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Research Article

Financial Stability and Creating Financial Stability Index for Turkey

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ABSTRACT

This study aims to create an index, which will be used for monitoring financial stability for Turkey. For this purpose, firstly the concept of financial stability was defined. As a result of the literature review, the variables considered to give information about financial stability were examined and the variables were grouped by principal component analysis. Finally, generated factors were subjected to logistic regression. The variables which were examined in the study include a total of 57 quarters, which is between the second quarter of 2003 and the second quarter of 2017. Three different dependent variables were used in the logistic regression analysis, each of which was formed by taking into consideration the "break points" in the independent variable series. All variables included in the financial stability index were standardized. The financial stability index was formed with the results obtained by the logistic regression analysis, and then; the contribution of the variables to financial stability was interpreted. It will be possible that the stakeholders in the financial system have information about the expected change in the level of financial stability by monitoring the variables which were examined and used in the analysis.

Keywords:

Financial Stability, Financial System, Financial Crisis, Financial Stability Index, Logistic Regression

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1. Introduction

There is no definitive definition of the concept of financial stability or financial instability. However, it is observed that the definitions of the financial crisis, financial stress, and financial distress are utilized to explain the stability or instability in the financial system. In addition, reviewing studies about financial stability makes this concept more understandable.

When a financial system has effective allocation of economic resources both spatially and intertemporally, and it is possible to operate all economic processes effectively even if there are external shocks or economic imbalances in the financial system, that means that the financial system is stable (Schinasi, 2004).

Schinasi (2004) made a definition of the situation of financial stability and stated that; financial resources are effectively distributed across time and space, all economic processes operate effectively, and even external shocks and economic imbalances can be managed without causing disruption in the financial system.

If the institutions in the financial system can meet the contractual obligations by their skills, the market has full confidence in institutions, and there is a lack of change in the prices at the periods of the short trade, then the financial system has stability (Göker, 2009:11).

Özince (2005:18) stated that financial stability depends on people's fulfillment of debt payments, therefore, it is human-oriented and because of this reason, the future of the financial sector is uncertain.

The financial stability is a condition; where the financial system withstands shocks and continues to channel savings into investments and provide effectiveness and safety of the payment mechanism (Padoa-Schioppa, 2003).

The Central Bank of the Republic of Turkey has published a report in 2015 about financial stability. In this report, financial stability is described as an indicator of sustainable trust against the financial system both on country basis and global basis; the financial instability is defined as the sudden and extreme fluctuations in the asset price, the disruption in the functions of the financial institutions and the deterioration in the functioning of the national or international credit system. According to the report, the sources of financial instability (TCMB, 2015:8-13):

- National and Global Factors
 - Macroeconomic reasons
 - Insufficient regulation processes
 - Capital flows
 - Current account imbalances
 - Financial innovations
- Risks that may arise in the Financial System
 - Credit risk

- Liquidity risk
- Market risk
- Operational risk
- Other risks

The aim of this study is to create an index; in which it is possible to observe the changes in financial stability of Turkey. For this purpose, the studies on financial stability and financial stability index were examined. Therefore, the researcher decided which of the variables and the methods will be used. After determining the appropriate data set, the Financial Stability Index was established by using logistic regression analysis.

2. Literature

The International Monetary Fund (IMF) (2006) published a guideline named “Financial Soundness Indicators” as the compilation guide of financial stability. Oosterloo, de Hann and Jong-A-Pin (2007:338), studied financial stability reports from different countries and stated that indicators published by the IMF are reflected in financial stability reports by 33% on average.

Van Den End (2006)’s study included Netherlands and nother six OECD member countries and suggests that financial stability indicator should contain information about financial institutions, markets and infrastructure. Van Den End stated that, financial conditions index (FCI) and monetary conditions index (MCI), which perform a comparable function for monetary policy is useful as an information variable about financial stability. He used real interest rate, real effective exchange rate, house price and stock market value while creating the index and the FCI for the Netherlands was extended with data on banks, pension funds and insurers, to construct a Financial Stability Conditions Index. In the study, VAR model was used to assign the weights of the variables in the index.

Illing and Liu (2006) developed the financial stress index for the Canadian financial system. Extreme values were called as financial crisis. They constructed three alternative measures of financial stress. First one is standard measure; which includes banking, foreign exchange, debt and equity markets. The second measure is called “refined measure” and researchers have an idea that the information about stressful periods will be provided better by refining the variables. Last one is GARCH estimation techniques. The Financial Stress Index (FSI) includes the equity markets, bond markets, foreign exchange markets, and the banking sector. At the end, credit-weighted standard-variable index has good performance and chosen as the FSI for Canada.

Gençay (2007) analyzed the relationship between financial dollarization and financial stability for Turkey. For this purpose, Gençay used depository financial institutions, other financial institutions, real sector, households, market liquidity and macroeconomic indicators as financial stability elements, and found that there is a negative relationship between dollarization and financial stability.

Wong, Wong, & Leung, (2007) created a leading indicator model for Hong Kong and other EMEAP (Executives' Meeting of East Asia-Pacific Central Banks) economies. They used quarterly data and the data set covers from 1990 Q2 to 2007 Q1 period. Researchers state that some indicators can be useful as leading indicators to reflect banking distress. According to this perspective, weakening macroeconomic fundamentals, an increase in money supply relative to foreign reserves, deteriorations in the creditworthiness of banks and companies are some important leading indicators. The explanatory variables in the model have a lag length of at least by three periods so the model could produce forecasts three periods ahead.

Hakkio and Keeton (2009) formed the Kansas Financial Stress Index in their study. To decide if the index should contain a variable or not, they determined several criteria. Firstly, each of the variables used should reflect at least one of the five criteria that they determined as the indicators of financial stress. Secondly, that each variable should reflect the prices or returns in the financial markets and returns contain the largest amount of information and reflect changes in financial conditions most rapidly. Thirdly, each variable supposed to be available at least on a monthly basis; and lastly, the variables should be accessible after 1990. Which variables meet these criteria are included in the index and the index cover the years by 1990 to 2009. The index was examined in terms of reflecting past crises and it was stated which crises took place at the peak points formed in the index.

Morales and Estrada (2010) defines Financial Stability Index as a continuous and quantifiable measurement, which can be used to determine the stress level. For measuring the stress level of Colombian Financial System, capital, liquidity, credit risk and return ratios of financial institutions in Colombia such as commercial banks, mortgage banks, commercial financial companies and financial cooperatives have been used. Monthly data was used for the period between January 1995 to November 2008. The study included data such as return on assets, return on equity, ratio of non-performing loans to total portfolio, ratio of net loan losses to total loan portfolio, intermediation spread, ratio of liquid liabilities to liquid assets, ratio of interbank funds to liquid assets, uncovered liabilities ratio, the number of financial institutions with high stress level per period for 170 different financial institutions. Variance-equal weight method, principle components and qualitative response approach have been used for combining the variables into a single index. To find the explanatory variables' weights, Probit model estimation was used.

Cheang and Choy (2011) constructed an aggregate financial stability index (AFSI) for the banking sector in Macao for the period of 1996 to 2010 with quarterly frequency data. The AFSI included three sub-indices, which were named as Financial Soundness Index, Financial Vulnerability Index and Regional Economic Climate Index. Financial soundness index included capital adequacy, asset quality, liquidity and profitability; financial vulnerability index included external sector, financial sector and real sector.

Masud and Haq (2016) collected the data mainly from the annual reports of banks and conducted a research to measure the financial soundness of five private commercial banks of Bangladesh for the period of 2006 to 2014. For the purpose of predicting future economic condition; trend of number of branches, trend of number of employees, trend of deposit, trend of loans and advances, trend of net income, trend of investment, trend of ROA and trend of ROE were used.

Gezer and Kılıç (2020), investigated the relationship between Financial Stability and Real Economy for Turkey for the quarterly period of 2004-2017. For the financial stability index, they used the variables of Financial Development Index, Financial Vulnerability Index, Financial Soundness Index, and World Economic Climate Index that Morris (2010) defined as Aggregate Financial Stability Index indicators. To analyze the stability and instability situations, they used the non-linear ARDL model and Hatemi-J causality tests. In a conclusion, the researchers found that financial stability has an effect on the real economy more than financial instability.

3. Methodology

3.1. Variables

The data frequency is quarterly and covering a total of 57 quarter periods from 2003 Q2 to 2017 Q2. Variables are collected from Central Bank of the Republic of Turkey (CBRT), Turkish Statistical Institute, Republic of Turkey Ministry of Treasury and Finance, The Banks Association of Turkey and Financial Information News Network (FINNET) data sources. The variables included in the analysis which are considered to have an effect on financial stability and are therefore included in the analysis are summarized under five headings and the abbreviations used in the analysis are shown in Table 1:

Deposit Takers	Capital adequacy standard ratio	DT 1
	(Nonperforming loans - Provisions) / Capital	DT 2
	Nonperforming loans / total loans	DT 3
	Return on assets	DT 4
	Return on equity	DT 5
	Other Operating Expenses / Net Operating Income	DT 6
	Liquid assets to total assets	DT 7
	Liquid assets to short-term liabilities	DT 8
	FX Net General Position / regulatory capital standard ratio	DT 9
	Return on equity / Return on assets	DT 10
Balance of Payments Report	Current account balance / Gross domestic product (GDP)	BOP 1
	Short-term external debt / Foreign exchange reserves	BOP 2
	Terms of Trade	BOP 3
Public Sector	Total debt stock / GDP	PS 1
	Budget balance / GDP	PS 2
	Net new domestic borrowing / Domestic debt stock	PS 3
	Interest payment of domestic debt / Tax income	PS 4
Non-Financial Corporations	Total Debt / Equity	NFC 1
	Return on equity	NFC 2
	Return on assets	NFC 3
	Return on equity / Return on assets	NFC 4
Global Scaled Indicators	TED Spread	G TED
	VIX	G VIX
	XU 100	G XU
	MSCI	G MSCI
	OECD Composite leading indicators	G OECD

Table 1. Independent Variables in Financial Stability Index and Abbreviations of Variables

Some of the variables defined in the above table are excluded from the model in accordance with the results of the analysis conducted in order to establish a financial stability index. In the following passages of the study, the variables included in the financial stability index are explained and interpreted.

3.1.1. Deposit Takers

The intermediary institutions which are one of the most important elements of the financial system provide the transfer of the surplus funds of individuals and institutions to other individuals and institutions who needs funds. While funds are provided to those who need them, the correct evaluation of risks is very important, otherwise the financial system may be troublesome. One of the most important reason of the crisis that started in the US housing markets in 2008 is the fact that even individuals with a high risk of default had high creditworthiness, meaning that the risks were not evaluated correctly and accordingly, that there were mistakes in the transfer of funds. For this reason, it is aimed to obtain information about the relationship between financial stability and intermediation activities by analyse deposit taker institutions activities. The variables used about deposit takers are: Capital adequacy standard ratio, nonperforming loans net of provisions/capital, ratio of nonperforming loans (non-performing loans/total loans), return on assets, return on equity, other operating expenses/net operating income, liquid assets to total assets, liquid assets to short-term liabilities, foreign currency net general position/equity standard ratio, return on equity/return on assets.

3.1.2. Balance of Payments

The Balance of Payments Report is a periodical report in which economic transactions are recorded between residents of a country and residents of different countries. Balance of payments variables were used to have information about Turkey's foreign currency acquire capability. If the debts and receivables of the firms in the import and export sector are in foreign currency, when these firms have open exchange position, the sudden exchange rate fluctuations may cause them to fall into default. Therefore, firms should pay attention to avoiding exchange rate risks. While creating financial stability index, variables created by using balance of payments are also included to the analysis. These variables are: Current account balance/GDP, Short-term external debt/Foreign exchange reserves and terms of trade.

3.1.3. Public Sector

For searching the effect of public sector variables such as public debt, public income and public expense on financial stability; some variables were added to analysis. The variables are: Total debt stock/GDP, budget balance/GDP, net new domestic borrowing/domestic debt stock and interest payment of domestic debt/tax income.

3.1.4. Non-Financial Corporations

The variables under this heading are: Total debt / equity, return on equity, return on assets, return on equity/return on assets. These variables are about the basic data on non-financial institutions and includes the data about non-financial corporations in XU 100 index. The relationship of these variables with financial stability and the effects of these variables on the financial stability index were analysed in this research.

3.1.5. Global Scaled Indicators

As a result of the developments in the fields of technology and transportation, both capital transfer and product-goods and even service transfer have been facilitated

and accelerated. Today, due to the high interaction between countries, individuals and institutions, financial troubles and crises have set off other crises. A financial crisis that may occur is likely to affect financial markets at global level. For this reason, it is necessary and useful to analyse the global scaled indicators for monitoring financial stability. These variables are: TED Spread, VIX, XU 100, MSCI and OECD Composite leading indicators .

3.2. Logistic Regression Analysis

Hair et al. (2014) states that logistic regression as which the dependent variable in a regression is nonmetric and binary. In the same study, they stated that logistic regression analysis may be preferred because of two reasons:

Discriminant analysis are based on strictly meeting the assumptions, such as multivariate normality and equal variance-covariance matrices between groups; however logistic regression analysis does not need that strict assumptions. Even in many situations where these assumptions are not met, applying logistic regression analysis is more appropriate.

Logistic regression is similar to multiple regression. Because of this similarity, many researchers prefer to apply logistic regression even the assumptions are met. The logistic regression is a comprehensive analysis in which metric, non-metric and nonlinear variables can be used together.

The equation of logistic regression is given below :

$$\text{Log } Y_1 = X_1 + X_2 + X_3 + \dots + X_n$$

- $\text{Log } Y_1$: It consists of binary and nonmetric values.
- $X_1, X_2, X_3, \dots, X_n$: It may consist of both metric values and nonmetric values.

3.2.1. Defining the Dependent Variable

The lack of a clear definition of the concept of financial stability causes the problem of not having an exact and easy measurement of financial stability. The dependent variable used in the logistic regression analysis was formed by using the independent variables which are thought to have an effect on financial stability. Dependent variable will give information about in which periods have financial stability and which periods do not.

The relationship between financial crisis and breakpoints has also been stated in different articles (Guidolin and Tam (2013), Gerlach, R., Wilson, P., & Zurbrugg, R. (2006)). The financial crisis and the financial instability do not have the same meaning however the breakpoints at the time series show the change of the trend, so it will be assumed that the breakpoints show instability.

To generate the dependent variable, firstly, the breakpoints of each independent variable was determined. The EViews 9 program was used to determine the breakpoints of the variables, and the Augmented Dickey-Fuller (ADF) unit root test was performed according to Schwarz criteria.

After determining the breakpoints of the variables, dependent variable were formed with the assumption that these breakpoints indicate the situations in which there is

not financial stability. Three different dependent variables were created and logistic regression analysis was performed for each dependent variable. Thereafter, financial stability index was created. If any independent variable have any break in the quarter, it means that quarter has financial instability. This assumption was used to create the first dependent variable. The assumption for creating second dependent variable is: When more than one independent variable has break in the quarter, it means that quarter has financial instability. The assumption for creating third dependent variable is: When more than two independent variables have break in the quarter, it means that quarter has financial instability. The quarters; which have break, numbered "1"; which have not break, numbered "0".

The categorically dependent variable created for this study is expressed as "Log Y" and is shown as follows.

$$\text{Log } Y = \begin{cases} 0, \text{Financial Stability} \\ 1, \text{Financial Instability} \end{cases}$$

The logistic regression equation is shown and explained as follows (Gujarati, 2004: 596) :

$$Li = \ln \left(\frac{Pi}{1 - Pi} \right) = \beta_1 + \beta_2 X_i$$

Li : Refers the logistics value of the logistic model.

β_1 : Refers the fixed value of the equation.

$\beta_2 X_i$: The slope (β_2), measures that the change on "L" based on each unit change in variable "X" and indicate the effect of unit change in "X" to the effect on actualization of event (the "1" value of the dependent variable).

In this equation, $\left(\frac{Pi}{1 - Pi} \right)$ ratio is called as "Odds Ratio". "Pi" is the value of the dependent variable. In the equation, "P" value can be between 1 and 0, and "L" value can be between $-\infty$ and $+\infty$. In addition, while "L" value is linear for X, probability values are not linear. If the logistic value is positive, with the increase in the value of the independent variables, the odds value will get closer to 1, and if the logistic value is negative, with the increase in the value of the independent variables, the odds value will get closer to 0.

3.2.2. Defining Factors Using Independent Variables:

In order to prevent problems that may occur due to the large number of variables, all the independent variables were grouped by using the principal component analysis method.

Büyüköztürk (2012:125) stated that, if a variable takes place in more than one factor; the factor, where the variable has the highest weight is selected if only the difference with the weight of the same variable's in another factor is at least 10 percent in absolute value. When a variable is loaded on a similar weight to two or more different factors, factor analysis restarted with excluding the variable.

As a result of the analysis performed, variables included in multiple factors were excluded from the analysis. In the results of the analysis, five different group of factors, which are thought to affect financial stability were formed. These five factors

were used as independent variables of the study and named as F1, F2, F3, F4 and F5. Factors and the variables in the factors are shown in Table 11.

3.2.3. First Model

The first dependent variable represents the periods, which at least one independent variable has break. The results of logistic regression analysis are given in Table 2.

Variables in the Equation							
	B	S.E.	Wald	Df	Sig.	Exp(B)	
Step 1 ^a	F1	.756	.436	3.004	1	.083	2.131
	F2	-1.548	.922	2.822	1	.093	.213
	F3	-1.159	.448	6.690	1	.010	.314
	F4	.805	.429	3.525	1	.060	2.236
	F5	-2.064	.690	8.947	1	.003	.127
	Constant	-.924	.498	3.444	1	.063	.397

a. Variables entered on step 1: F1, F2, F3, F4, F5.

Table 2. Results of First Logistic Regression Analysis: Significance of Variables

The result of equation shows that F1, F2, F3 and F4 variables are significant at 10% level, and the variable F5 is significant at 1% level. The equation, which includes five variables is given below:

$$\text{Log } Y_1 = F1 (0.756) + F2 (-1.548) + F3 (-1.159) + F4 (0.805) + F5 (-2.064) - 0.924$$

The possibility of estimating the financial stability of the model by including the independent variables is 82.5% as seen in the table below. With this model, 17 out of 23 financial instability cases could be estimated. Furthermore, 30 out of 34 financial stability periods were estimated.

Classification Table ^a					
	Observed		Predicted		
			1. Dependent Variable		Percentage Correct
	Financial Stability	Financial Instability	Financial Stability	Financial Instability	
Step 1	1. Dependent Variable	Financial Stability	30	4	88.2
		Financial Instability	6	17	73.9
	Overall Percentage				82.5

a. The cut value is .500

Table 3. Logistic Regression Analysis Classification Table: 1. Model, Step 1

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	40.892	.468	.632

Table 4. The Description Power of Model

The table 4 is represents the description power of model. Cox&Snell R Square shows that the model has 46.8 percent predictive power. Nagelkerke R Square, which expressed as a more reliable value (Kemalbay and Korkmazoğlu, 2014:734) shows that the model has 63.2% predictive power. Table 3 shows that, estimation of dependent variable by using independent variables have 82.5% accuracy rate.

3.2.4. Second Model

The second dependent variable represents the periods, which at least two independent variables have breaks. According to the results of the logistic regression analysis, the variable F2 is not significant, therefore another analysis was performed after excluding the variable F2 from the model. The results of logistic regression analysis are given in the table 5.

Variables in the Equation						
	B	S.E.	Wald	df	Sig.	Exp(B)
F1	1.204	.561	4.616	1	.032	3.334
F3	-1.387	.628	4.885	1	.027	.250
Step 1 ^a F4	.964	.423	5.194	1	.023	2.622
F5	-1.148	.510	5.074	1	.024	.317
Constant	-1.688	.572	8.704	1	.003	.185

a. Variables entered on step 1: F1, F3, F4, F5.

Table 5. Results of Second Logistic Regression Analysis: Significance of Variables

The result of equation shows; F1, F3, F4 and F5 variables are significant at level 5%. The equation, which includes that four variables is given below:

$$\text{Log } Y_2 = F1 (1.204) + F3 (-1.387) + F4 (0.964) + F5(-1.148) - 1.688$$

The possibility of estimating the financial stability of the model by including the independent variables is 91.2% as seen in the table below. With this model, 12 out of 16 financial instability cases could be estimated. Furthermore, 40 out of 41 financial stability periods were estimated.

Classification Table ^a					
	Observed	Predicted			
		2. Dependent Variable		Percentage Correct	
		Financial Stability	Financial Instability		
Step 1	2. Dependent Variable	Financial Stability	40	1	87.6
		Financial Instability	4	12	75.0
	Overall Percentage				91.2

a. The Cut Value is .500

Table 6. Logistic Regression Analysis Classification Table: 2. Model, Step 1

Model Summary				
Step	-2 Log likelihood	Log Cox & Snell R Square	Nagelkerke R Square	R
1	37.818	.408	.587	

Table 7. The Description Power of Model

Cox & Snell R Square shows that the model has 40.8 percent predictive power. Nagelkerke R square shows that the model has 58.7% predictive power.

3.2.5. Third Model

The third dependent variable represents the periods, which at least three independent variables have breaks. According to the results of the logistic regression analysis, the variables F2 and F4 are not significant, so another analysis was performed after excluding these variables from the model. The results of logistic regression analysis are given in the Table 8.

Variables in the Equation						
	B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1 ^a						
F1	.994	.527	3.551	1	.059	2.701
F3	-1.203	.425	8.006	1	.005	.300
F5	-1.286	.508	6.404	1	.011	.277
Constant	-2.142	.608	12.413	1	.000	.117

a. Variables entered on step 1: F1, F3, F5.

Table 8. Results of Third Logistic Regression Analysis: Significance of Variables

The result of equation shows; variable F1 is significant at level 10%, variable F3 is significant at level 1% and the variable F5 is significant at level 5%. The equation, which includes that three variables is given below:

$$\text{Log } Y_3 = F1 (0.994) + F3 (-1.203) + F5 (-1.286) - 2.142$$

The possibility of estimating the financial stability of the model by including the independent variables is 86% as seen in the table below. With this model, 6 out of 12 financial instability cases could be estimated. Furthermore, 43 out of 45 financial stability periods were estimated.

Classification Table ^a				
	Observed	Predicted		
		3. Dependent Variable		Percentage Correct
		Financial Stability	Financial Instability	
Step 1	3. Dependent Variable	43	2	95.6
	Financial Stability			
	Financial Instability	6	6	50.0
	Overall Percentage			86.0

a. The Cut Value is .500

Table 9. Logistic Regression Analysis Classification Table: 3. Model, Step 1

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	37.050	.316	.491

Table 10. The Description Power of Model

Cox&Snell R Square shows that the model has 31.6 percent predictive power. Nagelkerke R square shows that the model has 49.1% predictive power.

3.3. Variable's Effect on Financial Stability

As a result of the logistic regression analysis, the effect of the variables on financial stability was determined. Table 11 shows the direction of the effects of variables and factors on financial stability.

Variable	Abbreviation	Factor Number	Effect on Factor	Effect on Logistic Regression	Effect on Financial Stability
Capital adequacy standard ratio	DT 1	2	+	-	+
(Nonperforming loans - Provisions) / Capital	DT 2	1	-	+	+
Nonperforming loans / total loans	DT 3	2	+	-	+
Return on assets	DT 4	4	+	+	-
Return on equity	DT 5	4	+	+	-
Other Operating Expenses / Net Operating Income	DT 6	5	+	-	+
Liquid assets to total assets	DT 7	1	+	+	-
Liquid assets to short-term liabilities	DT 8	1	+	+	-
Short-term external debt / Foreign exchange reserves	BOP 2	1	-	+	+
Terms of Trade	BOP 3	1	-	+	+
Budget balance / GDP	PS 2	2	-	-	-
Net new domestic borrowing / Domestic debt stock	PS 3	2	+	-	+
Interest payment of domestic debt / Tax income	PS 4	2	+	-	+
Total Debt / Equity (NFC of XU 100)	NFC 1	1	-	+	+
Return on equity / Return on assets (NFC of XU 100)	NFC 4	3	+	-	+
TED Spread (Average)	G TED	3	-	-	-
VIX	G VIX	3	-	-	-
OECD Composite leading indicators	G OECD	3	+	-	+

Table 11. Variable's Effect on Financial Stability

3.4. Relationship Between Independent Variables and Financial Stability

DT 2 variable shows the level of net non-performing loans of deposit takers. There is a positive relationship between DT 2 and financial stability. Ganić (2012) stated that in times of crisis, there is an increase about this ratio. In addition, Berger et al. (2009) reported that with the increase in the financial stability level, deposit takers tend to supply more loans. In the aforementioned study, it is seen that banks extend higher-risk loans when financially strong and risk appetite is high and therefore act in a way that increases the total risk of their loan portfolios. The findings obtained in this study support the findings of Berger et al. (2009) and DT 3 variable gives the same result as DT 2 variable as expected and has a directly proportional relationship with the level of financial stability.

It is concluded that the DT 4 and DT 5 variables, which are the indicators of profitability of the deposit takers, are increasing in financial instability periods. In the periods of financial instability, the rate of return of banks from loans were increased. The provision of liquidity in times of crisis becomes difficult for all of the stakeholders of the financial system. Therefore, banks are more cautious about lending and demand higher interest rates for loans. In other words, the grow in net interest margin increases the profitability of the bank despite the loss loans.

The results about variable DT 6 shows that, in the periods of financial instability, the ratio of other operating expenses to net operating income of the banks decreased. To alleviate financial problems, institutions always want to increase revenues and reduce their costs. Findings of the study also show that personnel expenses and advertising expenses are reduced in times of financial instability for deposit takers.

DT 7 and DT 8 variables are about deposit takers' liquidity and the results showed that, these variables have inverse relationship with financial stability. In other words, deposit takers tend to hold less liquid asset at the periods of financial stability. In financial instability periods, deposit takers tend to escape to liquidity.

Tiryaki and Yılmaz (2012) stated that the capital adequacy standard ratio (DT 1) has a positive effect on financial stability in the long term. The results obtained in this study are similar. It is determined that the capital adequacy standard ratio decreases in periods of financial instability and increases in periods of financial stability.

The ratio of private sector short-term external debt to foreign exchange reserves (BOP 2), increases when financial conditions are positive. This is the result that having external debt is more easy in these periods and that creditors willing to supply the money to the market instead of holding it. In addition, it is seen that the problems experienced in the financial system reduce the level and possibility of obtaining short-term debt from external sources.

In particular, public expenditures were increased in order to prevent and reduce the negative effects of the crisis that started in 2008 and to support the private sector in order to invigorate the economy. The relationship between Budget Balance/GDP (PS 2) and financial stability have been found negative. This is because of the public sectors support to private sector. The decrease in the production and investments of the private sector cause stagnation in the economy. In order to eliminate the stagnation, public funding were used, therefore public expenditures were increased and budget deficit occurred.

The variables PS 3 and PS 4 shows the periods which the financial system is more stable and financial risks are decreased, the level of government new domestic borrowing has increased and in those periods, the increase in interest payment on the domestic debt is higher than the increase in tax income. This finding is consistent with the finding mentioned in the paragraph above.

The analysis results of terms of trade show that there is an increase in Turkey's trade gap at the financial instability periods. The variables provided by the Turkish Statistical Institute show the same result. Tokdemir (1981) stated that the situation of an increase in the terms of trade as the benefit of any country means an increase in the ration of the income distribution of that country.

When the situation regarding non-financial institutions is analyzed, it is seen that during the financial stability periods, the firms benefited more from the leverage effect of the debt and increased the company borrowings. This situation is seen with both the variable of the debt/equity ratio and the variable of profitability leverage ratio (ROE/ROA). These values indicate that firms can take more risks and borrow more easily during financial stability periods.

When the relationship between the variables related to global markets and financial stability is examined, the results obtained are consistent with the expected results. TED Spread (G TED), which is also expressed as an indicator of trust among banks, has been increasing in times of financial difficulties. Deposit takers tend to liquidity and avoid lending in cases of financial difficulties and demand higher interest rates for credit loans. This situation is the same at the transactions between deposit takers.

The relationship between financial stability and the G VIX variable (which is another global indicator and shows the expected 30-day volatility of the Chicago Stock Exchange) was realized as expected. It was obtained that the volatility of options

exchange increased during periods of financial difficulties and decreased at the periods defined as financial stability.

Another variable examined to follow the changes on a global scale is the OECD Composite Leading Indicator variable (G OECD). The OECD stated that this variable was designed to provide early warning of fluctuations in the economic system and includes information on short-term economic movements (OECD, 2018). The Financial Stability Index, which is created with this study has the same result. The index has a decreasing tendency in periods of financial instability and has an increasing tendency in the periods of financial stability. The results of principal component analysis and logistic regression analysis show that the periods of financial stability or instability reflected in the index.

3.5. Financial Stability Index

The financial stability index, which is an indicator of financial stability, was created after the data set were normalized. The following formula was used to normalize the data.

$$\text{Normalized "X" value} = \frac{X - X_{\min}}{X_{\max} - X_{\min}}$$

The coefficient of each independent variable was determined by logistic regression analysis. The weight of the factors in the index is based on these coefficients. For this purpose, the coefficients of the independent variables are standardized. The method described by King (2007) was used in the standardization process.

In the light of the results obtained from logistic regression analysis, three different financial stability indexes which are formed by three different methods (the differences between methods are dependent variables that were used, which were mentioned under Logistic Regression Analysis topic) are shown as a whole in the figure below.



Figure 1. Financial Stability Index

All three different indices are moving similarly. Turkey faced financial crisis late 2000. Figure 1 shows that in the periods of economic recovery, financial stability level of Turkey increased rapidly. In that period, regulations about financial system led to economic recovery and mitigated the effects of the crisis.

It seems that from the second quarter of 2003 until the end of 2007 (except 2005), the financial stability of Turkey had an upward trend experienced. At the beginning of 2008, political uncertainties emerged in the politics of the country, such as the closure case against the government party. At the end of 2008, credit delinquencies and bankruptcies were experienced globally as a result of the wrong appraisal of credit rating agencies and in the US housing market, mortgage loans were given even to the persons with a high probability of default. As a result of transferring default risks via securitization, there have been bankruptcies on a global scale and this have been cause a global crisis. After the 2008 crisis, Turkey's Financial Stability status began to a declining trend and this trend has continued with both economic and political uncertainties experienced by the Turkey and Turkey's neighboring countries.

4. Conclusion

In this study, the variables that effect financial stability of Turkey were examined. The data frequency is quarterly and covers a total of 57 quarter periods from 2003 Q2 to 2017 Q2. In the related periods, the change on financial stability was examined by logistic regression analysis. In addition, the effect of the variables on financial stability was interpreted.

The variables used in creating the index consist of variables that are thought to have an effect on financial stability, especially the variables specified in the financial soundness indicators published by the IMF in 2006. The independent variables were grouped by principal component analysis method in order to avoid problems that may occur due to the large number of variables. As a result of principle component analysis, five different group of factors were formed. These five factors were used as independent variables of the study.

Periods of financial stability and financial instability were determined for 57 periods included in the analysis. For this purpose the quarterly periods, where independent variables have break point were determined. As a result of the findings, three different dependent variables were formed. Logistic regression analysis method was preferred in the study because of the fact that the dependent variable have two different values depending on whether or not there is financial stability. The results of the analysis were standardized and then the financial stability indices were created with the highest value in indices as 100.

The findings show that, during the periods of financial stability the deposit takers have enough liquidity and behave less selectively for lending. In terms of the country's economy, it was concluded that in times of financial stability, more short-term external debt could be obtained, exports were strengthened against imports, more domestic borrowing was made and thus more domestic debt interest payments were realized. It is also seen that public budget deficits decreased with positive changes in financial stability. When the non-financial institutions are analyzed, it is concluded that the positive course of financial stability allows for a higher amount of debt to be

provided and the return on equity profitability is increased compared to the return on assets. According to the findings obtained from the global scale; banks' confidence in each other is directly proportional to financial stability, the level of volatility of the market decreases as financial stability increases and the increase in the OECD composite leading indicator is also positively related to the increase in financial stability level. The results are as expected.

The indexes created by this study are examined and the similarity between these indexes and the graph of OECD composite leading indicators observed. This situation confirms the validity of the method used in the creation of the financial stability index. Also, the method applied in this study will contribute to the literature in the matter of the variables and the perspective. In addition, it can be stated that this study is one of the pioneering studies in the literature in terms of creating the financial stability index for Turkey under the guidance of financial soundness indicators. In their study, Gezer and Kılıç (2020) have investigated the relationship between financial stability and the real economy of Turkey. The findings of their study are supporting that the findings of this study. Both studies investigated similar periods with different methods.

This study showed that the effects of variables on financial stability for Turkey. By taking into consideration these variables' effect, it will be possible to strengthen the level of financial stability status. It will be possible that the stakeholders in the financial system have information about the expected change in the level of financial stability by monitoring the variables which were examined and used in the analysis. The effect of the variables on each other and their contribution to financial stability may change over time. It is suggested that this situation should be kept in mind in the estimations. Using the lagged values of the variables which included in the financial stability index, it may be possible to take predictive measures for the future.

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