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THE INTERACTION OF THE BANKING SECTOR RISKS WITH FINANCIAL FRAGILITY: THE CASE OF TURKEY

ABSTRACT

The objective of this paper is to characterize the interaction of the banking sector risks with financial fragility by using annual data of Turkey from 1990 to 2014. The empirical work adopts a VAR (Vector Autoregressive) framework to capture the dynamic relationships among variables. In our model, there are five variables. They are, respectively, Interest Risk (IR), Liquidity Risk (LR), Exchange Risk (ER), Credit Risk (CR) and Financial Fragility Index (FFI). According to variance decompositions results, FFI is completely explained (100 percent) by its innovations in the first period, but after second periods FFI is explained by the innovations of Liquidity Risk and Exchange Risk (respectively 40%, 11%). In addition, ER and IR are explained by the innovations of FFI in the portion of approximately 30%. Impulse response functions and forecast error variance decompositions indicate that liquidity risk, credit risk and kur riski are more effective on financial fragility. The period of crisis in Turkey, liquidity risk come into prominence.

Keywords: Turkish Banking Sector, Banking Sector Risks, Financial Fragility, VAR Analysis, Turkey

BANKACILIK SEKTÖRÜ RİSKLERİ İLE FİNANSAL KIRILGANLIK ARASINDAKİ ETKİLEŞİM: TÜRKİYE ÖRNEĞİ

ÖZ

Çalışmanın amacı; Türkiye'de, 1990-2014 dönemi için, yıllık zaman serisi verileri kullanımıyla bankacılık sektörü riskleri ile finansal kırılganlık arasındaki etkileşimi ortaya koymaktır. Çalışmada, değişkenler arasındaki dinamik ilişkileri ortaya koymak üzere VAR modeli uygulanmıştır. Model'de, faiz riski (IR),likidite riski (LR), döviz kuru riski (ER), kredi riski (CR)ve finansal kırılganlık endeksi (FFI) olmak üzere 5 değişken kullanılmıştır. Finansal kırılganlık endeksindeki değişimin, birinci dönemde 100%'ü kendisi tarafından açıklanmaktadır. Ancak ikinci dönem sonrasında FFI, Likidite Riski ve Kur Riski tarafından açıklanmaktadır (sırasıyla %40 ve %11). Ayrıca kur riski ve faiz riski, yaklaşık %30 oranında finansal kırılganlık endeksi tarafından açıklanmaktadır. Etki tepki fonksiyonları ile varyans ayrıştırma analiz bulguları ortaya koymaktadır ki; likidite riski, kredi riski ve kur finansal kırılganlık üzerinde daha etkilidir. Ayrıca, Türkiye'de kriz dönemlerinde likidite riski ön plana çıkmaktadır.

Anahtar Kelimeler: Türk Bankacılık Sektörü, Bankacılık Sektörü Riskleri, Finansal Kırılganlık, VAR Analizi, Türkiye

1. INTRODUCTION

Before the establishment of Republic, Turkish Banking is described in different development stages such as National Banks period, Public Banks period, Private Banks period, planned period, liberalization and outward opening period (Işıktaç, 2009:16). Restructuring period and the period after 2007 banking sector will be discussed in the framework of global crisis. Pre-Republic period (1847-1923), the first paper money was issued to finance the budget deficit in the Ottoman Empire (Korukçu, 1998:4). Because of increased foreign trade deficit, the national currency was losing value. To ensure the financing of imports, it was difficult to find the source of the foreign markets. Ottoman Bank was established to resolve the loss of value against foreign currencies. The foundation of the Turkish Banking system was laid. Ottoman Bank has operated until 1852. Subsequently, it was given the opportunity to use loans to farmers to provide agricultural financing. Pre-republic period, an important role of the banking sector, when the government spending more than their income, it would be a mediation for taking loans from foreign countries between Ottoman government and foreign capital. At that time, many banks, which were established with domestic capital, were not able to compete with foreign banks in terms of credit; therefore, many of them were closed (Korukçu, 1998:5).

In the period of National Banks (1923-1933), many national banks and foreign banks were operated in the country. As the first private bank in the Republican period, Turkey Business Bank was established. In 1930, Central Bank of the Turkish Republic was founded to provide a good quality to the economy and to regulate the money and credit markets (Akgüç, 1975:13).

During the Public Banks, (1933-1945), Agricultural production was common in Turkey. Due to the lack of capital accumulation, the industrialization strategy was not provided a significant result with merely encouraging the private sector. Hence, it was necessary to more contribute for the realization of Government's industrial investment, thereby it was allowed to the achievement of economic development (Işıktaç, 2009:17-18). The first five-year industrial plan was prepared during this period. After the first five-year industrial plan, development was not only the contribution of the private sector but it was also begun to be supplied with Statism. After the changing this policy, Sümerbank (1933), Municipalities Bank (1933), Etibank (1935), Denizbank (1937) and Community Bank (1938) were founded (Akgüç, 1975:13-14).

In the period of Private Bank (1945-1960), Structure and Credit Bank, Garanti Bank, Akbank and Turkey Industrial Development Bank were founded with the increased of commercial activity in the country. Navigation Bank (1952), Turkey Endowments Bank (1954) and Turkey Teachers Bank (1959) were founded with private laws. In 1958, The Banks Association of Turkey was founded for ensuring cooperation, growth of the banking sector and to be fair in the sector (Günal, 2001:59).

During the Planned period (1961-1979), public interventions were increased in the banking sector. Economic activities were recognized according to development plan and annual programs. In that period, Republic of Turkey Tourism Bank (1960), Industrial Investment and Credit Bank (1963), Government Investment Bank (1964) and Government Industry and Employee Investment Bank (1975) were founded to make a development and investment banking (Uçarkaya, 2006:62).

Liberalization and outward opening period (the period after 1980), it was the period of becoming free of interest in the Turkish

banking sector. It was prepared an appropriate environment for the foreign banks operating in Turkey. Due to the economic liberalization, the number of foreign banks were increased rapidly and new commercial bank was established (Uçarkaya, 2006:62).

Restructuring period (2000-2010), Turkey took an important economic decision. Apart from money, finance, income and exchange policies, a program was implemented to reduce inflation including structural changes (Parasız, 2001 and Cansızlar, 2001:6-7). Although a positive contribution to the economy of those applications, in November 2001 foreign exchange demand increased because of the liquidity squeeze in the Turkish financial markets so that there was a crisis caused by the disruption in the international market (Yıldırım, 2004:42). It was taken loan from International Monetary Fund to avoid crisis however, reducing inflation program was not effective. In February 2001, increased the issue of trust in the financial markets, it was occurred again the financial crisis. Thereupon, monetary and exchange rate policies was given up, it was passed on floating exchange rate system. Thus, reducing inflation program was ended (Uygur, 2001). After 2000 and 2001 crisis, new program whose name transition to strong economy was put into effect. With this program, it was put in order specific arrangements in the banking sector and it was entered the restructuring process (Özcan, 2012:11-13). In 2002, it was aroused important developments. It was provided capital support to private banks. In 2004, banking sector continued to grow due to the steady progress that was achieved in economic and political environment. Besides the continuity of capital inflows from foreign countries, the raised in domestic demand contributed to mediation function development of banking sector (Yağcılar, 2011:108). By the year 2005, foreign investors invested directly or through associations in the banking system. In this case, the impact on the banking sector was positive. Banking sector continued to grow with the contribution of structural reforms and it was able to increase its profitability (BDDK, 2006:108).

American Federal Reserve (Civelek, 2009:33) started the 2008 crisis with the householder's debt burden keeping on sustainable level and low interest rates. Thus, supply-demand balance continued until 2006 in the housing sector. By the year 2006, housing prices were declined by investors' selling pressure. At the beginning of 2007, the problems that occurred in the system began to become apparent with the difficulties of global banks in housing loans (Civelek, 2009:33). The crisis was kept under control until 2008. However, it turned into a global crisis by spreading to other markets. In this crisis, although the Turkish banking sector felt the effects of the crisis, they responded to the crisis much more durable and strongly as regards to other developed and developing countries (Çınar, 2010:10-12). The reasons for this, after the 2001 crisis, new regulations and strict measures were taken to the Turkish banking sector. Steady growth brought up the rapid credit growth. However, measures taken allowed to overcome this process smoothly (Özcan, 2012:13).

2. RESEARCH SIGNIFICANCE

The objective of this paper is to characterize the interaction of the banking sector risks with financial fragility by using annual data of Turkey from 1990:1 to 2014. The empirical work adopts a VAR (Vector Autoregressive) framework to capture the dynamic relationships among variables. In our model there are five variables. They are, respectively, Interest Risk (IR), Liquidity Risk (LR), Exchange Risk (ER), Credit Risk (CR)and Financial Fragility Index (FFI). The paper

is structured as follows. Section 3 presents a theoretical framework of the interaction of the banking sector risks with financial fragility. Empirical models and their results are presented in Sections 4. Finally, Section 5 concludes.

3. BANKING SECTOR RISKS AND FINANCIAL FRAGILITY RELATION

Because of changes in the financial markets, banking sector was working to make improvements as a structural and functional. Due to policies that were implemented in the economy, it was removed limits on interest rates, bank activity areas were expanded and increased competition in the banking sector (Aloğlu, 2005:10-12). Because of these, banks risks became important. Risks are classified according to their origins. Types of risk are discussed in two groups as systematic risk and non-systematic risks (Özçelik, 2006:10). The sources of systematic risks are economic, social and political changes. These risks arise out of the company's control. The sources of non-systematic risks occur due to the investment instrument or company. The company can control and get rid of the risk (Özçelik, 2006:10-11). Systematic risk types are referred to as market risk. Exchange rate risk, interest rate risk, inflation risk, political risk involves systematic risk. Non-systematic risk types involve liquidity risk, credit risk, administration risk and activity risk. Administration risk affects the stock investors. Activity risk; when fixed income does not meet the fixed costs of the management, the rate of profit falls (Özçelik, 2006:11).

With the liberalization of the country, basic factors such as macro-economic instability and financial weaknesses in the financial structure are fragile to the financial aspects of the economy (Ural, 2003:14). This fragile structure becomes unsustainable situation so it occurs economic crisis. The qualities of the economic structure with high financial fragility describe as increased borrowing and existing debt becomes short term to the long term (Ural, 2003:15). Because of the important role of banks in the financial system and loss of confidence in the bank, weaknesses formed in the financial structure. This situation accelerated the economy into crisis. Financial fragility indicators give important clues about current situation of the economic structure and what to expect in the future.

3.1. Literature (Literatür)

Işık, Duman and Korkmaz (2004) have analyzed the causes of the 1994 and 2001 crisis in Turkey. With factor analysis, technique that was used in the study was obtained three factors. According to the obtained results, these factors were denominated as currency substitution, open position tendency of the banking system and enhanced fluctuations. Thus, Weak Turkish economy could encounter a financial crisis. Çelik and Akarım (2012) have analyzed banks whose stocks was traded in İstanbul Stock Exchange Market in 1998-2008 periods of Turkey. It was tested by using the factors affecting the liquidity risk management with panel regression analysis. In addition, it was tested with 9 commercial banks. As a result, variables of risky liquid assets and equity profitability was a negative relationship with liquidity risk. Besides this, variables of external financing and asset profitability was a positive relationship with liquidity risk.

Atış ve Saygılı (2014) have researched long term relations between current account deficit and total credit capacity in 1998-2013 periods of Turkey. The study was tested the vector error correction model and it was determined the causality relationships between variables. According to the obtained results, the increased in the

credit capacity increased current account deficit. However, it had limited impact. Furthermore, there was a unidirectional causality from credit to current account deficit.

Yiğitbaş (2014) has studied relationships between Turkey's bank loans and conjuncture fluctuations in 2002-2014 periods. Co-integration and vector error correction model was used in this study. At the end of the study, there was a stable equilibrium relationship between real bank loans and real GDP in the long-term. Additionally, there was a stable equilibrium relationship between inflation and outstanding loan in the long-term. The variables of 1994 and 2008 financial crisis, money supply and credit risks were short-term impact on the real bank loans. On the contrary, 2001 crisis were long-term impact on the real bank loans.

Tunay (2015) has analyzed the relationship between the sectoral lending and credit risk in 2002-2014 periods of Turkey. Linear panel data methods were applied. As a result of analysis, sectoral concentration had increased the credit risk. It was found a strong and positive relationship between sectoral lending and credit risk for all bank groups.

Barışık (2010) has researched the impact of the financial dominance of the banking sector in 1989-2007 periods of Turkey. In the analysis of the study, two-stage least squares method was used. Ultimately, increased fiscal dominance led to a decrease in loans and deposits but led to an increase in investment securities.

Taşkın (2011) has analyzed the internal and external factors affecting the performance of commercial banks in 1995-2009 periods of Turkey. The method of the study was panel data analysis. Return on assets, net interest margin and return on equity were taken into account as a measure of performance. According to the results, while banking performance was affected by the micro variables, there was no significant impact on the macro economic factors. Because of the negative impact of the 2001 crisis, it was concluded that affect bank performance whether the economy was stable or not.

Elmas and Yıldırım (2010) have studied Granger causality relationship between price and trading size for İstanbul Stock Exchange Market index shares. 2001, 2006 and 2008 were analyzed and session observation were used as data sets. As a result, it was found one-way causality relation from price to trading size. Accordingly, investors primarily followed the price movements then they gave trading decisions.

Zeren and Demirci (2013) have analyzed the resistance measurement to financial crisis of Turkey banking sector. Correlation coefficients were calculated by considering 22 banks and T-test analysis was performed. The variables that used in the study were bank's return on assets, equity profitability, non-performing loan and capital adequacy. It was reached the conclusion that Turkey got off to crisis of 2008 more slightly as regards other crisis.

Çakmak (2013) has researched the changes in basic macro-economic indicators of Turkey's economy and the results of these changes between 1989-2011 periods. It was analyzed with the help of financial fragility index. 8 macroeconomic variables were selected for Turkey's economy and financial fragility index was created. These 8 variables were Current Account Balance/GNP; Real Exchange Index; Export/Import, Short-Term External Debt/Exchange Reserves; Consolidated Budget Balance/GNP; Short-Term External Debt/Long-Term External Debt; Public Net Debt Stock/GNP. Threshold value that indicating the increase in financial fragility and the threshold value of analysis showed that 1994 and 2001 could have predicted in advance.

Kaplan and Yapraklı (2014) have studied factors that impact on exchange rate for 12 fragile developing countries. Generalized least squares were used in 2000-2012 periods. All variables were Current Deficit/GDP; Gross National Debt/GDP; Private Sector Domestic Credit Debt/GDP; Exchange Reserves/GDP; Inflation Rate and External Debt/Export. The effects of these variables on exchange rate were tested by panel data analysis. As a result, while exchange rate was affected negatively by current deficit/GDP, Gross National Debt/GDP; Private Sector Domestic Credit Debt/GDP and inflation Rate, it was affected positively by Exchange Reserves/GDP and External Debt/Export.

Demirel and Karanfil (2013) have analyzed the variables that affecting the fragility of the Turkish banking sector in 2008-2014 periods. It was used Johansen co-integration test. According to the findings, it was significant relation between financial fragility index and variables that selected in long-term. Even if the deviation between the variables in the short term, they would come to balance in the long term.

3.2. The Banking Sector Risk Indicators and Development

3.2.1. Exchange Risk

Exchange risk is likely to decrease with changes in the exchange rate of the bank's profit margin. Therefore, the main reason for the encounter with the exchange risk is fluctuations in exchange rates (Yücel, 2003:3). When banks expose to exchange risk, their assets and liabilities are sensitive to changes in exchange rates (Börekçi, 2004:15). Currency markets are influenced by macroeconomic factors such as foreign trade, balance of payments, interest rates and inflation (Yücel, 2003:3). It needs to be pursued regularly in the currency position to avoid the currency risk (Börekçi, 2004:15). Exchange risk ratio is calculated as the ratio of total foreign currency assets to total foreign currency liabilities and it is a measure of the magnitude of the existing risks. Exchange rate risk is calculated as follows.

$$Exchange\ Risk = \frac{Reserve\ Assets\ of\ Banks}{Foreign\ Exchange\ Liabilities\ of\ Banks}$$

When exchange risk ratio is lower than one, foreign exchange liabilities would be higher than foreign assets. When the exchange rate risk at a high level in the balance sheet, it is considered risky balance sheets (Ardıç, 2004:236). According to the following graph, it shows how to change the exchange rate risk in 1990-2014 periods. In 1994, fiscal deficits were increased by liberalization. It tried to explain these deficits by providing the closure of foreign funds into the country. Afterwards, Turkish lira came to an overvalued situation and so it brought a charming situation to give credit to the domestic market. It revived the domestic market with rising credits and imports increased. Thus, the trade deficit started to increase. The foreign exchange market demand increased due to the recession and devaluation expectations in Turkey's credit facilities. After 1996, there was a decrease of the exchange rate risk. The reason for this, attempting to create liquidity to the increase in foreign assets and keeping under the control of the growth in domestic assets was effective (Ardıç, 2004:236). In the 2008 crisis, it showed contraction in aggregate demand. The high increase in the exchange rate risk occurred deficits in the trade balance (Didin, 2009:8).

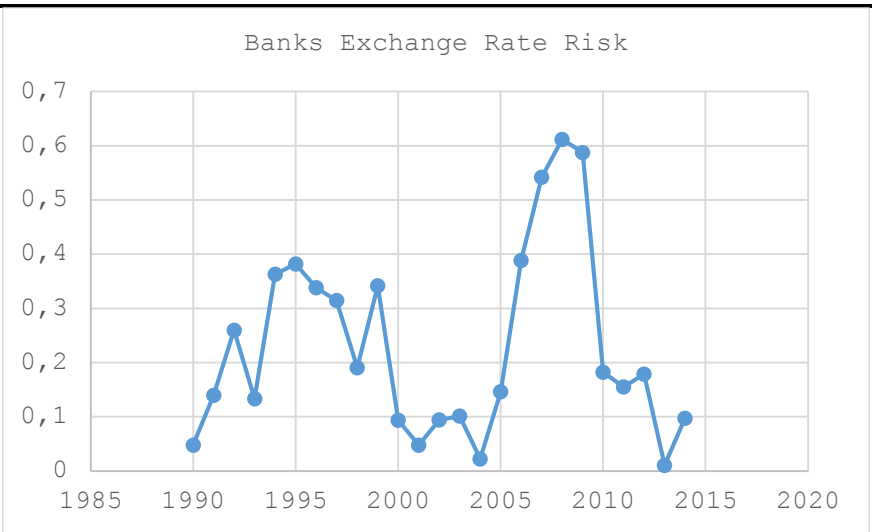

Figure 1. Graphs of exchange rate risk

3.2.2. Interest Risk

When changes in market interest rates start to cause fluctuations in the profitability of banks, interest rate risk arises. When it occurs distrust in banks in the market, banks are trying to finance long-term investments with short-term investments. In this case, the interest rate risk is commenced (Okay, 2001:85).

Banks use different measurement methods to reduce interest rate risk. The first method is "gap analysis". This method focuses on net interest income of the bank. Net interest income is composed of the difference between the bank's interest income and interest expenses. Nominal rate of interest, bank interest rate, the bank's interest income and expenses, the amount of assets and liabilities affect net interest income (Şimşek, 2007).

Changes in interest rates are the impact on the bank's net interest income depending on the terms of banks assets and liabilities, composition, difference values and interest rate sensitivity. When interest rates increase, a positive difference increases the net interest income. On the contrary, it reduces net interest income. What will be the amount of the increase or decrease depends on the sensitivity of the assets and liabilities interest rates (Şimşek, 2007:52).

The effect of net interest income to changes in interest rates can be calculated as follows (Koch, 1995:260).

$$\Delta Net\ Interest\ Income = Gap * \Delta i(Expected)$$

ΔNet Interest Income: Changes in net interest income

Gap: The total difference in the gap analysis carried out for the bank in a given period of time.

Δi (Expected): It shows the change in market interest rates can be estimated. When the expected rise in market interest rates, the total difference is positive or when the expected fall in market interest rates, the total difference is negative, net interest income increases. Total difference increases with increasing impact on the results. The size ratio of total difference is related to interest rate risk indicators (Şimşek, 2007:53).

The following graph shows the rate of change of the interest rate risk for the period 1990-2014.

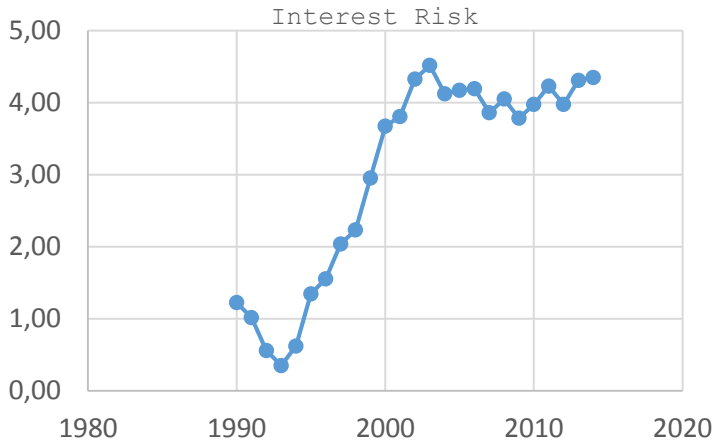

Figure 2. Graphs of interest risk

In 1993, it was tried to reduce the cost of internal debt policy. It was performed by placing additional taxes on interest income. Thus, because of rising interest rates was very high capital loss in Turkey. Therefore, Turkey was faced with the problem of depleting foreign exchange reserves (Ardıç, 2004:237). In 2000, International Monetary Fund provided additional reserves in Turkey. However, the economy was adversely affected by political instability in 2001 and so it began economic instability. Foreign exchange demand rose in the 2000s. Liquidity need of the market could not be achieved with tight monetary policy. Interest rates rose excessively (Günal, 2007:60). In the 2008 crisis, Turkey was affected the impact of the economic crisis that occurred in the United States in 2007. However, due to the configurations that made in the 2001 crisis, banking system was improved in Turkey. Therefore, the 2008 crisis was not caused great damage in Turkey. Interest rate was determined according to the market conditions by the Central Bank. Central Bank reduced interest rates in 2009 (Ardıç, 2004:237).

3.2.3. Credit Risk

Credit risk is unable to pay back debts of person or company who uses a loan from a bank. Credit risk also includes the making of a delayed payment. In this case, credit risk refers to the risk that faced by the bank (Okay, 2001:86). Many reasons can show the occurrence of credit risk. Credit risks arise from instability of the banking sector, macroeconomic instability in the country or the impact of fluctuations in international countries (Okay, 2001:86). Banks are specific strategies for the measurement and management of credit risk. These strategies are diversification of credit risk for their degree, necessary guarantees for the timely payment of loan, credit-risk analysis, implementation of restrictive agreements and establishment good relations with client who uses a long-term loan. Effective management of the banks' credit risks and how much capital they need to take the risk for unexpected circumstances risk are important for the substantiality and stability of the banking sector (Börekçi, 2004:18). The following graph shows that credit risk became narrow because of high interest rates and low domestic demand in 1994. The banking system was damaged from rising costs. In 2001, banks were unable to collect the credits issued. Thus, the highest level of credit risk problem occurred. After that, banks began to reduce the credit due to the risk of default. Consequently, production and investment levels reduced and began the recession (Afşar, 2007:2-6).

With the 2008 crisis, banks behaved timidly on open credit. Therefore, it led to adjournment of investment decisions. Foreign capital flows and external source initiative narrowed (Karagöl, 2010:12).

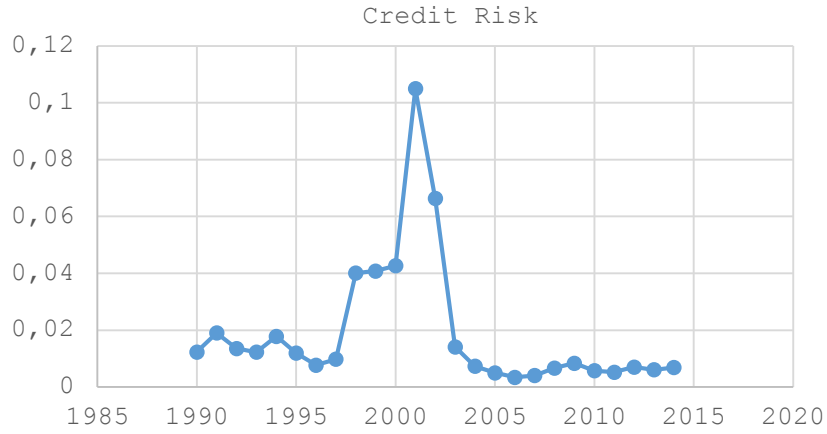

Figure 3. Graphs of credit risk

3.2.4. Liquidity Risk

Liquidity risk occurs when a bank cannot provide the balance between the fund inflow and the fund outflow (Yücel, 2003). Liquidity risk is also loss risk that may occur Bank's income and capital because of the failure to fulfill its obligations and liquidity crunch (Börekçi, 2004:20). Indicator of liquidity risk is cash outflow. Liquidity risk is found with the ratio of liquid assets to total assets. (Karagöl, 2010:8). The following graph shows that banks were faced with high interest rates, high inflation, credit risk and high liquidity issues in 1994 crisis. In 2000, because of the difficulties in financial markets, Turkish lira liquidity requirement increased for foreign exchange demand in the market. After 2001, provided to work on economic policy stability provided to the appreciation of the Turkish lira and the transferred resources to the liquidity of the company on the cheap. Particularly, it allowed companies which built in Turkey to reach easily to cheap resources (Erkan, 2009:2). Foreign exchange purchase bid continued in 2007 and there was excess liquidity situation in 2008 (Çağıl, 2011:54).

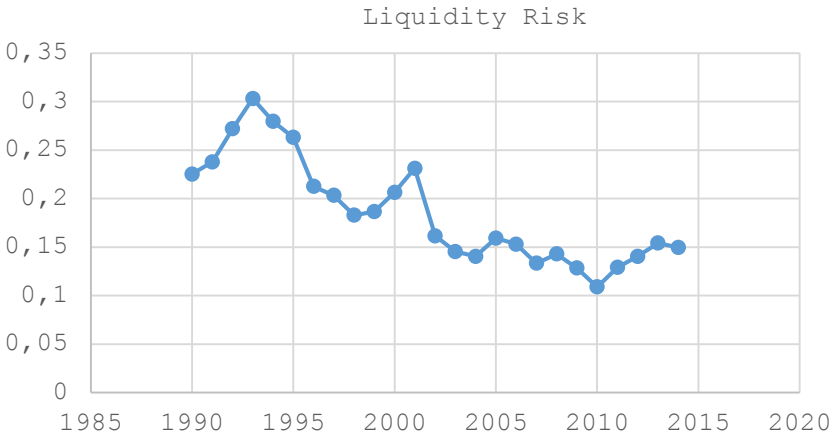

Figure 4. Graphs of liquidity risk

3.3. Financial Fragility Index

The variables that used in the financial fragility index is taken a calculated value by dividing the standard deviation for each observation. Financial Fragility Index is calculated with these value ratios.

Table 1. The variables that used in the FFI

Explanation	Symbol
Public Debt Stock/GDP	PDS
Budget Deficit/GDP	BD
Current Deficit/GDP	CD
Unemployment Rates	UR
Growth Rates	GR
Labor Productivity	LP

$$FKE_t = \frac{PDS_t}{\sigma_{PDS}} + \frac{BD_t}{\sigma_{BD}} + \frac{CD_t}{\sigma_{CD}} + \frac{UR_t}{\sigma_{UR}} - \frac{GR_t}{\sigma_{GR}} - \frac{LP_t}{\sigma_{LP}}$$

Unfavorable changes in the public debt stock, budget deficit, current deficit and unemployment rate are included in the index as a positive sign because it will increase the financial fragility of these changes. On the contrary, growth rates and labor productivity are involved in the index as a negative sign because the fragility will be reduced.

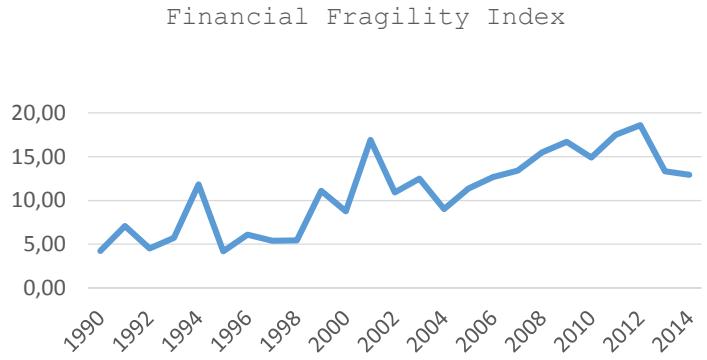

Figure 5. Graphs of financial fragility index

In 1994, a new banking crisis occurred with currency fluctuations and devaluations in the financial sector because of the attempt to reduce public borrowing interest. Therefore, Therefore, it began to significantly withdraw deposit from the system. It was 4,2 billion US dollars of foreign capital outflow from the country and short-term debt was 18,5 billion dollars. After the depletion of reserves and ongoing devaluation, Turkish lira was devalued by 20 percent in 1994. In addition, the real exchange rate depreciated 10%-15% in 1994 (Berument, 2002:4). In 1994 crisis, credit size narrowed because of high interest rates and low domestic market demand and credit risk was high level. Interest rates exceeded 400%. Banks were faced with high liquidity problems because of high interest rates, high inflation rates (PPI: 121%, CPI: 106%), credit risk and high foreign currency liquidity. During the 2001 crisis, the current account deficit grew in Turkey. It reached the highest level of 9,8 billion dollars at the end of 2001. That same year, a total of short-term debt was 28,9 billion dollars, total external debt stock increased to 114,3 billion dollars. Overnight interest rates of banks with insolvency reached a high level due to reclaim the unexpired

credits. Net capital outflow occurred 3,5 billion dollars with the start of the contraction of the domestic market (Akpınar, 2009:10). Inflation accelerated because of depreciation of the Turkish lira and impact of public price adjustments. PPI rose 88,6% and CPI rose 68,5% (Yükseler, 2004:4). As the labor market effects of the economic crisis, unemployment rate of 6,5% in 2000 increased to 10,3% in 2002. After all these adversities, the economy shrank by 6% (Turkish Statistical Institute). In 2008 crisis, it was seen a contraction in aggregate demand (Didin, 2009:11). The current account deficit approached 50 billion dollars. There was a depreciation of the exchange rate in Turkey in 2007. Therefore, 2008 inflation rates rose to 12% and investment income remained downward. Total debt reached 424,7 billion dollars. During that period, domestic debt was 74,3% and external debt was 25,7% (Under secretariat of treasury). In 2008, the average unemployment rose to 11%. Thus, Turkey's economy decreased to 4.7%.

4. EMPIRICAL ANALYSIS

In this section, firstly, the stability of the series is tested by applying unit root tests. The main reason for studying with the stable series on econometric analysis, if it is not static, the mean and variance of the series becomes variable. If macro-economic series are not stable, it reveals that the economy is a fragile structure against shocks. Augmented Dickey-Fuller test is used as a unit root test that was developed by D.A. Dickey and W.A. Fuller (1979). MacKinnon critical values are obtained with the Dickey-Fuller test statistics. As a result of these tests, Dickey-Fuller statistics are compared with MacKinnon (1996) critical values so null hypothesis $H_0: Y = 0$ is tested against the alternative hypothesis $H_0: Y \neq 0$ (Bulut ve Özdemir, 2012:213). Null hypothesis implies that the series have a unit root. On the contrary, the alternative hypothesis implies that the series is stationary and the series have not a unit root. In addition to this study, vector auto regression (VAR) analysis is performed.

VAR model is an equation system that is used to demonstrate the interaction of variables. The variable that will be used in the VAR model should be stable. The relationship between variables are studied with impulse-response functions and variance decomposition techniques by using the VAR models (Brooks, 2002:340-341). it is determined which one of the most influential variable on the macro-economic aggregates by variance decomposition. If it is found to be an effective tool that can be used as a variable policy is determined by the impulse-response functions. Impulse response functions determine a policy tool. Impulse-response functions show the dynamic response to the shock of the variables in the VAR model. Variance decomposition shows the sensitivity of their shock for the dependent variable of the VAR model. The shock that is seen in the variables in the system primarily affects the variable itself and then it affects other variables through the dynamic structure of the VAR model (Umutlu, 2008:233).

4.1. Data Set

In this study, Financial Crisis and Banking Sector Risk Analysis are discussed in the case of Turkey in 1990-2014 period by taking the annual data. The data that is used in this study; "Risk Types" from The Banks Association of Turkey, "GDP" from The World Bank, "Public Debt Stock" from Eurostat, "Deficit Budget" from General Directorate of Budget and Finance Control, "Labor Productivity" and "Growth rates"

from the OECD, "Deficit "and Unemployment" was obtained from Turkish Statistical Institute. The variables that are used in the analysis are included in the following table.

Table 2. The variables that used in the analysis

Variables	Symbol
Interest Risk	IR
Liquidity Risk	LR
Exchange Risk	ER
Credit Risk	CR
Financial Fragility Index	FFI

In 1994 crisis, banks got in difficulties because of the height of the funding costs, open position risks and credit turns. During this period, credit risk increased. The problems of credit risk were macro-economic factors such as foreign trade deficits and inflation. During the 2001 crisis, it was the highest level of credit risk problems due to failure to collect the loans given by the bank. By the year 2008, the credit risk was high, but lower height according to the 2001 period. With the 2008 crisis, banks abstained on open credit. Investment decisions were postponed because of mistrust. Since the middle of 1993, it was attempting to reduce interest rates. This was the main reason of the currency crisis that was experienced in 1994. Lack of savings in the country was led to high foreign trade deficit by attempting to close with over-valued Turkish Lira policy. Because of the high rate of devaluation, the exchange rate rose sharply in 1994. It was at high level between 2000 and 2002 years. In the 2008 crisis, it was seen a contraction in aggregate demand and was a very high raise in foreign currency risk.

In 1994, it was trying to reduce the cost of domestic borrowing policy. Additional taxes added to the interest income to reduce costs and so interest rates increased. In 2000, there was a liquidity squeeze due to current deficit, arise of foreign debt and start the withdrawal of undue debts by foreign banks. Accordingly, interest rates came to a very high rate. After the 2001 crisis, the banking system consolidated because of configurations. Thus, the interest rate risk was not high in the 2008 crisis and it reduced after 2009. In the 1994 crisis, banks were faced with high liquidity risk due to the very high interest rates and inflation and besides credit risk and liquidity was directed to the exchange. due to the demand for foreign currency in the market, the Turkish lira liquidity requirements increased in 2000. In 2007, foreign exchange purchase tender continued with the appreciation of the Turkish currency and liquidity risk was quite low according to previous crises. In the following graphs, original graphics of variables that are used in the analysis in 1990-2014 annually periods.

4.2. Unit Root Test

The first step in econometric analysis is to analyze the time series properties of the data by testing whether the variables are stationary, or not. For this aim, we apply ADF Test to the series and the results of this test are given in Table 3. If a series is stationary after differencing *d* times, this series is said to be integrated of order *d*, in short, it is shown as I (*d*).

Table 3. The results of ADF test

Variables	ADF values	Probability	Results
ΔIR	-5.156.636	0.0004	I (1)
ΔLR	-3.978.813	0.0060	I (1)
ER	-5.667.290	0.0002	I (0)
ΔCR	-4.154.142	0.0040	I (1)
FKE	-4.775.395	0.0009	I (0)

Δ symbol indicates that interest rate risks, liquidity risks, credit risks become stable by taking first differences. Exchange risk and Financial Fragility Index are a stable position at the level value. If the probability value is less than 0.05, it can be said that the series is stationary. Mackinnon critical values are -3.7880, -3.0123 and -2.6387 for 1% to 5% and 10% significance values. If it is taken the absolute value of the MacKinnon critical values and the ADF values, ADF values become larger and in this case the series is stationary, it involves unit root.

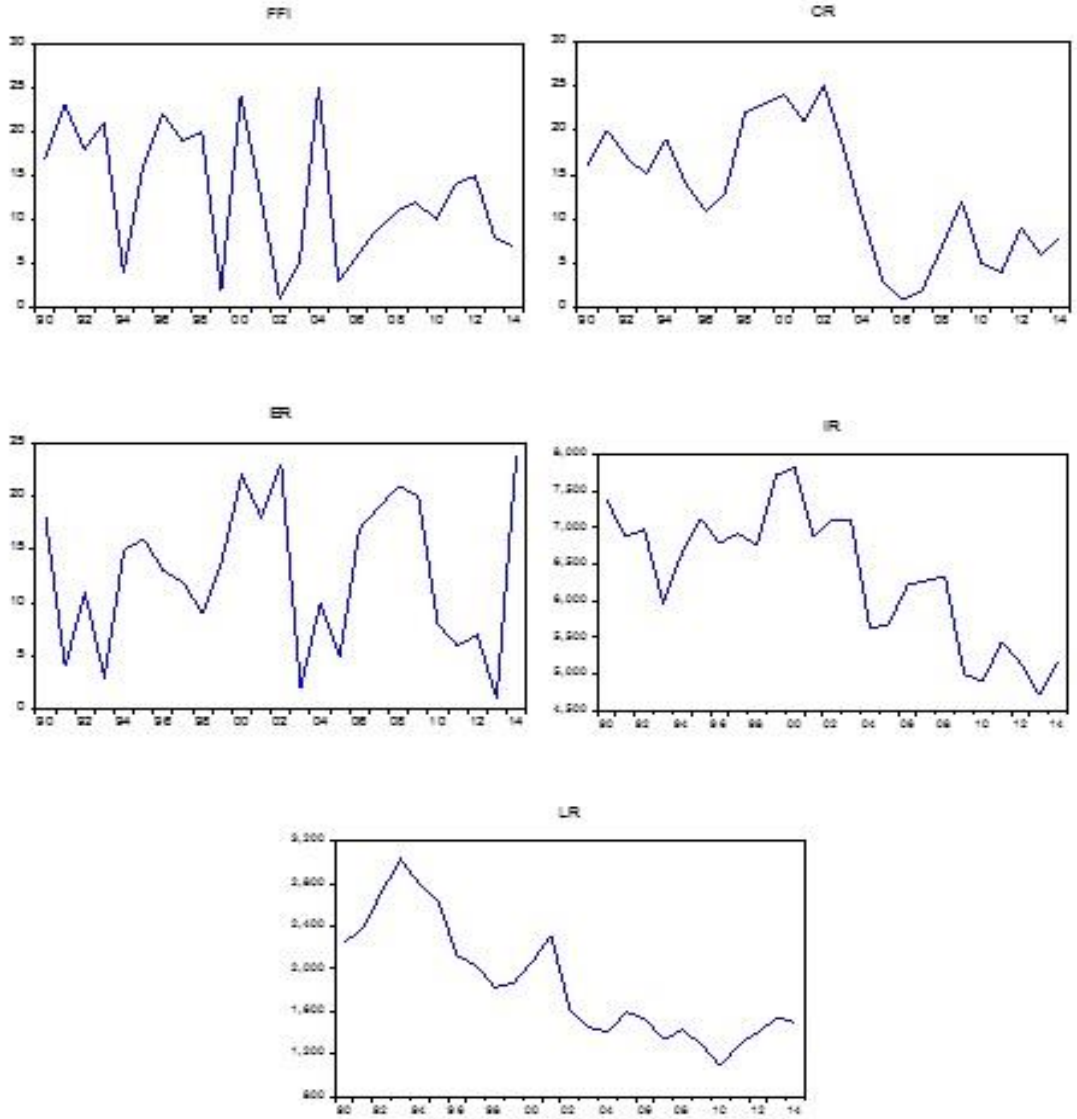

Figure 6. Graphs of the series

4.3. Vector Oto-Regression Analysis

The VAR model of analysis is applied auto correlation LM test to determine whether it contains the structural problem.

Table 4. VAR residual serial correlation LM test

Lags	LM-Stat	Prob
1	23.20654	0.5655
2	17.25405	0.8724
3	18.77937	0.8076
4	24.97537	0.4638
5	23.54793	0.5456
6	33.55284	0.1178
7	20.52243	0.7189
8	27.54622	0.3292
9	26.37924	0.3876
10	49.94548	0.0022
11	20.47771	0.7213
12	17.65070	0.8569

Probs from chi-square with 25 df

According to the LM test results, it is determined that autocorrelation is 10^{th} lag at 12 lag level and 5% significance level.

4.3.1. VAR Mode

The relationship between the variables of VAR (10) model is shown as follows. According to the equation; "10" means length of lag, "u" means zero mean and constant variance and it shows the random error term with a normal distribution. Error terms are unrelated with all variables in the model.

$$FFI_t = \alpha_1 + \sum_{i=1}^{10} b_{1i}\, FFI_{t-i} + \sum_{i=1}^{10} c_{1i}\, ER_{t-i} + \sum_{i=1}^{10} d_{1i}\, \Delta IR_{t-i} + \sum_{i=1}^{10} e_{1i}\, \Delta CR_{t-i} + \sum_{i=1}^{10} f_{1i}\, \Delta LR_{t-i} + u_{1t}$$

$$ER_t = \alpha_2 + \sum_{i=1}^{10} b_{2i}\, FFI_{t-i} + \sum_{i=1}^{10} c_{2i}\, ER_{t-i} + \sum_{i=1}^{10} d_{2i}\, \Delta IR_{t-i} + \sum_{i=1}^{10} e_{2i}\, \Delta CR_{t-i} + \sum_{i=1}^{10} f_{2i}\, \Delta LR_{t-i} + u_{2t}$$

$$\Delta IR_t = \alpha_3 + \sum_{i=1}^{10} b_{3i}\, FFI_{t-i} + \sum_{i=1}^{10} c_{3i}\, ER_{t-i} + \sum_{i=1}^{10} d_{3i}\, \Delta IR_{t-i} + \sum_{i=1}^{10} e_{3i}\, \Delta CR_{t-i} + \sum_{i=1}^{10} f_{3i}\, \Delta LR_{t-i} + u_{3t}$$

$$\Delta CR_t = \alpha_4 + \sum_{i=1}^{10} b_{4i}\, FFI_{t-i} + \sum_{i=1}^{10} c_{4i}\, ER_{t-i} + \sum_{i=1}^{10} d_{4i}\, \Delta IR_{t-i} + \sum_{i=1}^{10} e_{4i}\, \Delta CR_{t-i} + \sum_{i=1}^{10} f_{4i}\, \Delta LR_{t-i} + u_{4t}$$

$$\Delta LR_t = \alpha_5 + \sum_{i=1}^{10} b_{5i}\, FFI_{t-i} + \sum_{i=1}^{10} c_{5i}\, ER_{t-i} + \sum_{i=1}^{10} d_{5i}\, \Delta IR_{t-i} + \sum_{i=1}^{10} e_{5i}\, \Delta CR_{t-i} + \sum_{i=1}^{10} f_{5i}\, \Delta LR_{t-i} + u_{5t}$$

4.3.2. Impulse-Response Functions Analysis

The use of the impulse response function enables us to analyze the dynamic behavior of a variable due to random shocks given to other variables. In fact, the graphs of the impulse response functions provide a better device to examine the effects of the shocks. Impulse-Response functions graphic (Figure 7) shows the response of the other variables in the face of financial fragility index shock. The horizontal axis shows the duration of the period of the reaction. The vertical axis indicates the size of the response. Continuous lines show the response of the dependent variable against a shock in the error term and the dotted lines indicate the confidence interval for standard error (Özcan and Arı, 2011:131).

A shock that is seen in the FFI, the FFI's first reaction is negative. The FFI's first reaction is to go towards the negative. FFI's response to the shock is in the positive direction after the second period. A shock that is seen in the FFI, ER's first reaction

start with negatively, after the second term, it is going in the positive direction. It undulates after the fifth period. A shock that is seen in the FFI, IR gives negative reaction in the first period. It continues until the third period. It goes toward equilibrium after the sixth period. The response of the CR starts from negative to positive but it continues to be undulant. The response of the LR go toward the negative from the fourth period. After that, it follows a positive trend over the period.

4.3.3. Variance Decomposition

Variance decomposition method is used in order to analyze the portion of variance in the prediction for each variable in the system that is attributable to its own innovations and to shocks to other variables in the system. We have investigated the 10 periods, because after these 10 periods, the portions of variance have been found to be approximately steady in our application. The results of variance decompositions for all variables are reported in Table 5. According to the variance decomposition results, 100% of the change in financial fragility is explained by itself.

The biggest impact is determined by FFI and Liquidity Risk in all other periods. 82% of the change in the exchange rate risk is determined by itself. The remained rate 18% is caused by the FFI. According to the periods, in every part of exchange risk, interest rate risk is the lowest impact. In interest rate risk, there is no effect of liquidity and credit risk in the first period. The highest impact is determined by IR. In all periods, 28% of impact is caused by itself. The lowest impact on changes of credit risk is FFI. The overall effect of the period, approximately 19% comes from exchange risk. The biggest impact of the credit risks is described by itself. The lowest impact on the exchange rate risk is liquidity risk. The effect of credit risk is about 10% and exchange risk has an impact around 17%.

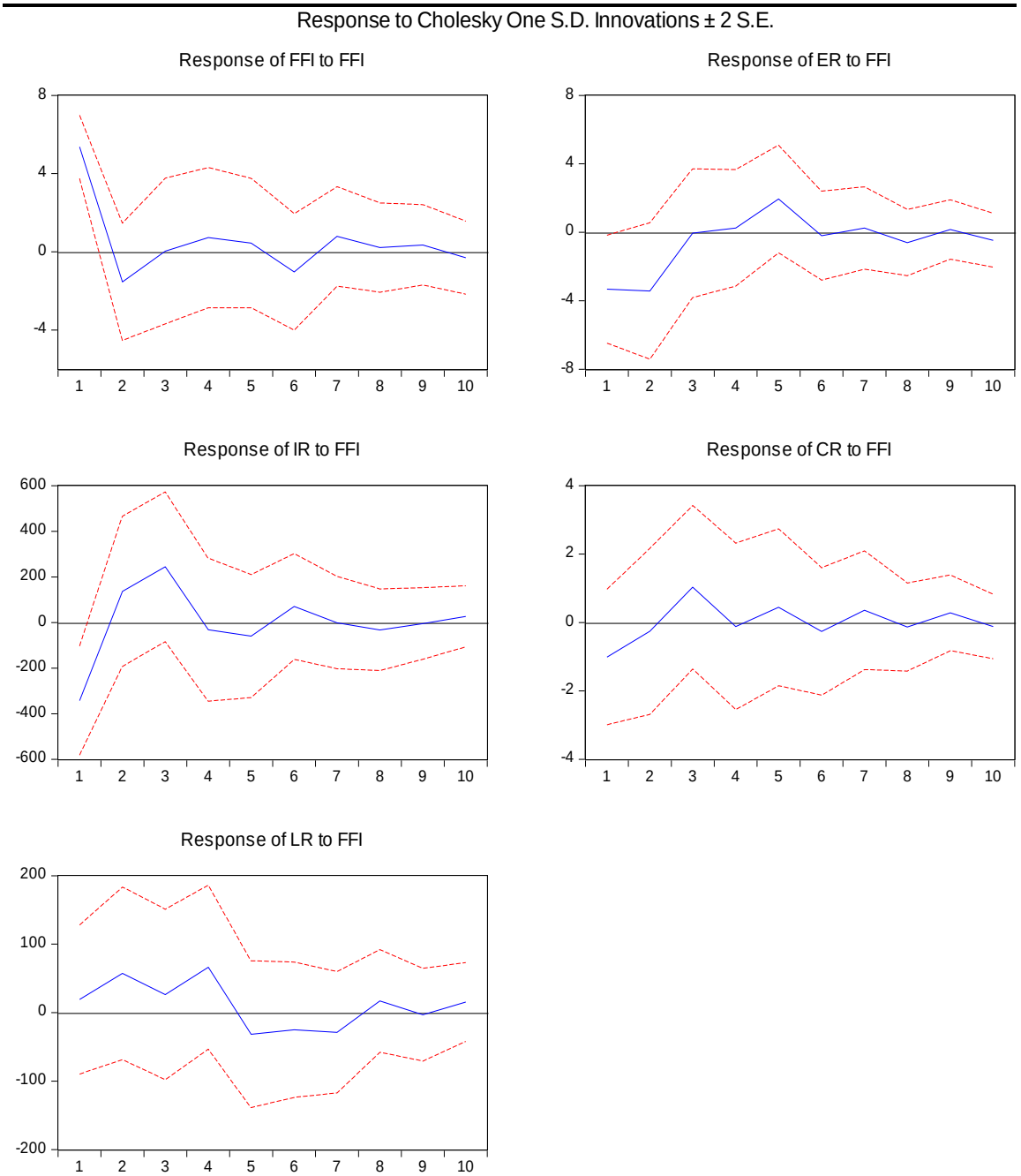

Figure 7. The Impulse response graphs

Table 5. The values of variance decomposition

Variance Decomposition of FFI

Period	FFI	ER	D(IR)	D(CR)	D(LR)
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	71.40803	6.306012	12.10573	7.916341	2.263887
4	40.73293	4.224090	7.990142	6.234142	40.81870
6	34.99172	11.73322	8.153596	8.487924	36.63354
8	33.55196	11.30926	7.882970	10.28055	36.97526
10	32.91141	11.97325	7.771283	10.27047	37.07359

Variance Decomposition of ER

Period	FFI	ER	D(IR)	D(CR)	D(LR)
1	18.34022	81.65978	0.000000	0.000000	0.000000
2	29.02352	63.12904	0.103704	2.085872	5.657865
4	25.70925	62.10667	2.700125	3.081018	6.402945
6	28.13697	58.95469	2.657376	3.718252	6.532713
8	27.74057	57.83901	2.658080	4.235210	7.527128
10	27.59728	57.76293	2.691086	4.377619	7.571083

Variance Decomposition of D(IR)

Period	FFI	ER	D(IR)	D(CR)	D(LR)
1	31.46051	19.21750	49.32198	0.000000	0.000000
2	26.39034	22.31662	35.80748	0.236424	15.24913
4	30.08375	22.00306	29.72912	1.320232	16.86383
6	28.22119	21.03136	26.75286	2.780841	21.21374
8	26.71272	21.15222	25.31294	4.395250	22.42687
10	26.34174	21.36098	24.94937	4.769598	22.57830

Variance Decomposition of D(CR)

Period	FFI	ER	D(IR)	D(CR)	D(LR)
1	4.632897	20.81977	4.832328	69.71500	0.000000
2	4.029502	17.61770	9.879899	58.01845	10.45445
4	5.569228	19.17826	10.04383	48.18109	17.02760
6	5.891165	18.22836	10.18198	47.05763	18.64086
8	6.071765	18.79038	10.11862	46.02096	18.99826
10	6.222097	18.75241	10.13728	45.86998	19.01824

Variance Decomposition of D(LR)

Period	FFI	ER	D(IR)	D(CR)	D(LR)
1	0.558867	3.005899	0.498558	5.82E-05	95.93662
2	4.996930	2.682805	1.895252	4.336590	86.08842
4	8.703439	15.65179	1.907502	7.939957	65.79732
6	9.212452	16.64629	1.744157	10.30744	62.08966
8	9.940547	17.01029	1.871615	10.10748	61.07007
10	9.982269	16.96419	1.866394	10.58413	60.60301

5. CONCLUSION

In Turkey, when financial fragility occurs, liquidity risk come into prominence. When a bank does not sufficient cash in order to satisfy its obligations and when the bank's assets do not be converted to cash in a short time, liquidity risk becomes higher. In the banks liquidity risk, it is borne the additional cost because of a portion of sources are remained inactive. In this situation, it is reduced profit margin. The banks make riskier activities to compensate for their troubled profit margin. The higher total risk of the bank may increase the possibility of bankruptcy. As a result of financial weakness, fragilities increase.

Throughout this paper, above mentioned positions are reviewed and empirically analyzed in order to find out the interaction of the banking sector risks with financial fragility by using annual data of Turkey from 1990:1 to 2014. The empirical work adopts a VAR (Vector Autoregressive) framework to capture the dynamic relationships among variables. Our model contains five variables. They are, respectively, Interest Risk (IR), Liquidity Risk (LR), Exchange Risk (ER), Credit Risk (CR)and Financial Fragility Index (FFI).

Concerning the interaction of the banking sector risks with financial fragility, we apply the variance decompositions and the impulse response function for all variables. Liquidity risk and exchange rate risk are more effective on financial fragility. In financial fragility index, 32% and %11 of impact are caused by liquidity risk and exchange risk in the large part of periods. Also, ER and IR are explained by the innovations of FFI in the portion of approximately 30%.

Because of the important role of banks in the financial system, financial structure weaknesses occur with the loss of confidence in banks. Therefore, this situation makes the economy go through the crisis more quickly.

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