Interest Rate Risk in Interest-free Banks:
An Empirical Research on Turkish Participation Banks

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Abstract: Participation banks, which are globally called Islamic Banks or interest-free banks, basically receive funds based on profit-loss sharing principle and make loans via purchasing a commodity or a service and selling it to customers for a higher price (murabaha method) or profit-loss sharing investment contracts (mudarabah or musharakah method). In literature, most of theoretical studies suggest that interest-free banks' business model is based on profit-lost sharing principles and therefore unlike conventional banks these institutions are not exposed to interest rate risk. Conversely some empirical studies suggest that Islamic banks' profitability is affected by market interest rates and these institutions are exposed to interest rate risk. In this study, with reference to Basel Committee's definition of interest rate risk, effects of market interest rate fluctuation on the profitability of Turkish Participation Banks has been analyzed with Seemingly Unrelated Regression method for the period between June 2005 and June 2016. It is found that there is a significant relationship between the profitability of the participation banks and interest rate changes and therefore each institution is exposed to the interest rate risk at different levels.

Keywords: Islamic Banking, Interest-Free Finance, Interest Rate Risk, Seemingly Unrelated Regression.

JEL Codes: G21, G32, C58, Z12

Introduction

Islamic banking or interest-free banking or participation banking, as called in Turkey, is defined as a type of financial activity that allows the transfer of funds obtained from parties with excess saving to saving deficit parties without violating Islamic religious rules (Obaidullah, 2005). In Turkey and many other countries, interest-free financing practices are increasingly on the agenda of academia and policy makers. Main factors contributing to the rapid development of interest-free finance in recent years include; the increasing demand for interest-free finance products around

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the world, the enforcement of related regulations, the diversification of investments, the increase in demand from conventional investors and the development of a range of products to meet individual or corporate finance demand (IFSB, 2010).

The interest-free financial system not only creates an alternative financial market but also stands out in its contribution to the sustainability of financial stability. The recent global financial crisis raised doubts about whether conventional banks are functioning properly and also brought interest-free banks under attention due to their successful performance during the crisis period (Hasan, 2010). There is widespread belief among academic and financial world that the interest-free banking system is relatively more resistant to certain types of financial shocks than the conventional banking system (Khan, 1986). Interest-free financial products are assumed to provide financial institutions with broader opportunities to meet maturity mismatches arising from long-term credit requirements with short-term resources, through partnership and risk-sharing principles (Beck, 2010). Moreover, it is claimed that the interest rate risk in interest-free banks is extremely limited because while conventional financial intermediation activities are predominantly based on debt financing and risk transfer, interest-free finance principles prohibit interest and it's expected that parties share profit and loss (Hasan, 2010).

On the other hand, there are various doubts whether interest-free financial institutions, especially participation banks, are really different from conventional financial institutions and whether these institutions operate in accordance with interest-free finance principles. Some new empirical researches strengthen these doubts. For example, strong correlation is found between participation banks' "profit share" ratios for housing loans and mortgage interest rates of the deposit banks in Turkey between 2005 and 2015. Besides that, the profit shares paid to participation accounts and deposit interest rates in the same period are highly correlated (Çetin, 2017). In this context, the distinct correlation between the yields of interest-free financial products and the market interest rates constitutes one of the most important controversial issues of today's interest-free finance system (Saraç, 2015). While such discussions directly affect the interest-free financial sector's reputation, another debate has risen: If the interest-free finance activities do not differ from the interest and other basic elements of conventional finance in a real sense, do the opinions that interest-free financial institutions be more robust and more resistant to crises than conventional financial institutions remain valid?

Theoretically, interest-free financing activities differ significantly from conventional financing activities. Interest-free finance principles do not allow interest,

speculation and prohibited products to be financed. Interest-free finance is based on the idea that there is profit-loss or risk-sharing principle in both assets and liabilities, furthermore, all financial transactions are derived from real commercial activities (Beck, 2010). Essentially, the most basic feature of the concept of interest-free finance is the prohibition of interest-bearing transactions. However, there is no consensus among scholars regarding the definition and scope of "riba", which is the Arabic equivalent of interest (Khan, 1986). There are different definitions of interest in different academic sources. However, with the commonalities found in the definitions of interest in the literature, interest may be defined as a surplus in liabilities, arise due to maturity, in the form of a predetermined or committed amount or rate, in transactions that generate debt. In this context, the general opinion about interest is that "all kinds of riba are interest" (Dinç, 2016).

One of the most important differences that distinguish interest-free banking from conventional banking is the principle of "Profit and Loss Sharing" (PLS). According to the PLS principle, it is not appropriate to establish a pre-determined fixed-rate contract in any financial transaction, but instead there is a financial relationship based on a symmetric return sharing between the parties (Ergeç, 2011). Accordingly, it can be said that as the compliance with the PLS principle increases, the sensitivity to interest rates decreases. On the other side, in an interest-free financial transaction, the profit-sharing ratio between the owner of the capital and the entrepreneur can be predetermined, but this does not contradict the PLS principle (Chong and Liu, 2009).

The theoretical models of interest-free banking mainly recommend partnership contracts such as "mudaraba" and "musharaka". However, current interest-free financing practices are based largely on interest-free financial instruments which operate in a manner similar to conventional financial instruments. Majority of interest-free banking transactions are based on murabaha (cost plus sale), ijara (leasing), selem (forward sale) and istisna (manufacturing contract) contracts that are permissible under Islamic rules but do not fully comply with the PLS principle (Chong and Liu, 2009).

There are several factors that cause interest-free financial institutions to offer products which produce financial consequences similar to those of conventional products in interest based institutions. One of these factors is that, due to the withdrawal risk, interest-free banks' managers prefer to pay their customers competitive yields at market rates, regardless of actual performance (Obaidullah, 2005).

Turkish participation banks have been paid competitive profit share that converge to the market deposit interest rates in order to compete with the market conditions. Figure 1 shows average participation fund profit share rates and average deposit interest rates between January 2005 and September 2015. The figure indicates that the profit share ratios and the deposit interest rates in this period show a similar course to a great extent.
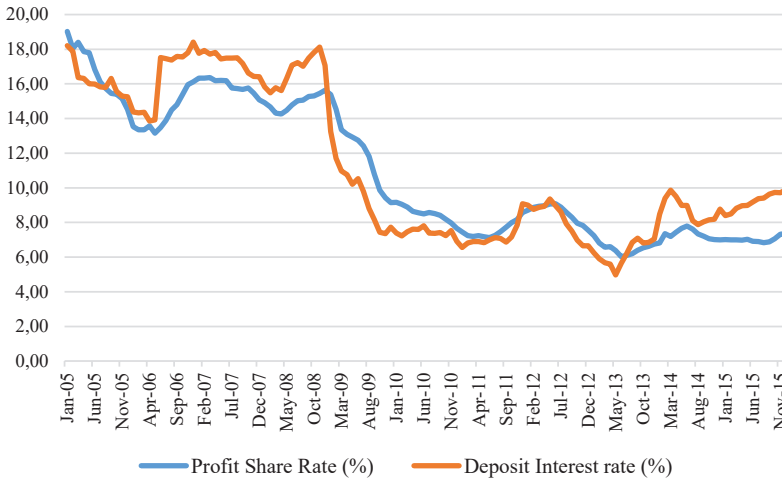
Figure 1. Average Deposit Interest Rates and Average Participation Fund Profit Share Rates in Turkish Banking Sector. Source: CBRT, http://evds.tcmb.gov.tr/

Participation banks allocate reserves from participation fund profits during periods of high returns and transfer them to low profit periods in order to be able to compete with deposit interest rates. These transfers are carried out in accordance with the third paragraph of Article 14 of the "Regulation on the Procedures and Principles for the Determination of the Qualifications of Loans and Other Receivables in Banks and Provisions" (BDDK, 2006). These amounts, which are reserved by legal provision provided by this Article, can be called "Profit Equalization Reserve ". Profit equalization reserve can be used to eliminate participation fund profit share rate fluctuations that occur between different periods. However, there is no publicly available information on how often and to what extent the participation banks have made profit transfers in order to eliminate profit fluctuations.

In addition to profit equalization reserves, another approach, which decreases compliance with the PLS principle, is to take market interest rates into account when pricing interest-free financial products. In this way, interest-free financial instituti-

ons can offer financial products that cause similar financial results to conventional products. For "murabaha" transactions, which comprise a large part of the financing activities of interest-free banks, the profit share rate is generally determined on the basis of a benchmark interest rate such as LIBOR[1]. Due to these benchmark rate fluctuations, probability of loss is called "mark-up" risk (Hussein, 2015).

On the other hand, the strict compliance with the PLS principle depends on the existence of certain conditions. For example, the level of information asymmetry in an economy and the efficiency and the demand for interest-free financing products compatible with the PLS principle are inversely proportional. Similarly, in order for financial institutions to offer long-term interest-free finance products, the risk of moral hazard and adverse selection must be minimized (Okumuş, 2012).

It is expected that there may be a relation between the level of compliance with the PLS principle and interest rate sensitivity. However, the issue of whether interest-free financial institutions are exposed to interest rate risk remains a matter of debate among both academic and financial sector.

In this study, our aim is to analyze the effect of the change in market interest rates on the profitability of the participation banks and to contribute to discussions about whether interest-free banks are exposed to interest rate risk or not. For this purpose, the Basel Committee on Banking Supervision's definition of interest rate risk in banking book (IRRBB) is taken as the basis for this research.

The interest rate risk is defined by the Basel Committee as the probability of a bank's loss as a result of market interest rate changes (BCBS, 2004). Besides, Basel Committee considers interest rate risk in two headings: "market interest rate risk" and "IIRBB". The market interest rate risk is mostly related to the probability of loss of interest-bearing capital market instruments in trading accounts. IRRBB is defined as the probability of loss that may arise in the bank's capital or income due to changes in market interest rates (Akan, 2008). Theoretically, due to interest-free finance principles, it is not possible for participation banks to have financial instruments that are exposed to market interest rate risk, such as bonds or option contracts. For this reason, in this study, it is assumed that participation banks can be exposed to only IRRBB.

According to the capital adequacy consensus known as Basel III[2], which was

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1   London Interbank Offered Rate
2   International Convergence of Capital Measurement and Capital Standards

published by the Basel Committee in 2010, banks use the statistical models for calculating IRRBB. However, this kind of model has not been utilized in this study because such models and data are not shared with the public.

Previous Empirical Studies

The relationship between interest-free banks and market interest rates has been the subject of many academic researches. Although in many theoretical studies it is claimed that interest-free banks are not exposed to interest risk, empirical studies have often reached the opposite conclusions. Chong and Liu (2009) analyzed Malaysian interest-free banks by the Granger Causality Test method and found that the assets of these banks are not different from the conventional banks in terms of PLS principle and their liabilities more comply with it.

Ergeç and Gülümser (2011) analyzed the data of the Turkish participation banks for the period between 2005 and 2009 using the VAR method and found that a change in the interest rates affects the assets and liabilities of both conventional and interest-free banks.

Abedifar, Molyneux and Tarazi's (2013) regression analysis study, conducted by panel data on 553 interest-free banks in 24 different countries between 1999 and 2009 periods, shows that interest-free banks are less sensitive to interest rates than conventional banks.

It has been found by Umar and Mansur (2014), by using time series multivariate forecasting technique on the interest-free banks' data in Malaysia between 1999 and 2012 periods, that there is correlation between the market interest rates and financing of interest-free banks, and a lead-lag causality relationship.

Saraç and Zeren (2015) determined that there is strong correlation between the interest rates of conventional banks and the profit share ratios of participation banks as a result of Granger Causality Test analysis on the data of participation banks in Turkey.

The strong correlation can be attributed to the correlation of the two variables with inflation. Regarding this issue, in his empirical study, Dinç (2017) showed that inflation is among the determinants of participation banks' net profit margin and there is strong relation between profit share, interest and inflation rate.

Data and Methodology

Profitability of banks has been examined in previous empirical studies by different models and methods such as multivariable regression or data envelopment analysis. There are a number of variables such as efficiency, scale economics and macroeconomic factors that affect the profitability of interest-free banks, like other financial institutions. However, the main purpose of this study is not to analyze the profitability of interest-free banks but to investigate the relationship between profitability and interest rates and determine whether interest-free banks are exposed to interest rate risk. For that reason, study focuses on interest rate variables by ignoring other factors affecting profitability.

Statistical Method

In the study the following two null hypotheses are tested:

> H_0: *There is no significant relationship between the profitability of the participation banks and the market interest rates.*

> H_1: *There is a significant relationship between the profitability of the participation banks and the market interest rates.*

The analysis in this study is based on the bank's profitability and interest rate relationship model developed by Mark J. Flannery (1981). Flannery's model is based on Arnold Zellner's (1961) Seemingly Unrelated Regression (SUR) method. The SUR method has been widely used to estimate multi-equation models since the first time it was introduced. This method is called seemingly unrelated, because, at first glance across the equations, dependent variables may seem unrelated but in fact error terms are related (Brooks, 2008). In this study, although the profitability of each participation bank seems to be independent of each other, it is expected that these banks affect each other's profit share ratios and their profitability because of the competitive environment caused by the oligopolistic market conditions. Since it allows considering the potential correlations between error terms in equations, SUR method has been found appropriate for this study.

The basic idea of the SUR approach is to make error terms unrelated by transforming the model. After the correlations between the error terms in the equations in the model are removed, SUR calculation of the system of equations should become equivalent to running separate Ordinary Least Square (OLS) regression for each equation (Brooks, 2008). In this way, the SUR method allows to estimate the profitability of banks together, rather than separately estimating each bank's profitability.

The SUR method (Hill, 2011), which is essentially a generalized OLS procedure, can be described as follows. In our example, there are "m" equations that determine the profitability of "m" banks.

$$y_1 = \beta_1 x_1 + u_1$$

$$y_2 = \beta_2 x_2 + u_2$$

$$.$$

$$.$$

$$.$$

$$y_m = \beta_m x_m + u_m$$

In general notation, ith equation in the equations set can be written as $y_i = \beta_i x_i + u_i$. There are equal number of observations (n) in all of these equations, however number of explanatory variables (K_i) in an equation may be different from each other. Accordingly, y_i and u_i are a (n x 1) vector, x_i is a (n x K_i) matrix, and β_i is a (K_i x 1) vector. To combine all the equations into a single model, the vectors and matrices can be written as:

$$
y_* = \begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ y_m \end{bmatrix}, \quad
x_* = \begin{bmatrix} x_1 & 0 & \cdots & 0 \\ 0 & x_2 & \cdots & 0 \\ \vdots & & \ddots & \vdots \\ 00 & & \cdots & x_m \end{bmatrix}, \quad
\beta_* = \begin{bmatrix} \beta_1 \\ \beta_2 \\ . \\ . \\ \beta_m \end{bmatrix}, \quad
u_* = \begin{bmatrix} u_1 \\ u_2 \\ . \\ . \\ u_m \end{bmatrix}
$$

y_* and u_* (nm x 1) vectors, x_* (nm x $\sum_{i=1}^{m} K_i$) matrix and β_* ($\sum_{i=1}^{m} K_i$ x1) vector can be shown in one single equation; $y_* = \beta_* x_* + u_*$ (Vogelvang, 2005).

There are three stages in the estimation procedure of the equation with SUR method;

1.   Each equation is estimated separately using the OLS method.

2.   The variances of the estimators and the covariance of the model are calculated by using residuals obtained by the OLS estimates.

3.   Using the estimates obtained in the second stage, all equations are estimated jointly in a generalized OLS framework (Hill, 2011).

There are commands in the econometrics software that automatically calculate these three stages. In this study, "STATA" software is used for estimation with SUR method.

Model

The main reason for using Flannery's model to determine whether participation banks are exposed to interest rate risk is that the model is based on market interest rate changes as a key factor in determining bank profitability. According to the model, the economic value of a bank is determined as follows:

$$V_t = \sum_{t=1}^{\infty} \frac{R_t - C_t}{(1 + r_t)^t}$$

where;

V_t: Current market value of the bank's equity,

R_t: Total operational revenues,

C_t: Total operational costs,

r_t: Discount rate.

According to the Flanner's equation, the main source of bank profitability is the difference between operational revenues and expenses. In other words, the source of profitability is the difference between interest income and interest expenses. Figure 2 shows the development of the interest and non-interest income of the Turkish Banking Sector over the last ten years. The figure indicates that net non-interest incomes are lower than net interest incomes. The graph shows that net non-interest incomes are lower than net interest incomes. Moreover, while net profit is positive, net non-interest income is negative in various periods. Therefore, net interest income is the main factor that determines the profitability of the Turkish banking sector. In this respect, the development of the profitability of the Turkish banking sector supports Flannery's approach.

However, in this study, unlike Flannery's model, net profit share income of participation banks is taken as a profitability indicator instead of net interest income. Net profit share income refers to margin between returns of participation banks' loans and the profit share paid to participation funds. In this context, "profit share margin" in participation banking and "net interest margin" in conventional banking have the same meaning. Besides, Figure 3 shows that the main factor that determines the total profitability of participation banks is net profit share income. In this respect, the use of the profit share ratio instead of the interest rate is appropriate for the general logic of the model.
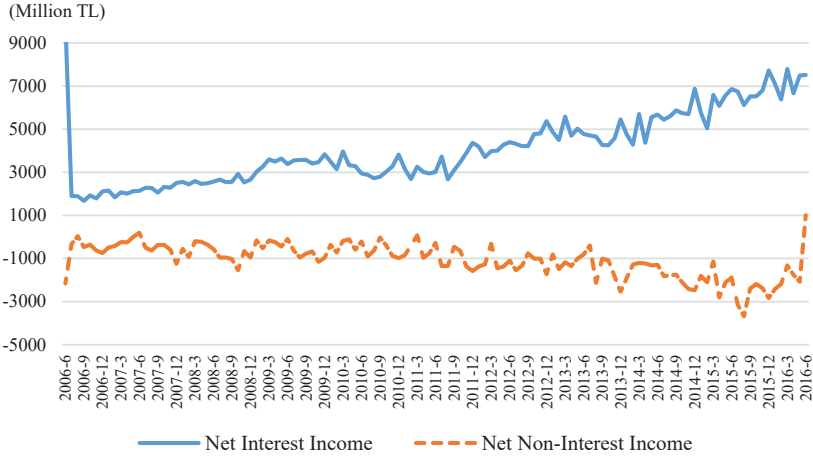
Figure 2: Development of Turkish Banking Sector Net Interest Income and Net Non-Interest Income[3], Source: BRSA Interactive Monthly Bulletin. http://ebulten.bddk.org.tr/ABMVC/en/Gosterim/Gelismis
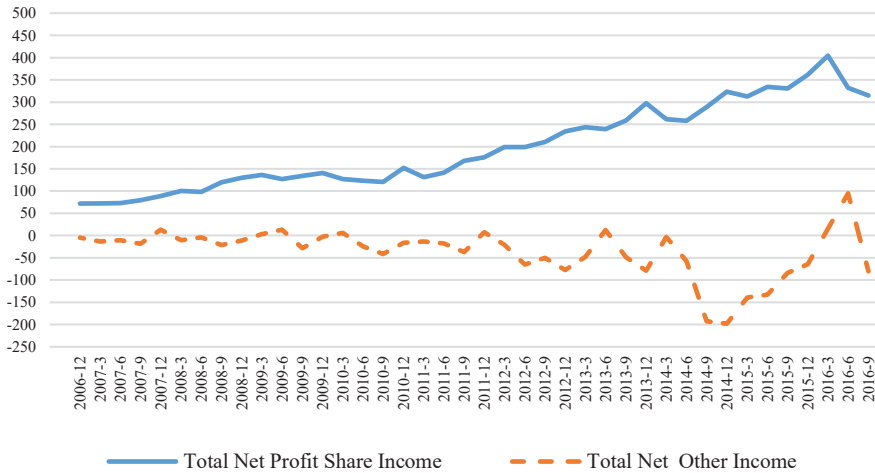
Figure 3: Development of Net Profit Share Income and Net Other Income of Turkish Participation Banks.

Source: BRSA Interactive Monthly Bulletin, http://ebulten.bddk.org.tr/ABMVC/en/Gosterim/Gelismis

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3   The graph is prepared by calculating the monthly developments of cumulative net interest incomes and net non-interest incomes from the data of the BRSA interactive monthly bulletin. Net interest income amounts include participation banks' net profit share incomes.

The relationship between the profitability of the banks and the market interest rates is estimated by the following model:

$$\frac{NCOE_t}{TA_{(t-1)}} = \beta_0 + \beta_1 \left(\frac{NCOE_t}{TA}\right)_{t-1} + \beta_2\, r_t + \beta_5 \sigma_{r\,t}^2 + \beta_4 \left[r_t \left(\frac{TA_t - TA_{t-1}}{TA_{t-1}}\right)\right] + \varepsilon_t$$

The dependent variable in the model is the "bank profitability" value, which is calculated by dividing the present values of the net operating profits of banks by their total assets. Where;

NCOE : Net Profit From Profit Sharing Activities, $(R_t - C_t)$,(R_t: Profit Share Income, C_t : Profit Share Paid),

r_t: Benchmark Interest Rate,

$\sigma_{r(t)}$: Volatility of Benchmark Interest Rate,

TA : Total Assets.

One of the difficulties in this study is to determine the benchmark interest rates. There may be more than one benchmark interest rates affecting the cost of the financial products of the banks. Furthermore, banks may offer different interest or profit share ratios for each financial product according to criteria such as maturity, customer type or tax rate. Banks may consider different market indicators due to their business strategies, while they determine the ratios of their financial products. For example, for housing loans the lowest rate of government securities and for consumer loans the highest rate can be taken as benchmark rate. Besides the market benchmark rates, the rates offered by other banks or the equity structure of banks and alternative costs are effective in determining the ratios of financial products. Therefore, it is not possible to set one single market interest rate that determines the cost of bank liabilities and the incomes of loans. As a consequence, any benchmark rate that can be taken as an explanatory variable can be statistically insignificant for a bank, while producing a significant result for another bank. For that reason, in this study, all possible market interest rate data are tested for each bank, and interest rates with significant result are selected as explanatory variables.

Dependent and independent variables in the model:

Yi   = NCOE/TA$_{t-1}$; (Profit Share Income – Profit Share Costs)/Total Assets of Previous Periods

DTA$_i$ = r_t ((TA$_t$ – TA$_{t-1}$)/TA) ; Change in total assets (discounted with benchmark rate)

IMR   = Change in interest rate margin between loan and deposit

ADR   = Monthly Average Deposit Interest Rate (discounted with inflation rate)

VAR   = Variance of benchmark rate.

Data

The data on total assets, profit share income and expenses of the four participation banks operating in the period 2005-2016 has been obtained from the Turkish Participation Banks Association and participation banks' websites. The Ziraat Participation Bank, which came into operation in November 2014 and the Vakif Participation Bank which was established in February 2016, are not included because of insufficient data. The loan-deposit interest rates data are obtained from The Central Bank of Turkey database and the average monthly deposit interest rates are obtained from the Turkish Statistical Institute.

The descriptive statistics of the time series used in the study are given in Table 1:

Table 1				
Descriptive Statistics of Variables				
Variable	**Max**	**Min**	**SD**	**Mean**
Y1	0,6854	0,1307	0,1269	0,3407
Y2	0,7377	0,0235-	0,1690	0,3501
Y3	0,4967	0,1864-	0,1414	0,3150
Y4	0,5899	0,2762	0,0918	0,3815
DTA1	0,0806	0,0778-	0,0290	0,0001
DTA2	2,0726	0,7997-	0,6173	0,1520
DTA3	1,6033	0,3289-	0,4517	0,2454
DTA4	1,4263	0,5767-	0,4413	0,3364
ADR	7,7600	4,6200-	2,7801	1,5000
IMR	1,7250	1,8625-	0,6783	0,0350-
Var	9,3396	0,1154	2,4861	1,5884

Empirical Results

The data series must be stationary in order to be able to perform analysis with SUR method. Augmented Dickey Fuller (ADF) and Philips–Peron procedures are applied to test the null hypothesis of unit root against the alternative hypothesis of stationarity. Table 2 shows summary of the unit root test results:

Table 2

Unit Root Tests Summary Results

Variable	ADF				Phillips Perron			
	Intercept		Trend and Intercept		Intercept		Trend and Intercept	
	t-Stat Value	% 5 Critic Value	t-Stat Value	% 5 Critic Value	t-Stat Value	% 5 Critic Value	t-Stat Value	% 5 Critic Value
Y1	-2,98	-2,93	-5,43	-3,52	-4,30	-2,93	-5,40	-3,52
Y2	-1,31	-2,93	-4,15	-3,52	-0,73	-2,93	-4,18	-3,52
Y3	-4,14	-2,93	-4,33	-3,52	-5,68	-2,93	-4,33	-3,52
Y4	-1,99	-2,93	-3,99	-3,52	-1,82	-2,93	-4,33	-3,52
DTA1	-6,94	-2,93	-7,09	-3,52	-6,95	-2,93	-7,10	-3,52
DTA2	-3,27	-2,93	-4,60	-3,52	-3,16	-2,93	-4,63	-3,52
DTA3	-5,32	-2,93	-6,05	-3,52	-5,37	-2,93	-6,05	-3,52
DTA4	-4,08	-2,93	-4,74	-3,52	-3,93	-2,93	-4,84	-3,52
ADR	-5,28	-2,93	-5,42	-3,52	-5,15	-2,93	-5,33	-3,52
IMR	-6,08	-2,93	-6,06	-3,52	-6,06	-2,93	-6,04	-3,52
VAR	-5,09	-2,93	-5,09	-3,52	-5,07	-2,93	-5,10	-3,52

The t statistic values for all variables are less than the 5% significance level critical values. According to this, the null hypothesis is rejected and the data series are stationary.

The SUR method needs to have some additional assumptions, along with the basic assumptions of the generalized OLS (Conniffe, 1982). One of the main assumptions of the SUR method is the correlation between the error terms of the equations in the same time period. If there is no such relationship, using SUR instead of generalized OLS will not be appropriate (Brooks, 2008). Breusch-Pagan Lagrange Multiplier test is used to test the null hypothesis of "there is no correlation between the units" against alternative hypothesis of "there is correlation between the units" (Tatoğlu, 2013). Table 3 shows that correlation matrix of residuals of the model and the results of the Breusch-Pagan Lagrange Multiplier test.

Table 3				
Correlation Matrix of Residuals and Breusch-Pagan Lagrange Multiplier Test				
	Albarakaturk	**Banksasya**	**Kuveytturk**	**Türkiye Finans**
Albarakaturk	1.0000			
Banksasya	-0.1610	1.0000		
Kuveytturk	0.2888	-0.0014	1.0000	
Türkiye Finans	0.2060	0.0237	0.3935	1.0000
Breusch – Pagan test of independence: chi2 (6) = 13.822, Pr = 0.0317				

The chi2(6) = 13,822 (Prob. = 0,0317) value, obtained from the Breusch-Pagan test, shows that the null hypothesis is rejected and the correlation between units exists. This means SUR method is appropriate for estimating the model.

The model to be estimated is as follows:

$$Y_1 = \alpha_0 + \alpha_1 Y_{1(t-1)} + \alpha_2 ADR + \alpha_3 DTA_1 + \alpha_4 VAR + u_t$$

$$Y_2 = \beta_0 + \beta_1 Y_{2(t-1)} + \beta_2 IMR + \beta_3 DTA_2 + \beta_4 VAR + \varepsilon_t$$

$$Y_3 = \gamma_0 + \gamma_1 Y_{3(t-1)} + \gamma_2 IMR + \gamma_3 DTA_3 + \gamma_4 VAR + \omega_t$$

$$Y_4 = \theta_0 + \theta_1 Y_{4(t-1)} + \theta_2 IMR + \theta_3 DTA_4 + \theta_4 VAR + \nu_t$$

Where;

$$Y_1 = \left(\frac{NCOE}{TA_{t-1}}\right)_{Albaraka} , Y_2 = \left(\frac{NCOE}{TA_{t-1}}\right)_{Bankasya} , Y_3 = \left(\frac{NCOE}{TA_{t-1}}\right)_{Kuveyttürk} \text{ ve } Y_4 = \left(\frac{NCOE}{TA_{t-1}}\right)_{TürkiyeFinans}$$

Another assumption of the SUR method is that there is no autocorrelation. The null hypothesis of "there is autocorrelation" is investigated by Portmanteu Test. Its results are shown in Table 4.

Table 4
Portmanteu Test for Autocorrelations
System Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 07/11/17   Time: 08:44
Sample: 2005Q4 2016Q3
Included observations: 44

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	25.17355	0.0668	25.75898	0.0575	16
2	38.23680	0.2072	39.44429	0.1714	32
3	57.18578	0.1709	59.77978	0.1184	48
4	75.72440	0.1498	80.17226	0.0835	64
5	92.89090	0.1536	99.53959	0.0686	80
6	99.27522	0.3891	106.9320	0.2094	96
7	110.7736	0.5150	120.6057	0.2725	112
8	119.9689	0.6812	131.8444	0.3899	128
9	132.9223	0.7359	148.1287	0.3897	144
10	146.1085	0.7772	165.1932	0.3728	160
11	159.1761	0.8136	182.6167	0.3506	176
12	172.0016	0.8471	200.2517	0.3267	192

According to Portmanteu autocorrelation test, the null hypothesis is rejected because the prob. values obtained for all lags are greater than 0.05, hence, there is no autocorrelation in the model.

After testing the assumptions, the estimation results of the model with the SUR method are presented below.

Table 5
Seemingly Unrelated Regression Estimation Results

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Albarakaturk	45	4	.103049	0.2040	17.61	0.0015
Bankasya	45	4	.0809245	0.7195	126.58	0.0000
Kuveytturk	45	4	.1030729	0.2783	19.51	0.0006
Türkiye Finans	45	4	.0488644	0.6883	115.48	0.0000

	Coef	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Albarakaturk						
Y11	.1231014	.0806355	1.53	0.127	-.0349412	.2811441
DTA1	.0069544	.6274408	0.01	0.991	-1.222807	1.236716
ADR	.0157341	.0059125	2.66	0.008	.0041498	.0273224
Var	.0128498	.0068073	1.89	0.059	-.0004524	.0281919
_cons	.2727856	.0381916	7.14	0.000	.1979315	.3476397

Bankasya						
Y22	.8364554	.1090981	7.98	0.000	.6305454	1.042365
DTA2	.0559795	.0262178	2.14	0.033	.0045936	.1073655
IMR	-.0399882	. 020934	-1. 91	0.098	-.0810181	.0010418
Var	-.0043878	. 0054563	-0.80	0.421	-.015082	.0063063
_cons	.0457057	.0413847	1. 20	0.230	-.0314068	.01308182
Kuveytturk						
Y33	.0916497	.1018663	0.90	0.368	-.1080047	.291304
DTA3	.0612247	.0359463	-1.70	0.089	-.1316781	.0092286
IMR	-.0929471	. 0262862	-3.54	0.000	-.1444671	.0414271
Var	-.0102337	. 0068352	1.50	0.134	-.003163	.0236304
_cons	.264479	.0411336	6.43	0.000	-.1838586	.3450994
Türkiye Finans						
Y44	.668032	.077058	8.67	0.000	.5170012	.8190628
DTA4	.0373606	.0211657	1.77	0.078	-.0041235	.0788446
IMR	.0249569	. 012618	1.98	0.048	.0002261	.0496877
Var	-.0033972	. 0035765	0.95	0.342	-.0036126	.010407
_cons	.1066698	.0312584	3.41	0.001	.04540044	.1679352

The overall results of the SUR show that the Wald statistic (Chi2) prob. values are smaller than 0.05 for all equations, meaning that the model is significant at the 5% significant level. In addition, the "R-sq" ratios, which indicates the level of explanation of the profitability of participation banks by the market interest rates, are 71.95% for Bankasya, 81% for Turkiye Finans Bank, 27.83% for Kuveyt Türk Bank and 20.4% for Albaraka Türk Bank .It can be argued that there is a stronger relationship between market interest rates and the profitability of banks with high R-sq ratios, and that these banks are exposed to more interest rate risk than banks with the low R-sq. The variable of average monthly deposit interest rate changes that explains changes in the profitability of Albaraka Türk Bank is statistically significan. And the variable of changes in loan-deposit interest rate margin, for other three participation banks, is statistically significant. It is concluded from the results of the model estimated by SUR method that there is a significant relationship between the profitability level of the participation banks and the market interest rates and that this relationship is stronger for the Bankasya and Türkiye Finans Participation Banks.

Conclusion

Interest-free banks, unlike conventional banks, do not commit to pay principal, interest or similar returns for the funds they collect. For this reason, it is claimed that

the banks are not subject to interest rate risk. However, many studies show that interest-free banks operate by taking in consideration the market interest rates. In order to determine whether interest-free banks are exposed to interest rate risk, it is important to determine the relationship between the financials of interest-free banks and the market interest rates.

In this study, the relation between the market interest rates and profitability of four Turkish participation banks for the period between 2005 and 2016 has been examined by the "Seemingly Unrelated Regression" method. As a result of the regression analysis, it is found that there is a significant relation between the profitability of the participation banks and the interest rate changes. This result indicates that the institutions are exposed to interest rate risk. However, the degree of the relationship with market interest rates differs for each bank. Therefore, when analyzing the interest rate risk of interest-free banks, a new approach should be developed which also takes into account the relationship between profitability and interest rate.

The main reason for the interest rate risk exposure of interest-free banks is to take market interest rates into consideration by mechanisms such as "profit balancing reserve" or "benchmark rate" when determining price of products. However, exposure to interest rate risk does not contradict Islamic finance principles, as expressed in many sources in the literature. Interest-free banks receive opinions and approval from competent and qualified persons in the field of interest-free finance for their transactions (Khan, 2015). Nonetheless, interest-free finance practices are based on the concept of "sharing", as is often stated in the literature. The preference of financial products, that take market interest rates into account instead of share based approach, reduces the degree of compliance with the "Profit Loss Sharing" principle.

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