

Investigation of Causality between Interest Rate and Deposit Investor's Behaviour

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Abstract

There are many factors that influence investor behaviour. One of them is interest rates applied by commercial banks. The aim of this study is to investigate whether changes in interest rates have an impact on the Turkish deposit investor's behaviour and to determine whether interest rates are the cause of deposit volume changes or not. For this purpose, deposit interest rates and monthly deposit volume data in the Turkish banking system for the period 2012 and 2018 was used. The data was tested using time series analysis. The Augmented Dickey Fuller (ADF) test was used to determine if the series is stationary and the Toda-Yamamoto Causality test was used to reveal the causality between the two data streams. Findings show that there is a causality between interest rates and deposit volume. This is in the line with McKinnon-Shaw's Theory, suggesting that the investors increase their deposit investments when interest rates rise. These findings offer important implications for policy makers.

Keywords: Investor Behaviour; Interest Rate; Deposit; Banking.

1. Introduction

One of the most important functions of the banks is to collect peoples' savings under the name of *deposit*, letting the fund-needing sector to use it as credit. In the Turkish banking system, deposits are the most important sources, with approximately 2/3 proportion, used by the banks in providing credits. Therefore, changes in the deposit volume has a significant effects on the operations of the banks. More deposits, means more funds available for credits and in turn more interest revenues for the banks. Decreasing deposits will decrease the revenue of the banks. Changing deposit volume will cause the banks to revise their resource planning. In case there is a decrease in the deposits volume, the banks will have to try different methods to finance their credits. In this respect, the change in the cash-deposit preference of the household has an important effect on banks' liquidity management.

According to sources from the Central Bank of Turkey (CBT), the maturity term of credits in Turkish banking system is longer than 1 year, while the maturity terms of deposit are less than 3 months (The Banks Association of Turkey, 2018). This is a maturity matching problem, which is a significant concern for the financing of Turkish banks. Additionally, when analysing the interest rates on time deposits of the commercial banks, a more striking situation appears. Particularly for the last 20/30-years, one can observe that Turkish commercial banks have applied higher interest

rates for 3-month time deposits, while lower interest rates have been applied to other time deposits. If the bank customers are after interest rates, this would necessitates banks to renew customer deposits every three months, making this a major liquidity risk for the banks, if clients want to employ their money for other purposes at the end of the 3-month period. Also, since in the event that clients renew their deposits, a different interest rate can be applied. For example, if the interest rates were to decrease, clients will gain less interest income and might decide to employ their money for other purposes apart from the bank or might utilise it for consumption. This means loss of deposits for the banks.

Therefore, (1) given this risk, why don't Turkish banks aim to obtain time deposit with longer terms? And (2) what is the effect of a decrease or an increase in the interest rates on Turkish banks' time deposit volume? The answer for the first question might be explained by future interest rate expectations of the banks, while the second question, is related to the preferences of the deposit investor.

Could banks have analyzed whether deposit investors are dependent on time deposits with lower risk and guaranteed return in a given period? If the answer to this question is yes, and if the deposit investors prefer deposits whatever the interest rate is, banks can use this information as a significant variable for their liquidity management. If the investors continue to invest in time deposit under all conditions, renewal of short time deposit will be easier and the maturity of the deposit will actually transform into long term.

Deposit investments are the most important investment preference of the Turkish household. According to the Turkish Capital Market Association (TCMA, 2018:37), 68 % of the total savings of residential individuals in Turkey is comprised of deposit investments. Also, one must note that with fluctuations in the exchange rate, the ratio of the foreign money held in deposit could increase.

In this article we will analyse the relation between the interest rate and deposit volume and the relation between investor type and deposit investment.

2. Interest Rate Deposit Volume Relation

Savings and particularly deposits are used as sources in real production by means of direct credit mechanisms, and based on this, the national income and welfare of the country increases. Therefore, in order for the economic growth to be sustainable, deposit volume should be maintained at a certain level.

The factors affecting the deposit volume are shown as national income, consumption and savings tendency and deposit interest (Değirmen & Şengönül, 2012:9). According to McKinnon-Shaw Theory (McKinnon, 1973; Shaw, 1973), an increase in the interest rate has a positive influence over savings volume. However, changes in the interests might not always influence savings and deposits at the same level. High interest, with its *substitution effect*, will increase the current price of the consumption compared to the future price. As a consequence, the savings of the household will increase. However, if the household is in a net lender position, an increase in interest will increase the life income, and with this *income effect*, savings will decrease while consumption increases (Barış, 2016). In this case, net effect of the interest rates on savings is shaped in parallel with the sizes of substitution and income effects. If the substitution effect is higher than the income effect, savings will react positively based on the increase in the interest rate.

McKinnon-Shaw asserts that in order for the savings to increase, financial independence is necessary. According to the McKinnon-Shaw hypothesis, if the financial independence is provided, the interest rates will initially increase, thereafter the savings rate will increase, and as a consequence the process will reverse, with an increase in the savings, and ultimately, although positive in real terms, interest rates decreases. Thus, in the end both the savings are increased and the interest rates are decreased. Thereby the credit demands and the investments will increase. Thus, the growth problem of particularly developing countries will be overcome (Çolak & Öztürkler, 2012:8).

Barış (2016) determines that there are many factors including the real interest influencing the savings volume. However, the effects of interest rates on deposit volume rather than on total

savings is examined in this study. Although there are numerous studies analyzing the relation between interest rate and savings volume, it is observed that there is quite a limited research on the relation between interest rate and deposit volume.

3. Investor Types and Risk-Taking

The types of investors can be classified under three titles: risk-avoider, risk-indifferent, and risk-lover. Risk-avoider investors dislike risks, therefore, they prefer the less risky investment among the ones with certain returns. According to Markowitz (1952), since the investors are rational, they avoid risk. Nonetheless, investors, most of the time display attitudes regardless of rationality. This, in turn, proves the importance of human psychology in investments.

Prospect theory (Kahneman & Tversky, 1979), states that psychological factors systematically detract individuals from rationality, and individuals display risk-taking attitudes. This theory underlies behavioral finance. Thus, human psychology is included into the economic models to explain how the investors decide and how they behave.

The financial risk-taking levels of the investors are mostly based upon the economic theory, which explains that risk is accepted in parallel with the risk avoidance principles, and risk avoidance is frequently evaluated as the proportion of risky assets to the total investment (Chaulk et al., 2003). In this respect it is stated that an investor, investing less in the risky assets is avoiding risk.

Investment types can be classified into five groups based on risk features as follows (Seetharaman et. al, 2017:153-154):

- i. Low-risk investment avenues: savings accounts, bank fixed deposits, CPF, government securities and so on.
- ii. Moderate-risk avenues: mutual funds, unit trusts, ETF, life insurance, debentures, bonds.
- iii. High-risk avenues: equity share market, commodity market, FOREX market.
- iv. Traditional avenues: real estate (property), gold/silver.
- v. Emerging avenues: virtual real estate, hedge funds/private equity investments, art and passion.

When the investors and investment types are examined, it is observed that the bank clients who invest in bank deposits are risk-avoider investors and they consent to a certain return with a low risk level. Nevertheless, stocks and forex investments are among the high-risk investments.

4. Literature Review

The McKinnon-Shaw theory focuses on the relation between interest rates and total savings volume. Numerous research studies in literature are concerned with the examination of this relationship. However, there are limited number of studies, which examine the relationship between interest rate and bank deposits, which is a part of savings.

We observed from literature, that fluctuations in interest rates have different effects on deposit volume. In a study on 23 Muslim and 23 Non-Muslim countries conducted by Mushtaq & Siddiqui (2017), the effect of an interest rate increase on deposit volume was examined. According to this study, it was determined that interest increase had no effect on deposit volumes in Muslim countries, while it had a positive effect in non-Muslim countries. Literature here suggests that the change trend in deposit volume occurred differently from the change trend in interest rates. Other studies also similarly show that interest rate increases have no effect on the deposit volume (Sukmana & Kassim, 2010; Siaw & Lawer, 2015; Mushtaq & Siddiqui, 2016; Kassim, Majid & Yosuf, 2009; Mobin & Masih, 2014).

However, on the other hand there are studies showing that an increase in interest rates lead to increases in deposit volume (Hakan & Gulumser, 2011; Loayza & Shankar, 2000; Nathanael & Eriemo, 2014; Ojeaga et al., 2013; Ostadi & Sarlak, 2014; Mashamba et al., 2014). Changes in the interest rates variously influence deposit volumes based on the socio-economic conditions of countries. Another factor that influences deposit variation is religious issues. In some Muslim countries, the

changes in interest rates do not influence deposit volume, while in some others there is a positive relation. Investors' behaviour is a determinant in the course of these relationships.

Bank time deposits provides a riskless return to the investors in a certain term with a certain interest rate. From this aspect, the deposit is the most preferred investment means for the investors who are risk-averse. When the literature is examined, based on the risk-taking levels, it is observed that the investors' preferences start from investments with the lowest risk (Öztürkkal, 2013; Bektur & Atasaygın, 2017) towards the ones with the highest. This is seen in numerous studies, where it is observed that risk-avoiding investors prefer low-risk deposit investments (Buccioli & Miniaci, 2007; Mittal & Vyas, 2007; Öztürkkal, 2013; Bektur & Atasaygın, 2017; Rekha & Ahamed, 2013).

In a study conducted by Öztürkkal (2013), on a highly-educated group, with a high level of financial knowledge, it was reported that 60,10 % of the investors invested in lower-risk fields such as bonds, realty and deposit as well. In another study conducted by Bektur & Atasaygın (2017) on a 500-investor group, it was determined that the investors tended towards time deposits and foreign exchange during uncertain periods. Buccioli & Miniaci (2007) defined time deposit investors as risk-avoiding investors. Mittal & Vyas (2007: 58-59), determined that there are differences in investment preferences of investors from different income groups concerning stocks, investment funds, and time deposits, and that low-income individuals make low-risk investments such as time deposits and they avoid investing in stocks/shares and investment funds.

In a study conducted by Rekha & Ahamed (2013) in India, it was determined that 363 of 500 surveyed participants invested in time deposit and the rest preferred other investment alternatives. In the study, it was reported that the investors did not have any apprehension as they did with other investments, and savings serve for their capital-preserving objective in any desired moment. According to the study, deposit investment is evaluated by the investors as the most reliable investment. Moreover, it was determined that the general knowledge levels of the investors about deposits were quite high. Similar to findings by Rekha & Ahamed (2013), in the study of Selvakumar & Manicka Mahesh (2015), time deposit was the most preferred among the investments.

The investors prefer any investment portfolio to have a reliable and moderate risk level. The portfolios involving gold and bonds are accepted as low-risk and capital-preserving investment alternatives.

After examining the literature we found that there are limited studies analyzing the behavior of Turkish investors in relation to interest rates and time deposit investments. Therefore, this study will contribute to close this gap and obtain a better understanding of such.

5. Method of the Research

The data of the study is comprised of monthly data for the period between 2012(12)-2018(3). Time deposit (Turkish Liras-TL) data was collected minus drawing account and interbank deposit and deposit changes between periods were calculated and analyzed. As the representative of the interest variable, weighted average interest rates (Stream Data, %) were considered as monthly, intermittent and average. Real interest was obtained by means of CPI (Consumer Price Index)-adjusted interest rates. Since the data was comprised of monthly series, they were seasonally adjusted. The data for deposit and interest variables was attained from the Electronic Data Delivery System (EDDS) of Central Bank of Turkey (CBT).

Firstly, the logarithms of data of variables were taken. The data was comprised of a monthly series. Therefore they were seasonally adjusted.

Time-series analysis was used as the econometric method for investigating the relations between these variables. In the time-series analysis, it is necessary to examine by means of stationarity analyses whether the series of the variables include unit root.

6. Findings

In order to obtain the findings of the study, Augmented Dickey-Fuller (ADF) unit root test, and Toda-Yamamoto causality analysis were implemented and reported.

6.1. Stationarity Analysis

Moreover, in order to analyse time series, these should not include unit root. In other words they should be stationary. Provided that the variance and average are *constant* in time, stationarity means that the covariances of the variables are dependent on the lag between variables and not dependent on time, in lagged two time periods.

In order to investigate the stationarity of the variables, Augmented Dickey-Fuller (ADF) unit root test was used. The results of ADF test are as follows;

Table 1. ADF Unit Root Test

| Variables | ADF Test Statistics | | Result |
|---------------|---------------------|----------------------------|--------|
| | Level | 1 st difference | |
| Interest Rate | -5,556646 | - | I(0) |
| Deposit | 1.249661 | -10.51231 | I(1) |

*** %1, ** %5, * %10 show the significance level. MacKinnon critical values; at %1 level-3.5401, %5 level-2.9092, and %10 level -2.5922, Optimal lag length was calculated according to Akaike Information Criterion (AIC) and put into parentheses.

The tested hypothesis is "time-series are not stationary (there is at least one unit root)". The results of unit root tests are presented in Table 1. While rejecting the null hypothesis, which states that the interest series include unit root, and accepting the alternative hypothesis, which states that the series are stationary, deposit series has become stationary in the first difference.

6.2. Toda-Yamamoto Causality Test Result

Toda-Yamamoto causality analysis can be used to conduct causality test disregarding the time series having the same stationarity levels and the co-integration relation between the variables. This method is used since it is applicable for the standard VAR model in different levels of variables and since it minimizes miscalculation of the integration levels of the series (Mavrotas and Kelly, 2001:100).

There are two steps in the implementation of the causality test. The first step is determining the lag length (m), and the second is choosing the maximum integration degree for the variables in the system. In order to determine the lag degree of VAR, Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn (HQ) Information Criterion were used. Afterwards, the VAR model is estimated with the sum of the lags of $p = (m + d_{max})$. In order to make a deduction for m VAR co-efficient matrix (without applying to all of the lagged co-efficients) and for the Granger causality test, standard Wald Test is applied (Awokuse, 2003:130).

In the Toda-Yamamoto causality test of this study, initially, a standard VAR model was established using the deposit and interest data level values. While establishing the VAR model, Akaike (ACI), Schwarz (SBC), and Hannan-Quinn (HQC) Information Criteria were used. Since information criteria displays 2 lags, the lag length of standard VAR is 2. In the latter phase, since we take deposit (1) and interest (0), the integration degree is determined as 1. Therefore, the lag length was determined as 3 by adding the integration degree to the standard VAR model.

By changing the lag length, a new VAR model was estimated by the Seemingly Unrelated Regression (SUR) method. SUR method was preferred since it takes into consideration the correlation (autocorrelation) among the error terms and heteroskedasticity (changed variance) in the error terms of the equations for the causality analysis, which was estimated in the model estimation.

Based on the above mentioned explanations, the Toda-Yamamoto causality analysis results of Deposit and Interest variables are on Table 2.

Table 2. Toda-Yamamoto Causality Test Result

| Dependent Variable | Direction of Causality | | |
|--------------------|------------------------|----------------------|--|
| | Deposit | Interest rate | |
| Deposit | - | 2.129202 (0.3449) | <i>Deposit</i> → <i>Interest rate</i> |
| Interest rate | 7.116330 (0.0285) | - | <i>Interest rate</i> → <i>Deposit</i> |

*Statistics on the Table are χ^2 values. The values within the parantheses are P-probability values.

According to Mwald test results, there was no causality relation between deposit volume to interest rate. However, it was determined that there was a causality relation between interest rate to deposit volume. Therefore, it was determined that a change in interest rate influenced deposit volume, but a change in deposit volume did not influence interest rate.

7. Results and Conclusions

As financial institutions, the banks have important roles in transferring savings to production. The banks collect the savings of the household under the *deposit* title, and these deposits comprise the most important sources of the banks. McKinnon-Shaw theory asserts that with their substitution effect, the interest rates would increase the savings, and thus, the deposits. The influence degree of the interest rates is dependent on the behaviors of the investors to a large extent.

In this study, in order to determine whether the interest rates are the cause of the investor behaviours, a set of 64-months observation between the period 2012 (12) - 2018 (3) was used. As the variable, 1-month real deposit interest rates and cumulative Turkish Lira deposit change rate on a monthly basis were used. The series was stationary and after examining via the ADF test, it was observed that the series was stationary at different levels. Therefore, the Toda-Yamamoto test, which does not need a co-integration relation and same level stationarity, was used. According to Toda-Yamamoto causality analysis, a one-way causality relation was determined between the two series. Accordingly, it was understood that the interest rate influences the deposit volume. Results show that the McKinnon-Shaw theory is valid in the Turkish banking system.

We also found that there is a causality from the interest rates to deposit volume. This means that the interest rate has an effect on the deposit volume. Accordingly, a change in interest rates influences the investment preferences of the investors. In the event that the interest rates are lowered, the investors will decrease their deposit investments, since their returns diminish, and they are assumed to look for other opportunities.

This attitude of the investors might put a strain on the liquidity managements of the banks, since a decrease in the interest rates negatively influences deposit volumes of the Turkish banks. In case the investors decrease their deposits held with the banks, banks will have to use their alternative finance sources such as credit and bond issuance in national and international markets. Thus, Turkish banks, whose time deposits are shorter than 3 months, face the risk of deposit withdrawal.

Despite such a risk, Turkish banks apply lower interest rates for long-term time deposit. The reason for this application is related to expectations. If banks expect a decrease in future interest rates, they would not want to pay higher interest for the deposits, they will use in the future. Thus, when faced with a choice between resource cost and withdrawal of deposit, it can be said that the Turkish banks prefer *decreasing the costs*. However, further studies using or adding different variables, can highlight how the investors allocate their savings to investment alternatives other than just deposits. Multiple comparisons can be made through gathering data from various countries.

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