not being used on bank transactions, still has an impact on it. The risk that participation banks face in the market affect their returns of the investment. This study aims to investigate the relationship that market risk has with the financial performance of participation banks in Turkey and compare it with conventional banks' response to the market risk relationship with their financial performance. The determinants of market risk, INT, INFL, FX, and GDP and determinants of financial performance, ROA, ROE are econometrically tested with ADF unit root test, Johansen co-integration test, and Granger causality test.

According to the results obtained for the unit root test all dependent and independent variables show to be stationary at the first difference for both participation and conventional banks. The null hypothesis of the presence of unit root is rejected and the variables are all constant over time. Further test analysis, Johansen co-integration test, dictates the long-run relationship be between variables. The results show that the variables are significantly positively related in the long run for both participation and conventional

banks in Turkey. Granger causality test results imply different outcomes for the short-run relationship between the variables and thesis outcome will be specified in the following.

### **5.1.1. The Relationship of Interest Rate and Exchange Rate with ROA and ROE for Participation Banks in Turkey**

#### **5.1.1.1 Interest Rate**

From the study's results, it is concluded that a positive long run relationship exists between the interest rate and return on assets and return on equity for participation banks in Turkey. This is because participation banks are highly dependent on financial instruments that have fixed assets like Murabaha stated by Rosly (1999). Mamoor et al. (2018) Minny & Görmüş (2017), supported this study's result of the positive relationship between the interest rate and profitability in Islamic banks. Moreover, Minny & Görmüş (2017) concluded that Islamic banks are moving together with conventional banks. If the interest rate increases, the credit rate for Islamic banks will increase too and the profit increases lightly. Therefore, the banks' return will increase. According to Wahyudi et. al. (2015) Islamic banks are exposed to interest rate indirectly and this effects is shown through mark-up price which occur in financial contracts like murabaha that have fixed returns. If there is an increase in the interest rate from the central bank Islamic banks cannot change the return rates on their ongoing contracts and this will bring a low return for the investors which will be willing to move to conventional banks which will reflect the change of the interest rate on their financial transactions. However, referring to the causality test, there is a uni-directional non-significant short run relationship dictated between the interest rate and return on equity for participation banks. The interest rate does not lead ROA and ROE in the short run but, return on equity causes interest rate in the short run.

#### **5.1.1.2. Foreign Exchange Rate**

The test result for foreign exchange rate confirm a significant positive long-run relationship between foreign exchange rate and return on assets and equity for participation banks in Turkey. This outcome supports other studies of Mamoor et al.

(2018) and Javaid & Alalawi (2017). The study result implies that an increase in the exchange rate will have a noticeable increase in Turkish Islamic banks (Mamoor et al. 2018). The positive relationship between exchange rate and participation banks returns show that these banks own a high amount of assets with foreign currency (Wahyudi et. al. 2015). Granger causality test results imply that the bi-directional short run relationship of exchange rate with return on assets and equity is not significant. The exchange rate does not cause ROA and ROE in the short run.

### **5.1.2 The Relationship of GDP per Capita and Inflation Rate with ROA and ROE for Participation Banks in Turkey**

#### **5.1.2.1. Inflation Rate**

It is concluded from the co-integration test that the relationship between inflation rate and return on assets and equity for participation banks is significantly positive in the long run. These results support other studies of Bashir (2003); Ali et al. (2018); Wasiuzzaman and Tarmizi (2010); Mamoor et al. (2018) and Chowdhury and Eskandar (2015). Bashir (2003) claimed that the positive relationship between inflation and return on assets and equity for Islamic banks exists when Islamic banks achieve most of their profits by using Murabaha or direct investments. Moreover, an anticipation of the inflation rate from the banks will help to define their asset quality and the rate of PLS, thus the income will be higher than the expenditure and the positive relationship between inflation and banks return's entails, Wasiuzzaman and Tarmizi (2010). In addition Wahyudi et. al. (2015) claimed that the Islamic banks are exposed to commodity price fluctuations (inflation rate) due to the fact that they keep inventory goods in order to make transactions in financial contracts like ijara, salam, istishna and sukuk.

On the other hand, the causality test result implies that there is a uni-directional non-significant short-run relationship between inflation and return on assets and equity for participation banks. The inflation rate does not cause return on assets and return on equity in the short run whereas, ROA and ROE cause inflation in the short run.

### **5.1.2.1 GDP per Capita**

A significant positive long-run relationship is dictated between GDP and return on assets and equity for participation banks in Turkey. The positive relationship result supports previous findings of Teng et al (2012); Zantioti (2009); Wasiuzzaman and Tarmizi (2010) and Mamoor et al. (2018). Wasiuzzaman and Tarmizi (2010) and Zantioti (2009) affirmed that progress in economic growth will upgrade the credit quality and this indicates a higher probability to pay back loans and reduces the default rate therefore, the profitability of banks will increase.

Granger causality test outcome concluded that there is a uni-directional and non-significant relationship in the short run between GDP and return on assets and equity for participation banks. GDP does not cause ROA and ROE in the short run.

### **5.1.2. Comparison between Participation Banks and Conventional Ones**

This study investigated the relationship between chosen independent and dependent variables for both participation and conventional banks in Turkey through panel data tests. According to co-integration test results, it is concluded that all market risk variables INT, INFL, FX, and GDP are significantly positively related in the long run with the variables of financial performance ROA and ROE for participation banks. However, the co-integration test outcome for conventional banks shows that only three of the independent variables are significantly positively related in the long run with ROA and ROE. Granger causality test results differ for participation and conventional banks. None of the chosen independent variables significantly cause dependent variables return on assets and return on equity in the short run for both participation and conventional banks because their probabilities are greater than the significance level of 5% where the null hypothesis of the test fail to be rejected. However, the probability outcome for conventional banks are lower than participation banks and this makes market risk variables for conventional banks to be less insignificant in the short run compared to participation banks.

## **5.2. Conclusion**

This study aims to investigate the relationship that market risk has with the financial performance of participation banks in Turkey for the time period from 2010 to 2019. The independent variables used are interest rate (INT), inflation rate (INFL), the foreign exchange rate (FX), and GDP per capita, as indicators of market risk, and the dependent variables are, return on assets (ROA) and return on equity (ROE) as indicators of financial performance for both participation and conventional banks. The results of this study concluded that interest rate, inflation rate, exchange rate, and GDP per capita have a more significant relationship in the long run with return on assets and return on equity of participation banks than conventional banks in Turkey. However, it is proved that the variables do not significantly cause each other in the short run. According to the analysis hypothesis H1, H2, H3, H4, H5, H6, H7 and H8 were rejected. In conclusion, market risk has a significant positive relationship on the financial performance of Participation banks in Turkey.

## **5.3. Recommendations**

Based on the finding of this study it is suggested that the Turkish government should adopt a law that protects and facilitate the operation of the participation banks in the market.

The policymakers of participation banks should enact policies to diminish the effect of market risk in Participation banks in Turkey and adopt a diversity of financial contacts in their financial activity (not mostly Murabaha) in order to not be affected by the fluctuations of the interest rate and inflation rate same as conventional banks do.

## **5.4. Implications**

### **Theoretical Implication**

This study increases the contribution of the literature on risk management in general and market risk in specific for participation banks in Turkey. It emphasizes the most important risk that participation banks encounter and shed light on the restrictions these banks face in the market, like interest rate, exchange rate and the fluctuations in commodity prices.

## **Practical Implications**

This study has emphasis on one of the most important component of risk that Islamic (Participation) banks are exposed to which is market risk and its positive relationship with the banks financial performance. The study allows policymakers to improve legislative shortcomings that slow down the development of participation banks in Turkey. Moreover, the findings can help to enhance the banks' management on market risk, to improve their financial instruments except using mostly cost-plus financing contracts (Murabaha). The results obtained for Participation banks in Turkey implies that Participation banks must apply other partnership based financial contacts like Musharaka and Mudaraba in their financial transactions in order to differ from conventional banks and diminish the effect of market risk fluctuations in their financial performance.

Other researchers can use this study as a guide of understanding the current operational and financial situation that Participation banks encounter in the market.

### **5.5. Limitations and Future Research**

There are some limitations that this study has and could be overcome in the future. The number of banks taken into the study is too low and the time period is short due to the restrictions of the availability of the data, however, a higher number of Participation banks and a wider time period could increase the reliability of the results.

The number of determinants of market risk taken into the study seems to be less and increasing the number of independent variables could make the study more inclusive and have more precise results. Furthermore, it is recommended to future researchers to improve the study by adding more internal and external determinants for market risk and other indicators for banks' financial performance too. The Panel data tests applied are not sufficient to explain properly the relationship of the variables with each other. Fixed effect panel data test can be applied in order to show the specific effects that the variables have on each other.

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# APPENDIXES

## APPENDIX A

### Descriptive Analysis of Participation Banks

	ROE	ROA	INT	INFL	GDP	FX
Mean	0.128251	0.011936	18.09287	0.012347	3.932041	100.0730
Median	0.146025	0.012000	16.58562	0.013500	3.924417	103.1850
Maximum	0.177000	0.021200	26.83615	0.032700	9.424685	126.5200
Minimum	0.017000	0.001200	13.32538	-0.004800	-0.447273	70.11000
Std. Dev.	0.040148	0.004631	4.022758	0.008384	2.612199	14.40435
Skewness	-1.149499	-0.353311	0.904663	-0.089206	0.084212	-0.420570
Kurtosis	3.521820	2.705837	2.353223	2.677374	2.384881	2.419814
Jarque-Bera	27.78843	2.929229	18.45989	1.132649	2.033691	5.220655
Probability	0.000001	0.231167	0.000098	0.567608	0.361734	0.073510
Sum	15.39013	1.432316	2171.144	2.469500	471.8449	12008.76
Sum Sq. Dev.	0.191810	0.002553	1925.728	0.013989	812.0062	24690.76
Observations	120	120	120	200	120	120

## Descriptive Analysis of Conventional Banks

	ROEC	ROAC	INT	INFL	GDP	FX
Mean	0.153030	0.015946	18.09287	0.012347	3.932041	100.0730
Median	0.147625	0.016000	16.58562	0.013500	3.924417	103.1850
Maximum	0.292250	0.028750	26.83615	0.032700	9.424685	126.5200
Minimum	0.056000	0.004000	13.32538	-0.004800	-0.447273	70.11000
Std. Dev.	0.043459	0.004512	4.022758	0.008384	2.612199	14.40435
Skewness	0.825747	0.174368	0.904663	-0.089206	0.084212	-0.420570
Kurtosis	4.155880	4.025895	2.353223	2.677374	2.384881	2.419814
Jarque-Bera	33.86241	9.783971	18.45989	1.132649	2.033691	5.220655
Probability	0.000000	0.007507	0.000098	0.567608	0.361734	0.073510
Sum	30.60608	3.189247	2171.144	2.469500	471.8449	12008.76
Sum Sq. Dev.	0.375845	0.004052	1925.728	0.013989	812.0062	24690.76
Observations	200	200	120	200	120	120

## APPENDIX B

### Augmented Dickey- Fuller Unit Root Test for Conventional Banks

**Null Hypothesis: ROEC has a unit root**

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=14)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.468555	0.0003
Test critical values:		
1% level	-3.463405	
5% level	-2.875972	
10% level	-2.574541	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROEC)

Method: Least Squares

Date: 10/31/20 Time: 13:00

Sample (adjusted): 3 200

Included observations: 198 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROEC(-1)	-0.137499	0.030770	-4.468555	0.0000
D(ROEC(-1))	0.219288	0.068494	3.201546	0.0016
C	0.020282	0.004882	4.154504	0.0000
R-squared	0.116822	Mean dependent var		-0.000914
Adjusted R-squared	0.107764	S.D. dependent var		0.019124
S.E. of regression	0.018064	Akaike info criterion		-5.174709
Sum squared resid	0.063633	Schwarz criterion		-5.124887

Log likelihood	515.2962	Hannan-Quinn criter.	-5.154543
F-statistic	12.89678	Durbin-Watson stat	2.007305
Prob(F-statistic)	0.000005		

**Null Hypothesis: D(ROEC) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.88289	0.0000
Test critical values:	1% level	-3.463405	
	5% level	-2.875972	
	10% level	-2.574541	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROEC,2)

Method: Least Squares

Date: 10/31/20 Time: 13:01

Sample (adjusted): 3 200

Included observations: 198 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROEC(-1))	-0.837556	0.070484	-11.88289	0.0000
C	-0.000764	0.001346	-0.567217	0.5712

R-squared	0.418748	Mean dependent var	1.10E-05
Adjusted R-squared	0.415782	S.D. dependent var	0.024751
S.E. of regression	0.018918	Akaike info criterion	-5.087320
Sum squared resid	0.070149	Schwarz criterion	-5.054106
Log likelihood	505.6447	Hannan-Quinn criter.	-5.073876

F-statistic	141.2031	Durbin-Watson stat	1.972475
Prob(F-statistic)	0.000000		

**Null Hypothesis: ROAC has a unit root**

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.284285	0.0006
Test critical values:	1% level	-3.463405	
	5% level	-2.875972	
	10% level	-2.574541	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROAC)

Method: Least Squares

Date: 10/31/20 Time: 13:02

Sample (adjusted): 3 200

Included observations: 198 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROAC(-1)	-0.145807	0.034033	-4.284285	0.0000
D(ROAC(-1))	0.218758	0.069822	3.133060	0.0020
C	0.002261	0.000564	4.012495	0.0001

R-squared	0.105532	Mean dependent var	-8.16E-05
Adjusted R-squared	0.096358	S.D. dependent var	0.002175
S.E. of regression	0.002067	Akaike info criterion	-9.510075
Sum squared resid	0.000833	Schwarz criterion	-9.460253

Log likelihood	944.4974	Hannan-Quinn criter.	-9.489909
F-statistic	11.50331	Durbin-Watson stat	2.005499
Prob(F-statistic)	0.000019		

**Null Hypothesis: D(ROAC) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.08409	0.0000
Test critical values:	1% level	-3.463405	
	5% level	-2.875972	
	10% level	-2.574541	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROAC,2)

Method: Least Squares

Date: 10/31/20 Time: 13:02

Sample (adjusted): 3 200

Included observations: 198 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROAC(-1))	-0.853924	0.070665	-12.08409	0.0000
C	-6.95E-05	0.000153	-0.453373	0.6508
R-squared	0.426943	Mean dependent var		9.94E-07
Adjusted R-squared	0.424019	S.D. dependent var		0.002842
S.E. of regression	0.002157	Akaike info criterion		-9.430218
Sum squared resid	0.000912	Schwarz criterion		-9.397003

Log likelihood	935.5915	Hannan-Quinn criter.	-9.416773
F-statistic	146.0252	Durbin-Watson stat	1.972634
Prob(F-statistic)	0.000000		

### Augmented Dickey-Fuller Unit Root Test, Participation Banks.

**Null Hypothesis: ROE has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.718868	0.4192
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROE)

Method: Least Squares

Date: 10/31/20 Time: 13:03

Sample (adjusted): 2 120

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROE(-1)	-0.053554	0.031156	-1.718868	0.0883
C	0.006419	0.004196	1.529708	0.1288
R-squared	0.024630	Mean dependent var		-0.000469
Adjusted R-squared	0.016294	S.D. dependent var		0.013689

S.E. of regression	0.013577	Akaike info criterion	-5.744258
Sum squared resid	0.021566	Schwarz criterion	-5.697550
Log likelihood	343.7833	Hannan-Quinn criter.	-5.725291
F-statistic	2.954506	Durbin-Watson stat	1.758124
Prob(F-statistic)	0.088283		

**Null Hypothesis: D(ROE) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.788230	0.0000
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROE,2)

Method: Least Squares

Date: 10/31/20 Time: 13:03

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROE(-1))	-0.904571	0.092414	-9.788230	0.0000
C	-0.000403	0.001266	-0.318479	0.7507
R-squared	0.452338	Mean dependent var		2.97E-05
Adjusted R-squared	0.447617	S.D. dependent var		0.018489

S.E. of regression	0.013741	Akaike info criterion	-5.720010
Sum squared resid	0.021904	Schwarz criterion	-5.673049
Log likelihood	339.4806	Hannan-Quinn criter.	-5.700942
F-statistic	95.80945	Durbin-Watson stat	2.005392
Prob(F-statistic)	0.000000		

**Null Hypothesis: ROA has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.465325	0.1266
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROA)

Method: Least Squares

Date: 10/31/20 Time: 13:04

Sample (adjusted): 2 120

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	-0.095836	0.038874	-2.465325	0.0151
C	0.001066	0.000499	2.137671	0.0346
R-squared	0.049382	Mean dependent var		-8.11E-05
Adjusted R-squared	0.041257	S.D. dependent var		0.001999

S.E. of regression	0.001958	Akaike info criterion	-9.617624
Sum squared resid	0.000448	Schwarz criterion	-9.570916
Log likelihood	574.2486	Hannan-Quinn criter.	-9.598657
F-statistic	6.077828	Durbin-Watson stat	1.854312
Prob(F-statistic)	0.015140		

**Null Hypothesis: D(ROA) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.45251	0.0000
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ROA,2)

Method: Least Squares

Date: 10/31/20 Time: 13:04

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROA(-1))	-0.969919	0.092793	-10.45251	0.0000
C	-7.52E-05	0.000186	-0.405289	0.6860
R-squared	0.485028	Mean dependent var		4.74E-06
Adjusted R-squared	0.480588	S.D. dependent var		0.002796

S.E. of regression	0.002015	Akaike info criterion	-9.559494
Sum squared resid	0.000471	Schwarz criterion	-9.512534
Log likelihood	566.0102	Hannan-Quinn criter.	-9.540427
F-statistic	109.2549	Durbin-Watson stat	2.001159
Prob(F-statistic)	0.000000		

**Null Hypothesis: INT has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.165485	0.2200
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INT)

Method: Least Squares

Date: 10/31/20 Time: 13:05

Sample (adjusted): 2 120

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT(-1)	-0.080963	0.037388	-2.165485	0.0324
C	1.550045	0.690812	2.243800	0.0267
R-squared	0.038535	Mean dependent var		0.089295
Adjusted R-squared	0.030318	S.D. dependent var		1.650195

S.E. of regression	1.624987	Akaike info criterion	3.825541
Sum squared resid	308.9482	Schwarz criterion	3.872249
Log likelihood	-225.6197	Hannan-Quinn criter.	3.844507
F-statistic	4.689323	Durbin-Watson stat	1.611073
Prob(F-statistic)	0.032380		

**Null Hypothesis: D(INT) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.160715	0.0000
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INT,2)

Method: Least Squares

Date: 10/31/20 Time: 13:05

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INT(-1))	-0.839349	0.091625	-9.160715	0.0000
C	0.072092	0.151420	0.476107	0.6349
R-squared	0.419764	Mean dependent var		-0.002828
Adjusted R-squared	0.414762	S.D. dependent var		2.146956

S.E. of regression	1.642440	Akaike info criterion	3.847047
Sum squared resid	312.9226	Schwarz criterion	3.894007
Log likelihood	-224.9757	Hannan-Quinn criter.	3.866114
F-statistic	83.91870	Durbin-Watson stat	2.019817
Prob(F-statistic)	0.000000		

**Null Hypothesis: INFL has a unit root**

Exogenous: Constant

Lag Length: 13 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.857196	0.0001
Test critical values:	1% level	-3.465585	
	5% level	-2.876927	
	10% level	-2.575051	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFL)

Method: Least Squares

Date: 10/31/20 Time: 13:06

Sample (adjusted): 15 200

Included observations: 186 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL(-1)	-1.221675	0.251519	-4.857196	0.0000
D(INFL(-1))	0.112261	0.240634	0.466521	0.6414
D(INFL(-2))	0.321155	0.234831	1.367596	0.1732
D(INFL(-3))	0.196512	0.223697	0.878471	0.3809
D(INFL(-4))	0.502514	0.215342	2.333562	0.0208

D(INFL(-5))	0.544621	0.207492	2.624780	0.0095
D(INFL(-6))	0.233203	0.194846	1.196860	0.2330
D(INFL(-7))	0.150200	0.175471	0.855982	0.3932
D(INFL(-8))	0.143345	0.155926	0.919313	0.3592
D(INFL(-9))	0.308747	0.146414	2.108726	0.0364
D(INFL(-10))	0.388243	0.138788	2.797375	0.0057
D(INFL(-11))	0.279037	0.120108	2.323224	0.0213
D(INFL(-12))	0.598678	0.101603	5.892339	0.0000
D(INFL(-13))	0.259303	0.073085	3.547962	0.0005
C	0.015206	0.003121	4.871488	0.0000

R-squared	0.889836	Mean dependent var	8.49E-05
Adjusted R-squared	0.880817	S.D. dependent var	0.013353
S.E. of regression	0.004610	Akaike info criterion	-7.843992
Sum squared resid	0.003634	Schwarz criterion	-7.583851
Log likelihood	744.4913	Hannan-Quinn criter.	-7.738573
F-statistic	98.65948	Durbin-Watson stat	1.961982
Prob(F-statistic)	0.000000		

**Null Hypothesis: D(INFL) has a unit root**

Exogenous: Constant

Lag Length: 11 (Automatic - based on SIC, maxlag=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.506493	0.0000
Test critical values:	1% level	-3.465392	
	5% level	-2.876843	
	10% level	-2.575006	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFL,2)

Method: Least Squares

Date: 10/31/20 Time: 13:07

Sample (adjusted): 14 200

Included observations: 187 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFL(-1))	-5.680733	1.031643	-5.506493	0.0000
D(INFL(-1),2)	3.720588	0.992855	3.747362	0.0002
D(INFL(-2),2)	2.986149	0.931260	3.206569	0.0016
D(INFL(-3),2)	2.223841	0.851360	2.612104	0.0098
D(INFL(-4),2)	1.844257	0.753747	2.446785	0.0154
D(INFL(-5),2)	1.523839	0.652618	2.334965	0.0207
D(INFL(-6),2)	0.939369	0.556801	1.687083	0.0934
D(INFL(-7),2)	0.395606	0.465412	0.850013	0.3965
D(INFL(-8),2)	0.017462	0.366570	0.047635	0.9621
D(INFL(-9),2)	-0.120706	0.259289	-0.465527	0.6421
D(INFL(-10),2)	-0.186764	0.162849	-1.146856	0.2530
D(INFL(-11),2)	-0.275933	0.071837	-3.841116	0.0002
C	0.000159	0.000362	0.439122	0.6611
R-squared	0.960747	Mean dependent var		5.08E-05
Adjusted R-squared	0.958040	S.D. dependent var		0.024100
S.E. of regression	0.004937	Akaike info criterion		-7.717219
Sum squared resid	0.004241	Schwarz criterion		-7.492597
Log likelihood	734.5600	Hannan-Quinn criter.		-7.626202
F-statistic	354.8976	Durbin-Watson stat		2.086272
Prob(F-statistic)	0.000000			

**Null Hypothesis: GDP has a unit root**

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.044088	0.0017
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP)

Method: Least Squares

Date: 10/31/20 Time: 13:07

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	-0.175044	0.043284	-4.044088	0.0001
D(GDP(-1))	0.393897	0.086111	4.574307	0.0000
C	0.646947	0.203023	3.186576	0.0019
R-squared	0.204620	Mean dependent var		-0.067654
Adjusted R-squared	0.190788	S.D. dependent var		1.299672
S.E. of regression	1.169136	Akaike info criterion		3.175502
Sum squared resid	157.1911	Schwarz criterion		3.245943
Log likelihood	-184.3546	Hannan-Quinn criter.		3.204103
F-statistic	14.79251	Durbin-Watson stat		2.140959
Prob(F-statistic)	0.000002			

**Null Hypothesis: D(GDP) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.894629	0.0000
Test critical values:		
1% level	-3.486551	
5% level	-2.886074	
10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP,2)

Method: Least Squares

Date: 10/31/20 Time: 13:08

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.697850	0.088396	-7.894629	0.0000
C	-0.048918	0.114661	-0.426629	0.6704
R-squared	0.349503	Mean dependent var		-0.005644
Adjusted R-squared	0.343895	S.D. dependent var		1.535933
S.E. of regression	1.244110	Akaike info criterion		3.291522
Sum squared resid	179.5459	Schwarz criterion		3.338483
Log likelihood	-192.1998	Hannan-Quinn criter.		3.310589
F-statistic	62.32516	Durbin-Watson stat		2.015217
Prob(F-statistic)	0.000000			

**Null Hypothesis: FX has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.771705	0.0654
Test critical values:		
1% level	-3.486064	
5% level	-2.885863	
10% level	-2.579818	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(FX)

Method: Least Squares

Date: 10/31/20 Time: 13:08

Sample (adjusted): 2 120

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FX(-1)	-0.126538	0.045654	-2.771705	0.0065
C	12.33461	4.623487	2.667816	0.0087
R-squared	0.061615	Mean dependent var		-0.352857
Adjusted R-squared	0.053595	S.D. dependent var		7.294394
S.E. of regression	7.096231	Akaike info criterion		6.773669
Sum squared resid	5891.710	Schwarz criterion		6.820377
Log likelihood	-401.0333	Hannan-Quinn criter.		6.792635
F-statistic	7.682350	Durbin-Watson stat		1.746977
Prob(F-statistic)	0.006489			

**Null Hypothesis: D(FX) has a unit root**

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.06457	0.0000
Test critical values:		
1% level	-3.486551	
5% level	-2.886074	
10% level	-2.579931	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(FX,2)

Method: Least Squares

Date: 10/31/20 Time: 13:09

Sample (adjusted): 3 120

Included observations: 118 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FX(-1))	-0.931288	0.092531	-10.06457	0.0000
C	-0.363999	0.675524	-0.538840	0.5910
R-squared	0.466165	Mean dependent var		-0.016186
Adjusted R-squared	0.461563	S.D. dependent var		9.987231
S.E. of regression	7.328458	Akaike info criterion		6.838211
Sum squared resid	6229.931	Schwarz criterion		6.885172
Log likelihood	-401.4545	Hannan-Quinn criter.		6.857279
F-statistic	101.2955	Durbin-Watson stat		2.001589
Prob(F-statistic)	0.000000			

## APPENDIX C

### Johansen Co-integration Test Analysis for Conventional Banks

**Date: 10/31/20 Time: 13:10**

Sample (adjusted): 6 120

Included observations: 115 after adjustments

Trend assumption: Linear deterministic trend

**Series: ROEC INT INFL GDP FX**

Lags interval (in first differences): 1 to 4

#### Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.564720	174.0131	69.81889	0.0000
At most 1 *	0.270852	78.36004	47.85613	0.0000
At most 2 *	0.178165	42.03406	29.79707	0.0012
At most 3 *	0.145403	19.46927	15.49471	0.0119
At most 4	0.012099	1.399917	3.841466	0.2367

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

#### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.564720	95.65304	33.87687	0.0000
At most 1 *	0.270852	36.32597	27.58434	0.0029
At most 2 *	0.178165	22.56479	21.13162	0.0312
At most 3 *	0.145403	18.06936	14.26460	0.0119

At most 4            0.012099            1.399917            3.841466            0.2367

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b\*S11\*b=I):

ROEC	INT	INFL	GDP	FX
-0.554140	1.699418	1166.968	-2.012694	0.991272
0.835466	0.212341	-1066.132	-0.854740	0.023231
11.76524	0.800082	534.6284	0.468510	0.187579
4.288770	-0.425194	-116.1517	-0.320463	-0.186063
-29.48321	0.151490	-30.16268	0.887256	-0.059405

Unrestricted Adjustment Coefficients (alpha):

D(ROEC)	-0.002552	0.001470	-0.000586	0.003647	0.001351
D(INT)	0.242598	-0.105781	-0.168640	-0.341121	-0.055014
D(INFL)	-0.001486	0.001066	-0.000269	-0.000304	-8.32E-05
D(GDP)	-0.123389	0.082383	0.011352	0.276822	0.019133
D(FX)	-1.954113	-0.874199	0.377656	1.699511	0.210222

1 Cointegrating Equation(s):            Log likelihood            437.1413

Normalized cointegrating coefficients (standard error in parentheses)

ROEC	INT	INFL	GDP	FX
1.000000	-3.066768	-2105.909	3.632104	-1.788848
	(0.31906)	(273.575)	(0.38304)	(0.16833)

Adjustment coefficients (standard error in parentheses)

D(ROEC)	0.001414
	(0.00092)
D(INT)	-0.134433

	(0.06543)
D(INFL)	0.000823
	(0.00016)
D(GDP)	0.068375
	(0.04432)
D(FX)	1.082852
	(0.31516)

2 Cointegrating Equation(s):                      Log likelihood                      455.3042

Normalized cointegrating coefficients (standard error in parentheses)

ROEC	INT	INFL	GDP	FX
1.000000	0.000000	-1339.601	-0.666797	-0.111227
		(228.448)	(0.33693)	(0.05619)
0.000000	1.000000	249.8750	-1.401769	0.547032
		(95.4969)	(0.14084)	(0.02349)

Adjustment coefficients (standard error in parentheses)

D(ROEC)	0.002642	-0.004024
	(0.00166)	(0.00284)
D(INT)	-0.222810	0.389815
	(0.11787)	(0.20136)
D(INFL)	0.001714	-0.002298
	(0.00026)	(0.00045)
D(GDP)	0.137203	-0.192196
	(0.07972)	(0.13618)
D(FX)	0.352488	-3.506484
	(0.56289)	(0.96159)

3 Cointegrating Equation(s):                      Log likelihood                      466.5866

Normalized cointegrating coefficients (standard error in parentheses)

ROEC	INT	INFL	GDP	FX
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1.000000	0.000000	0.000000	0.118471	-0.023128
			(0.03223)	(0.00529)
0.000000	1.000000	0.000000	-1.548245	0.530599
			(0.18388)	(0.03018)
0.000000	0.000000	1.000000	0.000586	6.58E-05
			(0.00024)	(4.0E-05)

Adjustment coefficients (standard error in parentheses)

D(ROEC)	-0.004250	-0.004493	-4.857956
	(0.01954)	(0.00313)	(2.76192)
D(INT)	-2.206898	0.254889	305.7216
	(1.37282)	(0.21977)	(193.999)
D(INFL)	-0.001446	-0.002513	-3.013766
	(0.00307)	(0.00049)	(0.43427)
D(GDP)	0.270767	-0.183113	-225.7523
	(0.93880)	(0.15029)	(132.666)
D(FX)	4.795703	-3.204328	-1146.470
	(6.61362)	(1.05876)	(934.596)

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4 Cointegrating Equation(s):                      Log likelihood                      475.6213

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Normalized cointegrating coefficients (standard error in parentheses)

ROEC	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.000000	-0.010905
				(0.00226)
0.000000	1.000000	0.000000	0.000000	0.370869
				(0.02747)
0.000000	0.000000	1.000000	0.000000	0.000126
				(1.6E-05)
0.000000	0.000000	0.000000	1.000000	-0.103168
				(0.01755)

Adjustment coefficients (standard error in parentheses)

D(ROEC)	0.011393 (0.02024)	-0.006044 (0.00312)	-5.281613 (2.69535)	0.002436 (0.00364)
D(INT)	-3.669890 (1.39133)	0.399932 (0.21459)	345.3434 (185.249)	-0.367554 (0.25020)
D(INFL)	-0.002748 (0.00325)	-0.002384 (0.00050)	-2.978504 (0.43213)	0.002050 (0.00058)
D(GDP)	1.457995 (0.93144)	-0.300816 (0.14366)	-257.9057 (124.017)	0.094535 (0.16750)
D(FX)	12.08452 (6.67899)	-3.926950 (1.03010)	-1343.871 (889.276)	4.312548 (1.20108)

**Date: 10/31/20 Time: 13:11**

Sample (adjusted): 6 120

Included observations: 115 after adjustments

Trend assumption: Linear deterministic trend

**Series: ROAC INT INFL GDP FX**

Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.571701	187.7216	69.81889	0.0000
At most 1 *	0.296810	90.20931	47.85613	0.0000
At most 2 *	0.203021	49.71462	29.79707	0.0001
At most 3 *	0.183555	23.61797	15.49471	0.0024
At most 4	0.002575	0.296512	3.841466	0.5861

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized	Max-Eigen	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.571701	97.51233	33.87687	0.0000
At most 1 *	0.296810	40.49468	27.58434	0.0007
At most 2 *	0.203021	26.09666	21.13162	0.0092
At most 3 *	0.183555	23.32145	14.26460	0.0014
At most 4	0.002575	0.296512	3.841466	0.5861

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b\*S11\*b=I):

ROAC	INT	INFL	GDP	FX
-7.437276	1.759961	1215.922	-2.080778	1.034824
5.250321	0.086073	-1191.805	-0.736849	-0.042211
-111.3822	-0.673263	-467.6808	-0.096163	-0.159536
-29.88831	-0.797242	-477.9247	-0.585016	-0.266468
295.0033	-0.038400	98.58250	-0.742765	0.078429

Unrestricted Adjustment Coefficients (alpha):

D(ROAC)	-0.000219	0.000224	-9.70E-05	0.000218	-6.16E-05
D(INT)	0.299498	-0.116041	0.271415	-0.165576	0.033394
D(INFL)	-0.001147	0.001077	0.000323	-0.000250	6.04E-05
D(GDP)	-0.162925	0.104784	-0.127359	0.219329	-0.015109
D(FX)	-2.425395	-0.694574	-0.775511	1.168830	-0.149433

1 Cointegrating Equation(s):                      Log likelihood                      748.5479

Normalized cointegrating coefficients (standard error in parentheses)

ROAC	INT	INFL	GDP	FX
1.000000	-0.236641	-163.4902	0.279777	-0.139140
	(0.02455)	(21.8951)	(0.02819)	(0.01299)

Adjustment coefficients (standard error in parentheses)

D(ROAC)	0.001629
	(0.00109)
D(INT)	-2.227452
	(0.79320)
D(INFL)	0.008532
	(0.00206)
D(GDP)	1.211717
	(0.53847)
D(FX)	18.03833
	(3.86447)

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2 Cointegrating Equation(s):                      Log likelihood                      768.7952

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Normalized cointegrating coefficients (standard error in parentheses)

ROAC	INT	INFL	GDP	FX
1.000000	0.000000	-222.8821	-0.113125	-0.016534
		(35.6348)	(0.05115)	(0.00849)
0.000000	1.000000	-250.9794	-1.660331	0.518114
		(161.957)	(0.23247)	(0.03860)

Adjustment coefficients (standard error in parentheses)

D(ROAC)	0.002807	-0.000366
	(0.00131)	(0.00025)
D(INT)	-2.836707	0.517117
	(0.96474)	(0.18673)
D(INFL)	0.014188	-0.001926
	(0.00231)	(0.00045)

D(GDP)	1.761867	-0.277722
	(0.65166)	(0.12613)
D(FX)	14.39160	-4.328384
	(4.68474)	(0.90675)

3 Cointegrating Equation(s):                      Log likelihood                      781.8435

Normalized cointegrating coefficients (standard error in parentheses)

ROAC	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.007798	-0.002070
			(0.00312)	(0.00051)
0.000000	1.000000	0.000000	-1.524164	0.534400
			(0.17183)	(0.02818)
0.000000	0.000000	1.000000	0.000543	6.49E-05
			(0.00022)	(3.6E-05)

Adjustment coefficients (standard error in parentheses)

D(ROAC)	0.013613	-0.000301	-0.488235
	(0.01607)	(0.00027)	(0.25385)
D(INT)	-33.06745	0.334384	375.5300
	(11.4173)	(0.19271)	(180.390)
D(INFL)	-0.021827	-0.002144	-2.829967
	(0.02815)	(0.00048)	(0.44483)
D(GDP)	15.94735	-0.191976	-263.4227
	(7.86211)	(0.13271)	(124.219)
D(FX)	100.7697	-3.806262	-1758.603
	(56.8011)	(0.95875)	(897.438)

4 Cointegrating Equation(s):                      Log likelihood                      793.5043

Normalized cointegrating coefficients (standard error in parentheses)

ROAC	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.000000	-0.001303

				(0.00024)
0.000000	1.000000	0.000000	0.000000	0.384391
				(0.02572)
0.000000	0.000000	1.000000	0.000000	0.000118
				(1.5E-05)
0.000000	0.000000	0.000000	1.000000	-0.098420
				(0.01637)

Adjustment coefficients (standard error in parentheses)

D(ROAC)	0.007103	-0.000475	-0.592340	0.000172
	(0.01643)	(0.00029)	(0.25972)	(0.00032)
D(INT)	-28.11865	0.466388	454.6630	-0.466920
	(11.6505)	(0.20624)	(184.223)	(0.23019)
D(INFL)	-0.014354	-0.001945	-2.710479	0.001708
	(0.02899)	(0.00051)	(0.45839)	(0.00057)
D(GDP)	9.391975	-0.366835	-368.2455	0.145737
	(7.70143)	(0.13634)	(121.779)	(0.15216)
D(FX)	65.83529	-4.738103	-2317.216	4.949297
	(57.1013)	(1.01084)	(902.912)	(1.12820)

### Johansen Co-integration Test, Participation Banks

Date: 10/31/20 Time: 13:12

Sample (adjusted): 6 120

Included observations: 115 after adjustments

Trend assumption: Linear deterministic trend

Series: ROE INT INFL GDP FX

Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05
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No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.638527	185.8004	69.81889	0.0000
At most 1 *	0.260351	68.78003	47.85613	0.0002
At most 2 *	0.148054	34.09834	29.79707	0.0150
At most 3 *	0.092490	15.67163	15.49471	0.0470
At most 4 *	0.038466	4.510861	3.841466	0.0337

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

#### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.638527	117.0204	33.87687	0.0000
At most 1 *	0.260351	34.68168	27.58434	0.0052
At most 2	0.148054	18.42671	21.13162	0.1147
At most 3	0.092490	11.16077	14.26460	0.1463
At most 4 *	0.038466	4.510861	3.841466	0.0337

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

#### Unrestricted Cointegrating Coefficients (normalized by b\*S11\*b=I):

ROE	INT	INFL	GDP	FX
-0.893816	1.358091	933.7019	-1.667143	0.799961
0.306101	-0.251449	1037.680	0.893560	-0.050710
4.195847	0.451728	154.1707	0.563918	0.133645
8.748652	0.355756	136.4488	0.861984	-0.081908
32.14252	-0.029881	-104.6654	-0.713097	0.031322

Unrestricted Adjustment Coefficients (alpha):

D(ROE)	-0.001792	-0.001206	-0.002284	0.001157
D(INT)	0.239936	0.079168	0.287972	-0.270013
D(INFL)	-0.001988	-0.001039	-8.00E-06	-0.000380
D(GDP)	-0.086218	-0.049270	-0.283161	0.098845
D(FX)	-1.828330	1.049224	-1.578692	0.933663

1 Cointegrating Equation(s):                      Log likelihood                      393.6068

Normalized cointegrating coefficients (standard error in parentheses)

ROE	INT	INFL	GDP	FX
1.000000	-1.519430	-1044.624	1.865196	-0.894995
	(0.13042)	(123.390)	(0.19587)	(0.07134)

Adjustment coefficients (standard error in parentheses)

D(ROE)	0.001602
	(0.00118)
D(INT)	-0.214459
	(0.10996)
D(INFL)	0.001777
	(0.00026)
D(GDP)	0.077063
	(0.07534)
D(FX)	1.634191
	(0.52855)

2 Cointegrating Equation(s):                      Log likelihood                      410.9477

Normalized cointegrating coefficients (standard error in parentheses)

ROE	INT	INFL	GDP	FX
1.000000	0.000000	8609.144	4.159590	0.692697

		(1487.69)	(2.31805)	(0.38825)
0.000000	1.000000	6353.546	1.510036	1.044927
		(987.123)	(1.53809)	(0.25762)

Adjustment coefficients (standard error in parentheses)

D(ROE)	0.001233	-0.002130
	(0.00125)	(0.00182)
D(INT)	-0.190225	0.305948
	(0.11597)	(0.16954)
D(INFL)	0.001459	-0.002439
	(0.00026)	(0.00038)
D(GDP)	0.061981	-0.104702
	(0.07949)	(0.11621)
D(FX)	1.955360	-2.746865
	(0.54915)	(0.80281)

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3 Cointegrating Equation(s):                      Log likelihood                      420.1610

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Normalized cointegrating coefficients (standard error in parentheses)

ROE	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.264670	-0.026567
			(0.09973)	(0.01626)
0.000000	1.000000	0.000000	-1.364414	0.514109
			(0.20319)	(0.03314)
0.000000	0.000000	1.000000	0.000452	8.35E-05
			(0.00026)	(4.2E-05)

Adjustment coefficients (standard error in parentheses)

D(ROE)	-0.008352	-0.003162	-3.276285
	(0.00558)	(0.00189)	(1.82238)
D(INT)	1.018063	0.436034	350.5764
	(0.51208)	(0.17302)	(167.214)
D(INFL)	0.001425	-0.002442	-2.935803

	(0.00118)	(0.00040)	(0.38509)
D(GDP)	-1.126118	-0.232614	-175.2835
	(0.33912)	(0.11458)	(110.736)
D(FX)	-4.668590	-3.460005	-861.7446
	(2.39870)	(0.81046)	(783.266)

4 Cointegrating Equation(s):                      Log likelihood                      425.7414

Normalized cointegrating coefficients (standard error in parentheses)

ROE	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.000000	-0.037818 (0.01023)
0.000000	1.000000	0.000000	0.000000	0.572107 (0.07609)
0.000000	0.000000	1.000000	0.000000	6.43E-05 (2.8E-05)
0.000000	0.000000	0.000000	1.000000	0.042508 (0.05343)

Adjustment coefficients (standard error in parentheses)

D(ROE)	0.001772 (0.01260)	-0.002751 (0.00193)	-3.118378 (1.82312)	0.001619 (0.00278)
D(INT)	-1.344190 (1.12817)	0.339975 (0.17313)	313.7334 (163.291)	-0.399621 (0.24925)
D(INFL)	-0.001901 (0.00265)	-0.002578 (0.00041)	-2.987686 (0.38288)	0.002054 (0.00058)
D(GDP)	-0.261356 (0.76215)	-0.197449 (0.11696)	-161.7962 (110.313)	0.025234 (0.16838)
D(FX)	3.499701 (5.35450)	-3.127848 (0.82173)	-734.3474 (775.006)	3.900180 (1.18298)

**Date: 10/31/20 Time: 13:12**

Sample (adjusted): 6 120

Included observations: 115 after adjustments

Trend assumption: Linear deterministic trend

**Series: ROA INT INFL GDP FX**

Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.631180	199.3730	69.81889	0.0000
At most 1 *	0.274587	84.66651	47.85613	0.0000
At most 2 *	0.208953	47.74981	29.79707	0.0002
At most 3 *	0.128867	20.79399	15.49471	0.0072
At most 4 *	0.041951	4.928509	3.841466	0.0264

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized	Max-Eigen	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.631180	114.7065	33.87687	0.0000
At most 1 *	0.274587	36.91670	27.58434	0.0024
At most 2 *	0.208953	26.95582	21.13162	0.0067
At most 3 *	0.128867	15.86548	14.26460	0.0277
At most 4 *	0.041951	4.928509	3.841466	0.0264

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b\*S11\*b=I):

ROA	INT	INFL	GDP	FX
-21.21218	1.414059	975.3653	-1.776527	0.846243
41.08635	0.479192	-867.2300	-0.609197	0.082120
158.0105	0.642368	671.8211	0.748058	0.139900
-3.191818	0.080426	-72.65215	-0.309512	0.155839
419.9630	-0.132245	-93.85599	-1.435902	0.056552

Unrestricted Adjustment Coefficients (alpha):

D(ROA)	-0.000301	0.000122	-0.000248	-0.000573
D(INT)	0.253171	-0.116445	0.016244	0.399030
D(INFL)	-0.001799	0.000833	-0.000685	0.000419
D(GDP)	-0.073803	0.018286	-0.145371	-0.247387
D(FX)	-1.852693	-1.034894	-0.177065	-1.780452

1 Cointegrating Equation(s):                      Log likelihood                      677.6911

Normalized cointegrating coefficients (standard error in parentheses)

ROA	INT	INFL	GDP	FX
1.000000	-0.066663	-45.98137	0.083750	-0.039894
	(0.00609)	(5.50254)	(0.00848)	(0.00327)

Adjustment coefficients (standard error in parentheses)

D(ROA)	0.006389
	(0.00395)
D(INT)	-5.370305
	(2.57736)
D(INFL)	0.038165
	(0.00625)
D(GDP)	1.565528
	(1.75264)
D(FX)	39.29966

(12.3978)

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2 Cointegrating Equation(s):                      Log likelihood                      696.1495

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Normalized cointegrating coefficients (standard error in parentheses)

ROA	INT	INFL	GDP	FX
1.000000	0.000000	-24.81133 (4.22983)	-0.000149 (0.00664)	-0.004239 (0.00114)
0.000000	1.000000	317.5701 (84.7613)	-1.258561 (0.13314)	0.534856 (0.02291)

Adjustment coefficients (standard error in parentheses)

D(ROA)	0.011387 (0.00859)	-0.000368 (0.00028)
D(INT)	-10.15462 (5.59041)	0.302199 (0.18051)
D(INFL)	0.072390 (0.01303)	-0.002145 (0.00042)
D(GDP)	2.316851 (3.81944)	-0.095599 (0.12333)
D(FX)	-3.220356 (26.5657)	-3.115729 (0.85780)

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3 Cointegrating Equation(s):                      Log likelihood                      709.6274

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Normalized cointegrating coefficients (standard error in parentheses)

ROA	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.008785 (0.00214)	-0.001604 (0.00036)
0.000000	1.000000	0.000000	-1.372902 (0.19134)	0.501119 (0.03200)
0.000000	0.000000	1.000000	0.000360 (0.00026)	0.000106 (4.3E-05)

Adjustment coefficients (standard error in parentheses)

D(ROA)	-0.027775 (0.03031)	-0.000527 (0.00030)	-0.565766 (0.27022)
D(INT)	-7.587958 (19.9031)	0.312633 (0.19649)	358.8318 (177.457)
D(INFL)	-0.035920 (0.04488)	-0.002585 (0.00044)	-2.937806 (0.40018)
D(GDP)	-20.65327 (13.3710)	-0.188981 (0.13200)	-185.5069 (119.217)
D(FX)	-31.19843 (94.5407)	-3.229470 (0.93335)	-1028.517 (842.930)

4 Cointegrating Equation(s):                      Log likelihood                      717.5601

Normalized cointegrating coefficients (standard error in parentheses)

ROA	INT	INFL	GDP	FX
1.000000	0.000000	0.000000	0.000000	0.005559 (0.00156)
0.000000	1.000000	0.000000	0.000000	-0.618211 (0.24357)
0.000000	0.000000	1.000000	0.000000	0.000400 (6.6E-05)
0.000000	0.000000	0.000000	1.000000	-0.815303 (0.17679)

Adjustment coefficients (standard error in parentheses)

D(ROA)	-0.025946 (0.02869)	-0.000573 (0.00028)	-0.524131 (0.25607)	0.000453 (0.00036)
D(INT)	-8.861589 (18.7045)	0.344726 (0.18485)	329.8414 (166.943)	-0.490180 (0.23230)
D(INFL)	-0.037257 (0.04432)	-0.002552 (0.00044)	-2.968234 (0.39556)	0.002047 (0.00055)

D(GDP)	-19.86366	-0.208877	-167.5337	0.087797
	(12.6889)	(0.12540)	(113.252)	(0.15759)
D(FX)	-25.51556	-3.372664	-899.1631	4.340431
	(89.5379)	(0.88487)	(799.152)	(1.11204)

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## APPENDIX D

### Granger Causality Test, Conventional Banks

#### Pairwise Granger Causality Tests

Date: 10/31/20 Time: 13:13

Sample: 1 200

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INT does not Granger Cause ROEC	118	0.98142	0.3779
ROEC does not Granger Cause INT		1.84455	0.1628
INFL does not Granger Cause ROEC	198	0.20624	0.8138
ROEC does not Granger Cause INFL		10.8623	3.E-05
GDP does not Granger Cause ROEC	118	1.48792	0.2302
ROEC does not Granger Cause GDP		4.58237	0.0122
FX does not Granger Cause ROEC	118	1.23402	0.2950
ROEC does not Granger Cause FX		0.70845	0.4946
INFL does not Granger Cause INT	118	0.01557	0.9846
INT does not Granger Cause INFL		10.4055	7.E-05
GDP does not Granger Cause INT	118	4.22579	0.0170
INT does not Granger Cause GDP		5.52918	0.0051
FX does not Granger Cause INT	118	0.07433	0.9284
INT does not Granger Cause FX		4.22538	0.0170
GDP does not Granger Cause INFL	118	19.0983	7.E-08
INFL does not Granger Cause GDP		0.31809	0.7282
FX does not Granger Cause INFL	118	26.2084	4.E-10
INFL does not Granger Cause FX		1.91389	0.1523
FX does not Granger Cause GDP	118	7.52234	0.0009

GDP does not Granger Cause FX	1.23447	0.2949
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**Pairwise Granger Causality Tests**

Date: 10/31/20 Time: 13:14

Sample: 1 200

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INT does not Granger Cause ROAC	118	1.04927	0.3536
ROAC does not Granger Cause INT		2.33975	0.1010
INFL does not Granger Cause ROAC	198	0.34583	0.7081
ROAC does not Granger Cause INFL		10.2666	6.E-05
GDP does not Granger Cause ROAC	118	2.62894	0.0766
ROAC does not Granger Cause GDP		6.68847	0.0018
FX does not Granger Cause ROAC	118	2.13429	0.1231
ROAC does not Granger Cause FX		1.18872	0.3084
INFL does not Granger Cause INT	118	0.01557	0.9846
INT does not Granger Cause INFL		10.4055	7.E-05
GDP does not Granger Cause INT	118	4.22579	0.0170
INT does not Granger Cause GDP		5.52918	0.0051
FX does not Granger Cause INT	118	0.07433	0.9284
INT does not Granger Cause FX		4.22538	0.0170
GDP does not Granger Cause INFL	118	19.0983	7.E-08
INFL does not Granger Cause GDP		0.31809	0.7282
FX does not Granger Cause INFL	118	26.2084	4.E-10
INFL does not Granger Cause FX		1.91389	0.1523

FX does not Granger Cause GDP	118	7.52234	0.0009
GDP does not Granger Cause FX		1.23447	0.2949

## Granger Causality Test, Participation Banks

### Pairwise Granger Causality Tests

Date: 10/31/20 Time: 13:15

Sample: 1 200

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
INT does not Granger Cause ROE	118	0.05406	0.9474
ROE does not Granger Cause INT		0.72080	0.4886
INFL does not Granger Cause ROE	118	0.04701	0.9541
ROE does not Granger Cause INFL		4.10220	0.0191
GDP does not Granger Cause ROE	118	0.14055	0.8690
ROE does not Granger Cause GDP		0.88179	0.4169
FX does not Granger Cause ROE	118	0.14910	0.8617
ROE does not Granger Cause FX		0.43867	0.6460
INFL does not Granger Cause INT	118	0.01557	0.9846
INT does not Granger Cause INFL		10.4055	7.E-05
GDP does not Granger Cause INT	118	4.22579	0.0170
INT does not Granger Cause GDP		5.52918	0.0051
FX does not Granger Cause INT	118	0.07433	0.9284
INT does not Granger Cause FX		4.22538	0.0170
GDP does not Granger Cause INFL	118	19.0983	7.E-08
INFL does not Granger Cause GDP		0.31809	0.7282
FX does not Granger Cause INFL	118	26.2084	4.E-10
INFL does not Granger Cause FX		1.91389	0.1523

FX does not Granger Cause GDP	118	7.52234	0.0009
GDP does not Granger Cause FX		1.23447	0.2949

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**Pairwise Granger Causality Tests**

Date: 10/31/20 Time: 13:15

Sample: 1 200

Lags: 2

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Null Hypothesis:	Obs	F-Statistic	Prob.
INT does not Granger Cause ROA	118	0.43262	0.6499
ROA does not Granger Cause INT		3.30315	0.0403
INFL does not Granger Cause ROA	118	0.16088	0.8516
ROA does not Granger Cause INFL		11.1545	4.E-05
GDP does not Granger Cause ROA	118	0.64577	0.5262
ROA does not Granger Cause GDP		4.78176	0.0102
FX does not Granger Cause ROA	118	0.73484	0.4819
ROA does not Granger Cause FX		0.85612	0.4275
INFL does not Granger Cause INT	118	0.01557	0.9846
INT does not Granger Cause INFL		10.4055	7.E-05
GDP does not Granger Cause INT	118	4.22579	0.0170
INT does not Granger Cause GDP		5.52918	0.0051
FX does not Granger Cause INT	118	0.07433	0.9284
INT does not Granger Cause FX		4.22538	0.0170
GDP does not Granger Cause INFL	118	19.0983	7.E-08
INFL does not Granger Cause GDP		0.31809	0.7282
FX does not Granger Cause INFL	118	26.2084	4.E-10

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