Discerning causal relationship between operational cost and bank profit for commercial banks: Turkish evidence with ARDL approach

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Discerning causal relationship between operational cost and bank profit for commercial banks: Turkish evidence with ARDL approach

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Abstract

The purpose of this study is to identify the causality relationship between bank profits and operational expense for the commercial banks in Turkish banking sector. A robust time series technique, ARDL is applied by using the monthly data for the year between 2007 and 2017, which is collected from the website of Banking Regulation and Supervision Agency of Turkey. While Net Profits (PR) and Operational Expense (OE) are determined as focus variables, Total Asset (TA) and Liquidity (LQ) are chosen as control variables. The results indicate that there is long-term causality relationship between PR and OE. We found OE as an exogenous variable leading PR which is an endogenous variable. Operational expense as the most exogenous variable leads the bank profits in the long run. Findings suggest that efficient operational investments will provide more profitability. Therefore, investing in sales and marketing, new branches, advertisement, human forces, IT services which are called efficient operational cost is suggested for more profitability in the long-term.

Key Words*: Operational Expense, Bank Profit, Causality Relationship*

1. Introduction

Turkish banking sector is the second largest banking system in emerging Europe after Russia with an asset size of USD846 billion. Banking dominates the Turkish financial sector. There are 53 banks in Turkey (34 deposit banks, 13 development and investment banks, 6 participation banks) (Financial Services Sector in Turkey, 2016). The commercial banks accept demand deposits and make loans and provide other services for the public. These banks make a profit by intermediating between depositors (savers) and borrowers (investors) (Acaravci & Çalim, 2013).

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The importance of bank profitability (BP) at both the micro and macro levels has made researchers, academics, bank managements and bank regulatory authorities to develop considerable interest on the factors that affect bank profitability (Aburime, 2014).

Operational Expense (OE) is one of specific factors affecting bank profitability. OE means non-interest expense. It includes employee compensation and benefits, information technology, legal fees, consulting services, expenses associated with buildings (for new branches), security services, advertisement and etc. In a short, an operating expense is an expense a business incurs through its normal business operations.

After a comprehensive literature review, it was noticed that there is a lack of works that are exclusively focused on the causality relationship between operational expense and profitability for the years between 2007 and 2017 for Turkey.

The aim of this study by identifying the causality relationship between bank profits and operational expenses for the commercial banks in Turkey is to give policy makers a clear idea for their long-term activities on operational expense investments.

For this purpose, a time series technique, ARDL is applied. Monthly data for the year between 2007:4 - 2017:9 which is collected from the website of Banking Regulation and Supervision Agency of Turkey is used. Net Bank Profits (PR) and Operational Expense (OE) are determined as focus variables, and Total Asset (TA) and Liquidity (LQ) are chosen as control variables.

After analyzing the data, results show that there is long-term causality relationship between PR and OE. We found OE as exogenous variable leading PR, which is endogenous variable. This means that more investing in operational expense can provide more profitability for the commercial banking sector in Turkey in the long run.

The structure of this paper is as follows. After the introduction, there is a literature review, followed by the description of data and the empirical methodology. Findings of the econometric analysis are provided next and the paper ends with conclusions.

2. Literature Review

Although investigating the determinants of bank profitability for Turkey attracted great attention of some researchers, there is no enough international vastly literature for the bank

profitability. Majority of authors publishing an article for commercial banking sector are (Ozgur, 2016) and (Kaya, 2002), (Ata, 2009), (Toprak, 2016), (Atasoy, (Gülhan and Uzunlar, 2011), (Gorus, 2016), (Acaravci & Çalim, 2013) and (Aydemir & Ovenc, 2016), (Ganioğlu & Us, 2014). They used time series technique and panel data technique in their papers.

The literature generally splits the factors that influence banks' profitability into three groups; bank- specific, industry-specific and macroeconomic. The empirical literature on the determinants of bank profitability generally focuses on the internal determinants of bank profitability that use variables such as capital adequacy, size of total assets, credit risk, and liquidity ratio (Aydemir & Ovenc, 2016). On the other hand, the bank specific determinants have been more effect than the external determinants, both industry-related and macroeconomic (Acaravci & Çalim, 2013) .

In the literature, profitability of banks is generally measured by return on asset (Rachdi, 2013). ROA, which is the ratio of net income to total assets, measure how profitably and efficiently the management, is using the firm's total assets (Williams, 2003), (Ali, Akhtar, & Ahmed, 2011). It shows the profits of assets and indicates how effectively the bank's assets have been managed to generate revenues.

Operational expense is another important determinant of bank profitability. It is usually measured by the ratio of operational expense to assets because operating expenses can be considered as the performance of bank management. (Ozgur, 2016), (Kaya, 2002), (Ata, 2009), (Toprak, 2016), (Gülhan and Uzunlar, 2011), (Curak, Poposki, & Pepur, 2012) and (Munyambonera, 2013) found that operational expense has significantly negative influence over ROA. On the other hand, (Ozgur, 2016) examined that operational expenses are not statistically significant.

Liquidity ratio, which is the ratio of liquidity to total asset, presents ability power of banks again immediate shocks. Liquidity risk reflects the possible inability of bank to meet its obligations which can eventually lead to bank failure. However, higher liquidity may imply lower profitability (Curak et al., 2012). The results concerning liquidity are mixed. (Petria, Capraru, & Ihnatov, 2015), (Ozgur, 2016), (Kaya, 2002), (Gülhan and Uzunlar, 2011) find positive and significant relationship between the level of liquidity and profitability. The NIM variable is defined as the net interest income divided by total assets. NIM is focused on the profit earned on interest activities (Acaravci et al., 2016). (Garcia & Guerreiro, 2016), (Gorus, 2016), (Ozgur, 2016) estimated that NIM have positive effect on bank

profitability

Bank size (the amount of total assets) is often considered an important determinant of its profitability. Total assets of the bank is used as a proxy for its size. Larger banks are likely to have economies of scale (increased operational efficiency) and economies of scope (higher degree of product and loan diversification) advantages than smaller banks. Also some researches have shown that banks that have become extremely large exhibit a negative relationship between size and profitability due to bureaucratic and other reasons related to size (Dietrich & Wanzenried, 2014). (Bashir, 2003), (Ata, 2009), (Gülhan and Uzunlar, 2011), (Sohail, Iqbal, Tariq, & Mumtaz, 2013), (Masood & Ashraf, 2012) found positive and significant relationship between bank size and profitability. On the other hand, (Toprak, 2016), (Pasiouras & Kosmidou, 2007), (Ana & Roberto, 2011) found negative impact of bank size on profitability. (Athanasoglou, 2005) report that the effect of bank size on profitability is not important and Goddard et al. (2004) find no systematic evidence for relationship between size and performance.

Market share with bank size as a whole new trend about structural effects on bank profitability started with the application of the Market-Power (MP) and the Efficient-Structure (ES) hypotheses (Athanasoglou, 2005). (Petria et al., 2015), (Gülhan and Uzunlar, 2011), (Atasoy, 2007) , (Gorus, 2016) and (Curak et al., 2012) estimated that market share has positive influence on bank profitability. On the other hand, (Ozgur, 2016), (Bourke, 1989) found insignificant relationship for Commercial Banking Sector for Turkey. A rather interesting issue is whether the ownership status of a bank is related to its profitability. However, little evidence is found to support the theory that privately-owned institutions will return relatively higher economic profits (Athanasoglou, 2005), (Garcia & Guerreiro, 2016), (Pasiouras & Kosmidou, 2007). (Hasan & Dridi, 2010), (Bashir, 2003) examines the performance of Islamic banks (IBs) and conventional banks (CBs) they suggests that IBs have been affected differently than CBs. (Gorus, 2016), (Eyceyurt Batir, Volkman, & Gungor, 2017) estimated the effects of bank specific factors on profitability of Islamic banks in Turkey and (Gorus, 2016) found that NIM, and MS have positive effect on bank profitability.

3. Data, Model and Methodology

The purpose of this study is to identify the causality relationship between bank profits and

operational expenses for the commercial banks in Turkey. For this purpose, time series technique, ARDL is applied.

Monthly data for the year between 2007:4 - 2017:9 which is collected from the website of Banking Regulation and Supervision Agency of Turkey is used. Net Bank Profits (PR) and Operational Expense (OE) are determined as main variables, and Total Asset (TA) and Liquidity (LQ) is chosen as control variables. According to findings in literature, our expectation regarding profitability and operational cost is negative correlation.

Table 1: Variables for the Model

Variables	**Description**	**Source**
Net Profit (PR)	Net profit after tax (monthly)	BDDK
Total Asset (TA-Size)	Total asset of balance sheet (monthly)	BDDK
Liquidity (LQ)	Liquid Assets (average of monthly and yearly liquid assets)	BDDK
Operating expense (OE)	Operational expenses without interest and tax expenses	BDDK

Unit Root Test

Before applying the technique, it is critical to test the stationary of the variables involved. Other co-integration techniques require all the variables to be stationary at the level form, ARDL allows mixture of stationary at the level form.

Table: 2 Augmented Dicky Fuller (ADF) Test

Variables in Level Form			
Variable	T-Stat	C.V.	Result
LTA	-3,3094	-3,4475	STATIONARY
LPR	-6,1479	-3,4475	NON-STATIONARY
LOE	-6,5167	-3,4475	NON-STATIONARY
LLQ	-1,9026	-3,4475	STATIONARY

Variables in Difference Form			
Variable	T-Stat	C.V.	Result
DTA	-5,8381	-2,8857	STATIONARY
DPR	-8,2058	-2,8857	STATIONARY
DOE	-12,4277	-2,8857	STATIONARY
DLQ	-7,3283	-2,8857	STATIONARY

Note: Null: Non-Stationary. Alternative: Stationary

The result obtained from the three unit root tests indicates that some variable are stationary at the level form and all variable are stationary at the difference form. Additionally, there is no need to test variables with other test methods because we found some variables are stationary and we decided to use ARDL method.

Why ARDL Model?

Because the variables used in the study are mixed consisting of the non-stationary and stationary at level form variables, we decided to use this approach due to some benefits of ARDL.

ARDL (Auto-Regressive Distributive Lag) is applicable irrespective of whether the variables are stationary or non- stationary at their level form. Second, it is suitable and robust for a small size data sample to estimate and test the hypotheses on the long run coefficients.

ARDL MODEL (2,2,2)

In our study, following ARDL model is constructed to reveal the relationship between especially operational expense and profitability of all commercial banks. For the base model, net profits were taken as a dependent variable of this study.

$$DPR_t = \alpha_0 + \sum_{i=1}^{k} b_1 DPR_{t-i} + \sum_{i=0}^{k} b_2 DOE_{t-i} + \sum_{i=0}^{k} b_3 DLQ_{t-i} + \sum_{i=0}^{k} b_3 DTA_{t-i} + (LPR - LOE - LLQ - LTA)_{.t-1} + u_t$$

Other Models;

$$DOE_t = \alpha_0 + \sum_{i=1}^{k} b_1 DPR_{t-i} + \sum_{i=0}^{k} b_2 DOE_{t-i} + \sum_{i=0}^{k} b_3 DLQ_{t-i} + \sum_{i=0}^{k} b_3 DTA_{t-i} + (LPR - LOE - LLQ - LTA)._{t-1} + u_t$$

$$DLQ_t = \alpha_0 + \sum_{i=1}^{k} b_1 DPR_{t-i} + \sum_{i=0}^{k} b_2 DOE_{t-i} + \sum_{i=0}^{k} b_3 DLQ_{t-i} + \sum_{i=0}^{k} b_3 DTA_{t-i} + (LPR - LOE - LLQ - LTA)._{t-1} + u_t$$

$$DTA_t = \alpha_0 + \sum_{i=1}^{k} b_1 DPR_{t-i} + \sum_{i=0}^{k} b_2 DOE_{t-i} + \sum_{i=0}^{k} b_3 DLQ_{t-i} + \sum_{i=0}^{k} b_3 DTA_{t-i} + (LPR - LOE - LLQ - LTA)._{t-1} + u_t$$

VAR Order Selection

Before proceeding with the test of cointegration, determining the order of the vector autoregression is normally not necessary when using an ARDL approach because the process itself finds an individual lag for each variable.

Table 3: The Order of the VAR Model

Order	AIC	SBC
2	571,9518	521,6276
0	553,3452	547,7536

Note: Leg order has been selected based on highest value of AIC and SBC.

Results indicates that AIC recommends order of two whereas SBC says no lag. It will be more efficient to select the result (2 lag) according to AIC because the SBC is more concerned on over-parameter.

Long Term Relationship Between Variables

We can say that ARDL has 2 important stages. The first stage involves the testing for an existence of a long-run relationship between the variables. The second stage involves the estimation of the long-run coefficients.

First Stage: The first stage involves the testing for an existence of a long-run relationship

between the variables. This is done by computing the F-statistic to test the joint significance of the lagged levels of the variables in the error correction form of the ARDL model. The computed F-statistic is then compared to two asymptotic critical values. If the F-statistic happened to fall below the lower critical value, the null hypothesis of "no long-run relationship" is accepted regardless of the variables being I(1) or I(0). Conversely, if the F-statistics goes beyond the upper critical value, the null hypothesis of 'no long- run relationship' is rejected despite the variables being I(1) or I(0). However, if the test statistics falls in between the two critical values, the result is said to be inconclusive. If there is at least one significant F-statistic in the error-term equation, we can say that the long-run relationship between the variables is present.

Table 4: F-Statistics for Testing the Long-Run Relationship (ARDL)

Variable	F-stat	Lower B.	Upper B.	Cointegration
TA	1,0527	**3.539**	**4.667**	No
PR	11,7504	**3.539**	**4.667**	Yes
OE	11,1924	**3.539**	**4.667**	Yes
LQ	1,6898	**3.539**	**4.667**	No

The above table shows the calculated F-statistics are higher than the upper bound 4.667 for PR and OE, considering 5% significance level. This means 2 co-integrations in the long run.

The economic implication of this result is the variables long-run relationship exists between focus variables in Turkey.

Second Stage: The second stage involves the estimation of the long-run coefficients. The result for co-integrating relationship, however, does not reveal any short-run dynamics between the variables. There is a possibility for the variables to deviate from one another in the short run. Since it does not unfold the short-run adjustment process in bringing the long run equilibrium.

In order to estimate the adjustment coefficients of the error-correction term, corresponding error-correction term is estimated. A value of zero implies that there is no long-run relationship between the variables, while a value that falls between the ranges of 0 to -1

shows the existence of partial adjustment. A positive value implies the system is moving away from the equilibrium in the long run, and conversely, a value smaller than -1 indicates the model over adjusts in the current period.

The error correction version of the model is as follows:

Table 5: The error correction results of the Model

Variables - ecm1(-1)	Coefficient	Standard Error	T-Ratio [Prob.]	Result
LOE	-0,05609	0,047237	-1.1874[.238]	Exogenous
LPR	-0,096369	0,044108	-2.1848[.031]*	Endogenous
LTA	-0,05041	0,029218	-1.7253[.087]	Exogenous
LLQ	-0,14214	0,057719	-2.4626[.015] *	Endogenous

**significance at 5% level*

The p–value of the ECM coefficient that is less than our 5% significance level for Liquid assets (LQ) and Net Profits (PR) indicates that they are endogenous. This confirms that profit, which is endogenous, can be affected from exogenous variables, which are operational expenses and the total asset. We can say that operational expenses leads bank profits. On the other hand, VECM gives only absolute endogeneity and absolute exogeneity. It does not mention about relative exogeneity/endogeneity.

Variance Decompositions (VDC)

The test of variance decomposition (VDCs) determines the level of exogeneity and endogeneity among the variables, which are estimated by the proportion of the variance examined by its own past. This is normally not a regular step for an ARDL approach. It provides the ranking of variables.

There are two different ways in executing VDCs, which are, the orthogonalized VDCs and generalized VDCs. The generalized VDCs is more powerful tool. Because orthogonalized VDCs assumes that when a particular variable is shocked, other variables in the system are switched off. Second is it does not generate a unique solution, in which it depends on the ordering of the variables in VAR. Comparatively, the generalized VDC does not depend

on the particular ordering of VAR and no such assumption that other variables are switched off is made.

Thus, Table 6 tabulates the result obtain from applying the generalized VDC.

Table 6: Generalized VDC (15 Months)

Variables	Horizon	LTA	LPR	LOE	LLQ
LTA	15	91%	1%	1%	34%
LPR	15	89%	87%	3%	5%
LOE	15	94%	3%	92%	4%
LLQ	15	79%	2%	34%	2%

Table 6: Generalized VDC (30 Months)

Variables	Horizon	LTA	LPR	LOE	LLQ
LTA	30	77%	2%	1%	32%
LPR	30	87%	86%	3%	6%
LOE	30	94%	3%	92%	4%
LLQ	30	53%	3%	37%	2%

Table 6: Generalized VDC (50 Months)

Variables	Horizon	LTA	LPR	LOE	LLQ
LTA	50	71%	2%	2%	25%
LPR	50	87%	85%	4%	6%
LOE	50	94%	3%	92%	4%
LLQ	50	37%	3%	46%	2%

Our findings at the end of forecast horizon period for 15, 30 and 50 months indicate that Liquidity is the most endogenous variable and Operational Expense is the most exogenous variable. On the other hand, Bank Profit is in the third order for 15 months, and it is in the second order for the 30 and 50 months. This strengthens our previous findings. We can say that operational expense has impact on the bank profit. But, this effect may not be high.

Policy makers can focus on efficient operational costs to affect and control the profits. This normally is contradicting with general rule regarding relation between cost and profit. However, it is very logical when we consider the banking structure. More branches and sale forces can bring more customers and indirectly more profit for the banks.

Impulse Response Analysis

IRF produces the same result as the VDCs except that it was produced in a graphical form.

When we look at the graphs, it can be seen easily that operational expense and profits go together along the long term when we apply variable shocks on OE. These results support our previous findings and show that there is positive and high correlation between 2 focus variables of this study. This information is very important for Bank Management to decide investment areas. We can easily say that high quality and efficient operational investments will bring more profit accordingly.

Figure 1: Shocks to Net Profit Amount of the Banks

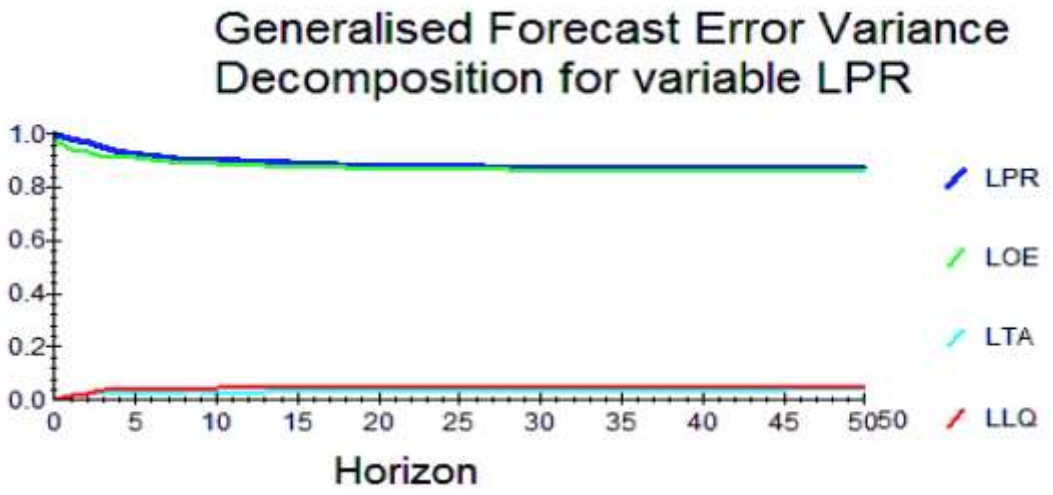


Figure 2: Shocks to Operational Expenses of the Banks

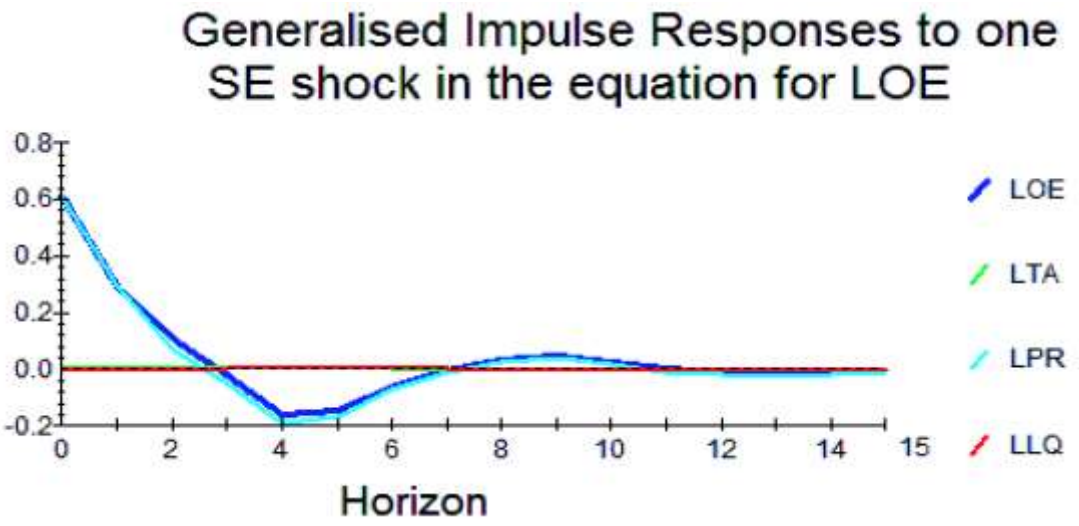


Figure 3: Shocks to Total Assets of the Banks

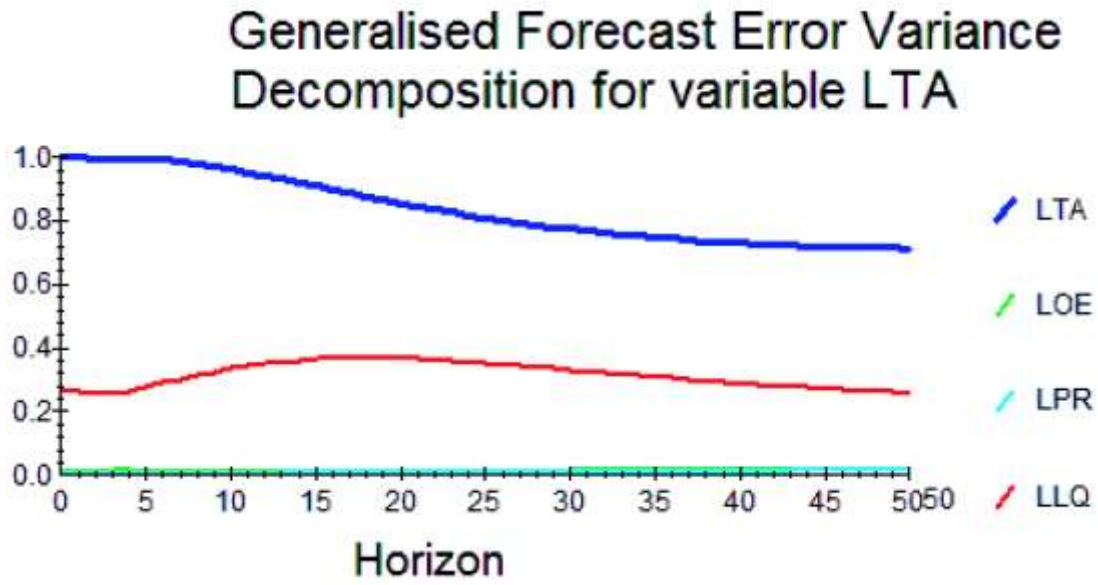
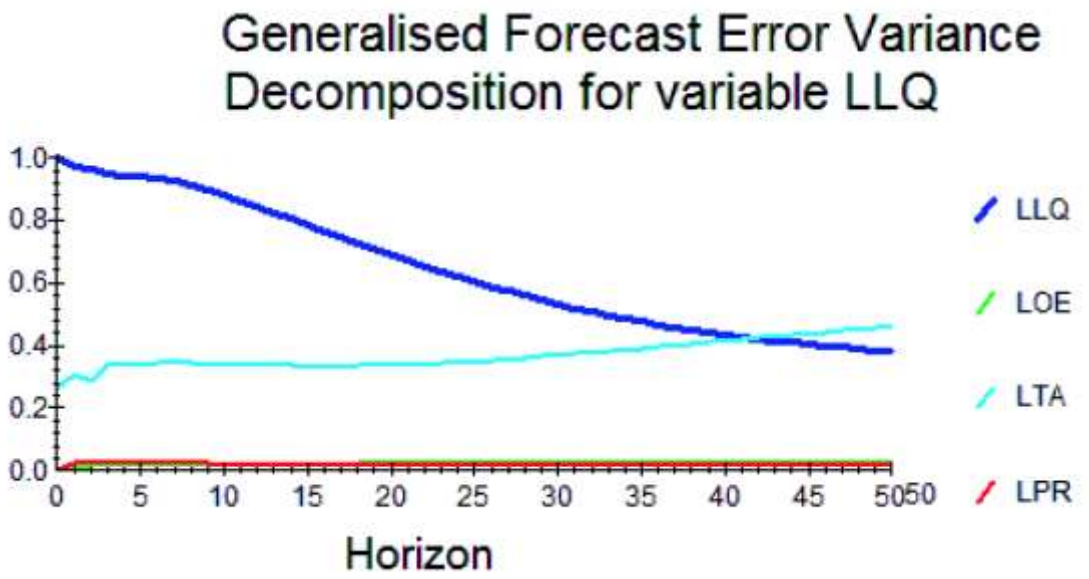


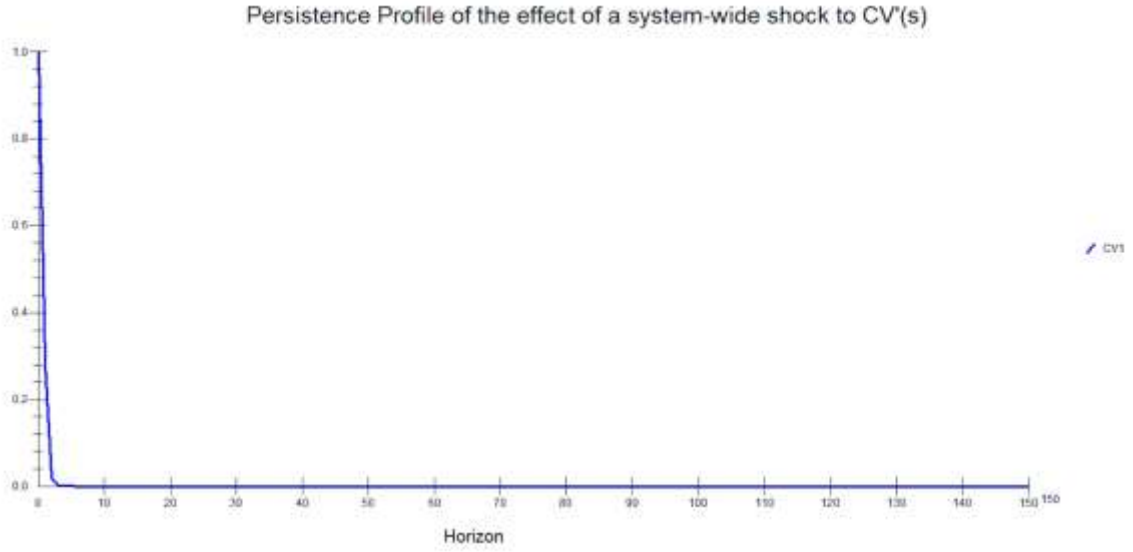
Figure 4: Shocks to Liquid Assets of the Banks



Persistence Profile (PP)

The persistence profile illustrates the situation when the entire co-integrating equation is shocked, and indicates the time for the relationship to get back to equilibrium. The chart below shows the persistence profile for the co-integrating equation of this study.

Figure 4: Persistence Profile (PP)



The chart indicates that it would take approximately 3 or 4 months for the cointegrating relationship to return to equilibrium following a system-wide shock. This is a very short term for equilibrium and it can be considered positive for the system.

5. Conclusions and Policy Implications

There is a long-term causal relationship between bank profits and operational expenses for the commercial banks in Turkey. Operational expense as the most exogenous variable leads the bank profits in the long run.

Findings are very logical and meaningful because operational expense is very important to attract more customer and customer satisfaction. More customer with satisfaction means more profitability for the banking sector.

The main cost sources for banks are interest expenses of depositors and operational expenses. Interest cost is mostly beyond the control of the banking sector and it depends on macro-economic factors. Operational expenses can be controlled and managed more easily compared to interest expense. Therefore, discriminating the function of interest expenses and non-interest expenses for profitability plays an important role to understand the importance of operational expenses management for efficient investment in the long term.

Findings suggest that efficient operational investments will provide more profitability. Therefore, investing in sales and marketing, new branches, advertisement, human forces, IT services which are called efficient operational cost is suggested for the profitability in the long run.

On the other hand, regulatory bodies like government and private agencies regulating and controlling the sector can give more attention to high quality and efficient operational expense tools, methods, strategies for profitability and stability of the sector.

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