Financial Stress and Economic Activity Relationship In Turkey: Post-2002 Period

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ABSTRACT

The global financial crisis has hit emerging markets more deeply than advanced economies. This has directed the focus of post-crisis literature to the stress of the financial system. Therefore, exploring the methods to measure and monitor the instability of Turkey's financial system will provide early warning signals of possible factors causing financial stress, thereby facilitating the implementation of appropriate policy measures. In this regard, we constructed a financial stress index in this paper. Our financial stress index composes of several sub-indexes for measuring the instabilities of different financial markets (such as stock market, foreign exchange market, banking sector, and public sector). The implications of financial stress on Turkish economic activity examined empirically. According to our study results, there is a one way direct causal relationship between financial stress and economic activity. The results of impulse response function reveal that random shocks in financial stress have a negative and diminishing impact on economic activity.

Key Words: *Financial stress index, economic activity, Granger causality.*

JEL Classification: *E44, G10, C43*

Türkiye'de Finansal Stres ve Ekonomik Aktivite İlişkisi: 2002 Sonrasi Dönem

ÖZ

Global finansal krizin gelişmekte olan ülkeler üzerindeki etkileri, gelişmiş ülkelere göre daha şiddetli olmuştur. Bu durum kriz sonrası literatürünün ağırlıklı olarak finansal sistem stresi üzerinde yoğunlaşmasına neden olmuştur. Dolayısıyla, Türk finansal sistemindeki istikrarsızlığın ölçülmesi ve izlenmesi, olası stres kaynaklarına yönelik erken bir uyarı sistemi sağlayarak, doğru politikaların yürütülmesini kolaylaştıracaktır. Bu çerçevede çalışmamızda öncelikle farklı piyasalardaki istikrarsızlıkları (hisse senedi ve döviz piyasası ile bankacılık ve kamu sektörü) kapsayacak şekilde bir finansal stres endeksi oluşturulmuştur. Çalışma sonuçlarımıza göre Türkiye'de ilgili dönemde finansal stresten ekonomik aktiviteye doğru tek yönlü bir nedensel ilişki bulunmaktadır. Hesaplanan etki tepki fonksiyonu ise finansal streste meydana gelen rassal şokun ekonomik aktiviteyi olumsuz etkilediğini ortaya koymuştur.

Anahtar Kelimeler*: Finansal stres endeksi, ekonomik aktivite, Granger nedensellik.*

JEL Sınıflandırması*: E44, G10, C43*

I. INTRODUCTION

In the aftermath of the financial crisis, arguments arose over how to monitor financial market developments.

The global financial crisis has revealed the importance of financial circumstances in the effective implementation of macroeconomic policies. When

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financial stress is on the increase, change in interest rates does not cover the whole interaction between the financial system and the real economy. Nonetheless, financial stress index, as a composite index specific to the country, consists of the fundamental markets of a national financial system. The variables reflecting the developments in the financial market were not included into the macroeconomic estimations for the period till the outbreak of the global financial crisis. Because of leaving these variables out, the size of the global financial crisis was estimated to be lower in traditional macroeconomic models. As a result, a need for including financial market variables into these models emerged. Detecting the state of the financial system is a crucial issue for policy implementation. Market participants and financial authorities should be effectively alert to the stress of the financial system. In order to ensure that, it must be construct an early warning system. Early recognition of financial stress reduce the possibility of financial crisis.

In this regard, the first part of the study will discuss general features of financial stress, followed by the calculation of the financial stress index for Turkey. In the related literature, financial stress indexes (FSIs) are mostly calculated on a monthly basis for the developed countries. This study presents a financial stress index for Turkey on a daily basis. The third part will focus on the relations between financial stress and economic activity. The final part will present our discussions on the empirical validity of this relation.

II. GENERAL FEATURES OF FINANCIAL STRESS

There is not a consensus on the definition of financial stress in the literature. However, it is commonly accepted that financial stress is an aspect disrupting the functioning of financial markets. Illing and Liu (2006) discuss financial system stress as shocks with negative effects on the real economy whereas some studies regard the emergence of financial stress as a process. For instance, according to Hakkio and Keaton (2009), financial stress is dependent on the completion of some stages which are uncertainties about the real value of financial assets, uncertainties about the attitudes of other investors, asymmetric information, and increasing demand for flight to quality and flight to liquidity. On the other hand, Balakrishnan et al. (2011) defined financial stress based on the financial structure of the banking system. According to this definition, financial stress is a result of instabilities that prevent the banking system from functioning as an intermediary and emerge in time, which is similar to the approach presented in the study by Hakkio and Keaton (2009).

Although the reasons for the above mentioned instabilities and the relative importance of their main components change from time to time, some features of financial stress that exist in every period can be explained in detail as follows (Hakkio and Keaton, 2009: 6-10): a. One common feature of financial stress is the increasing uncertainty of creditors and investors about the real value of financial assets. This uncertainty leads to an increase in the volatility of the asset prices, causing investors to show more reaction to the new information. For example, the highest price an investor is ready to bid for a company's stock depends on the long-term profitability of that company. When uncertainty about the profitability of the

company increases, the investor shapes its expectations based on the new information about the company during this period. When uncertainty about the long-term profitability of a company increases, this time the investor makes more changes in its expectations. The price bid for the stock also changes in line with the new information. Accordingly, price volatility also increases as uncertainty about the real value of stocks increases. b. Another factor resulting in an increase in the volatility of asset prices is the speculative behavior of investors. c. Increasing asymmetric information. Asymmetric information between creditors and borrowers results in an adverse election or moral hazard, thereby increasing the average borrowing cost on the one hand and decreasing the average cost of assets in secondary markets on the other hand. d. A flow from risky assets towards safe assets. The tendency of investors' choices to safe assets causes a wider difference between the rate of returns on the aforementioned asset types and results in an increase in the borrowing costs of investors making their investments in risky assets. The main reason why creditors and investors avoid holding risky assets is the change in their perceptions of risk. Accordingly, creditors and investors have lower risk estimation during the economic expansion whereas they have higher risk estimation during the economic contraction. e. Declining demand for assets with lower liquidity. During financial crises, investors avoid financial assets with lower liquidity, which makes the gap between the rates of returns on financial assets with high and low liquidity smaller and increases the borrowing costs of companies issuing financial assets with lower liquidity.[1]

The relations between financial structure and economic development can be analyzed under four main categories: bank-based approaches, market-based approaches, theory of financial services, and law-finance theory. Bank-based theoretical approach focuses on the positive impacts of banks on economic growth. It is argued that banks rather than markets have more influence on the financing for development in emerging markets in particular. This theoretical approach focuses on the weakness of the market-based systems resulting from the problem of asymmetric information faced at the first stages of economic development which has not completed the phase of institutional development (Boyd and Prescott 1986). On the contrary, market-based theoretical approach focuses on the superiority of well-functioning markets in the improvement of economic performance and criticizes the bank-based financial systems. According to this approach, markets that have high liquidity and function effectively accelerate economic growth, promote good management and facilitate risk management (Beck and Levine, 2002; Beck and Levine 2004). This approach argues that it is possible for banks to result in failure in the proper distribution of loans as they disrupt the fund distribution in the financial system. Hence, market-based financial systems reduce the disruption resulting from banks and positively affect economic development and growth. On the other hand, according to the model developed by Boyd and Smith (1998), financial structure changes at different stages of development. As the

[1] Also see Brunnermeier and Pederson (2007).

development process gains speed, countries become more market-based. The third theoretical approach, theory of financial services, focuses on the main services provided by the financial systems. According to this approach which is in line with the market-based and bank-based approach, creating an environment in which financial services can be rendered moderately and effectively is more important than the sources of finance. In this regard, there is no competition between banks and markets which are different components of the financial system. This approach draws the attention to a better-functioning banking system and to the variables necessary for the market system. The final theoretical approach discussing the relation between the financial structure and economic development is the law-finance theory.

This approach emphasizes the importance of the legal system as a factor promoting the growth of the financial system. Legal rights and contracting mechanisms enhance the functioning of both markets and financial intermediaries. The developments particularly in property rights facilitate the management of financial markets, contributing to the development of financial markets (La Porta et al. 1998).

III. FINANCIAL STRESS AND ECONOMIC ACTIVITY

Financial system is a structure that has connections to the real economy. Financial system promotes economic growth by ensuring effective allocation of resources and provides businesses and households with opportunities to access capital and manage risks as well. The shocks to the financial system pose important social cost on society.

An increase in financial stress causes a contraction in economic activity in three ways. The first one is increasing uncertainty about financial asset prices and the economic situation in general, both of which increase the volatility in financial asset prices. In such circumstances, companies tend to delay their plans for investment while households tend to delay their plans for consumption. Tendency towards safe assets on the one hand and increasing asymmetric information and tendency towards liquid assets on the other hand lead interest rates to increase. In addition, financial stress makes getting funds more costly for the companies as they do this by issuing new stocks. An increase in financing costs leads to a decrease in investment and consumption expenditures on the one hand, and it intensifies the contraction in economic activity on the other hand (Hakkio and Keaton, 2009: 29).

One of the traditional indicators used to show financial stress is the volatility gained from the dynamics of stock market. However, it is argued that this variable is not an optimal indicator of the real economy for some reasons. The first one is that volatility gained by using dynamics in stock market includes information on stock market not directly related to the developments in real economy. For example, as presented empirically in the study by Cardarelli et al. (2011), the contractionary effects of financial turmoil resulting from the instability in banking sector are more than those in stock or foreign exchange market. Beltratti and Morona (2006) and Beetsma and Giuliodori (2012) drew a similar conclusion in their studies. The main finding in these studies is that volatility in stock market does

not have significant effects on real economy. Nevertheless, some studies[2] put an emphasis on the effects of upward and downward sloping in stock market on aggregate demand and argue that central banks should include changes in stock prices into their reaction functions. It is emphasized that sudden changes in asset prices can be avoided by this way.

Foreign exchange market is one of the markets affected by financial stress or a reason for financial stress from time to time. More fluctuations are observed in foreign exchange rates when compared to the period without financial stress, which is the same in financial asset prices.

When financial markets are steady, investors adopt carry trade strategy. When capital is moved from countries with low interest rate to the ones with high interest rate, the estimated return on this change is zero according to the uncovered interest parity based on risk neutrality. The main reason for this is that the expected appreciation of currency with low-interest rate offsets the gains on differences in interest rates in investment periods. However, the findings of empirical analyses[3] argue against uncovered interest parity. Based on this argument, when the currency of target country appreciates based on currency trade, transactions in currency trade also increase. During this period, investors also have capital gains in foreign exchange market. All in all, capital inflows related to currency trade lead to sharp changes in financial asset prices and an over-appreciation of currency that will adversely affect the competition of the country. When financial stress is on the increase, currency with low-interest rate appreciates, which results from the fact that capital flees to safe haven currency (Deutsche Bundesbank 2014: 16).

Another sector which may become a source for financial stress is the public sector with its high borrowing levels. Financial deepening and increasing borrowing are two variables acting together. As economy cannot grow without borrowing, macroeconomic volatility may be more than desired. However, when there are shocks affecting economy negatively, it becomes more difficult for countries with high borrowing levels to stay solvent. High public borrowing includes some risks. As borrowing level increases, loan repayment becomes more vulnerable to decreases in economic growth rates and increases in interest rates[4]. Besides, because of high borrowing levels, financial authorities may become constrained in implementing a countercyclical stabilization policy and in their role as lender of last resort during financial crises (Cecchetti et al. 2011: 34). Only a little of the instability experienced in the banking sector was related to economic contraction in the past. However, with the global financial crisis, this has changed. To show the effects of financial stress on economic activity, it is important to comprehend the scope of financial cycle well. Cyclical structure of financial system stimulates economic dynamics such as credit growth rate, changes in leverage rates, and sharp changes in asset prices, increasing financial instability.

[2] Rigobon ve Sack (2003).
[3] Bkz; Clarida vd.,(2009).
[4] In their study, Reinhart and Rogoff (2009) calculated threshold values of public sector borrowing, which was a threat for the economic growth, for 18 OECD countries.

Mutual interaction between real sector and financial sector is analyzed in the literature generally within the scope of "bank lending channels" and "financial accelerator" (Bernanke and Gertler, 1996; Bernanke, Gertler and Gilchrist 1999; Kiyotaki and Moore, 1997). According to this approach, increases (decreases) in collateral value of debtors expand (contract) the loan volume and increase the effects of financial cycle on real economy as well. Some studies in the literature analyze whether financial accelerator changes or not according to the type of the financial system-bank-based financing, market based financing- (Rajan and Zingales, 2003).

While the role of banking sector in monetary transmission mechanisms is emphasized on the side of bank lending channel, the effects of financial constraints on cyclical fluctuations are focused on the side of financial accelerator. In general, the feedback from financial sector to real sector is based on demand and supply-side dynamics. On demand side, disruption in financial situations of households and companies negatively affect the decisions on consumption and investment. On supply side, disruption in creditworthiness of borrowers tightens the lending standards of banks and increase loan costs as well. Credit losses resulting from nonperforming loans and market losses resulting from decreases in asset prices have an adverse impact on the capital structure of banks. To protect their capitalization levels, banks either show a tendency for issuing new stocks or restrict their portfolios in a way that will negatively affect their loan supplies (Sorge 2004: 20).

When financial stress is low, financial markets function steadily. Savers direct their bonds to investments expected to yield positive returns. Risks likely to result from invested savings are priced effectively. When financial market conditions become instable, it becomes more difficult and costly to receive funds from savers. During this period, risk premium for risky borrowers increases.

In the following part of the study, financial variables chosen to show the size of financial stress and how these variables are placed in the index will be presented.

IV. EMPIRICAL FINDINGS

A. Financial Stress Index

Calculation of financial stress index is essential not only for evaluating macroeconomic conditions and implementing monetary/fiscal policies but also for determining the sources for the fragility of the financial sector. This will also enable financial system to work steadily.

There is not comprehensive literature on financial stress index. Studies on this issue vary according to the methodologies used and the number of countries included.

According to Hakkio and Keaton (2009), it is important to have a threshold value identification to determine the periods of financial stress. Based on this, how long the index stays above the threshold value determines the periods of financial stress. Within this framework, in studies by Illing and Liu (2006) and Cardarelli et

al. (2011), the periods when financial stress increases are defined as time processes exceeding the trend level by one-point standard deviation.

The financial stress index for advanced economies was developed by Cardarelli et al. (2011) while it was adapted to emerging markets by Balakrishnan et al. (2011). Fundamental variables stand out for emerging markets, in particular, which are indexes of banking, stock market and foreign exchange market. While constructing the index, it is important to choose variables that have high correlation with real economy. Variables mainly used in the literature (stock, foreign exchange, banking and public sector data) while constructing indexes were included in our study (Nelson and Perli 2007, Illing and Liu 2006, Hollo et al. 2012, Elekdağ and Kanlı 2010, Ekinci 2013). Within this framework, the variables to be used in our study are as follows: (i) foreign exchange market pressure index (ii) five-year credit risk premium values to show the credit risk of the country (CDS)[5] (iii) stock returns (iv) time-varying stock returns (v) "beta" coefficient to show the banking risk. Generally, monthly or quarterly data were used in the literature while calculating the financial stress. However, changes in financial markets occur so rapidly based on the global developments and the effect of these changes becomes apparent in the relevant period. Hence, this effect disappears in a short period of time when there is not a financial crisis. Montly or quarterly data may not accurately determine the effect. Because of these reasons, daily data were preferred in our study to construct financial stress index[6].

The risk in stock market was measured via the stock market index volatility estimated with GARCH (1,1) model. Secondly, stock returns were used to measure the risk in stock market. Stock returns were multiplied by -1. By this way, sharp declines in stock prices will be reflected in the index value as an increase. Stress in foreign exchange market was measured with volatility. Following Balakrishnan et al. (2011), the foreign exchange risk was calculated as the following:

$$EMPI_{i,t} = \frac{\left(\Delta e_{i,t} - \mu_{i,\Delta e}\right)}{\sigma_{i,\Delta e}} - \frac{\left(\Delta RES_{i,t} - \mu_{i,\Delta RES}\right)}{\sigma_{i,\Delta RES}} \qquad (1)$$

The variables in the equation denote the followings respectively; $\Delta e_{i,t}$ is the change in real exchange rates; $\Delta RES_{i,t}$ is the change in international reserves; μ is the average value of the relevant variable, σ is the standard deviation of the relevant variable. Based on this equation, an increase in exchange rates or a decline in the central bank reserves cause more pressure on foreign exchange market (Elekdağ and Kanlı 2010: 2).

As an indicator of the instability in the banking sector, Beta ($\beta_{i,t}$) parameter was used.

[5] Countries with high CDS premiums and institutions within these countries have to bear higher costs to meet their borrowing needs. Therefore, CDS premium is an important indicator for countries.

[6] See Ekinci (2013).

$$\beta_{i,t} = \frac{\mathrm{Cov}(r_{i,t}^{Bank}, r_{i,t}^{Mrkt})}{\mathrm{Var}(r_{i,t}^{Mrkt})} \quad (2)$$

In the equation no (2), $r_{i,t}^{Bank}$ denotes the earnings of the banking sector, and $r_{i,t}^{Mrkt}$ represents market earnings. In this regard, $\beta_{i,t}$ is calculated by calculating the ratio of the covariance between bank and market earnings to market variance. Based on this, in the case of $\beta_{i,t} > 1$, the relative risk of the banking sector is high, which means the volatility of returns on bank stocks exceeds the returns on general stock market. This parameter shows whether returns on banking sector are more volatile than those on general index.

To measure the stress in the borrowing sector of the country, five-year data on credit risk premium (CDS) were used. Buyers of CDS pay premium to sellers of CDS, which is called CDS premium and is calculated based on a specific percentage of the insured amount. CDSs are a sign of reliability for countries. The higher this rate is, the more risky country bonds are.

Although the variables focused above are mainly used in the literature while developing a financial stress index, it is observed in some studies that an aggregation process of various approaches is preferred. Balakrishnan et al. (2011) and Ekinci (2013) examined the combination of all sub-indexes in the aggregation process adopted in their studies. In contrast, Illing and Lu (2006) who carried out a factor analysis adopted equal-weight and economic-weight methods. Cardarelli et al. (2011) preferred to give equal weight to variations in their studies while Hakkio and Keeton (2009) and Çevik et al. (2013) used principal component analysis.

When financial stress index gains a positive value, it means financial stress is above the average while gaining a negative value means it is below the average.

By taking all the aforementioned points into consideration, we constructed a financial stress index for Turkey by using daily data for the period 1/1/2002-28/10/2014. Firstly, five sub-indicators were standardized after they were calculated within the scope of the abovementioned explanations. Then an aggregate financial stress index was developed by applying a factor analysis[7] to all sub-indexes. Figure 1 shows daily financial stress index series developed[8].

When Figure 1 is analyzed, it is seen that our study reports findings supporting the findings of Elekdağ and Kanlı (2010), Ekinci (2013) and Çevik et al. (2013). Figure 1 indicates that political and/or economic shocks resulting from both internal and external factors have an effect on financial stress index.

[7] Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. Factor analysis is a size reduction process to eliminate the dependence on ability to obtain factor structure.

[8] The financial stress index was constructed with the combination of every single sub-index and by giving equal weight. Similar results were concluded in each method, though. The results can be presented upon request.

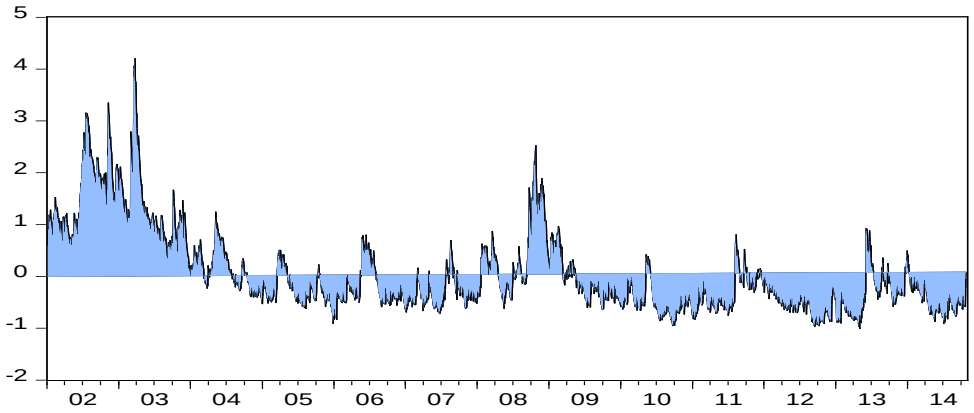

Figure 1: Daily Financial Stress Index

For example, we can observe that such factors as the general elections in Turkey after 2002 and the Iraq War in 2003-2004 had a negative impact on financial markets, causing uncertainty. Another period when financial uncertainty remarkably increased was the period when the effects of the global financial crisis were felt. According to these results, in periods when there is uncertainty, financial stress shows a tendency to increase. All in all, we can see that financial stress index gains negative values most of the time apart from the abovementioned periods.

In the following part of the study, the effects of financial stress index will be presented.

B. Financial Stress and Real Economy

Financial stress is expected to lead to economic contraction by both increasing credit/loan cost and causing higher uncertainty for economic units. For instance, in their study on 14 countries in which a dynamic heterogeneous panel method was used, Luintel et al. (2008) reached some findings indicating that financial structure affects the output levels in most countries. Blanco (2009), in his study covering 18 Latin American countries, analyzed the relation between financial development and economic growth with VAR model. According to the findings of his study, economic growth results in financial development while financial development is not a reason for economic growth. In other words, net impact of financial development on economic growth is quite low. The relations between financial development and economic growth are rather complicated since there is a mutual causal relationship between variables. The relation between financial development and economic growth varies according to the country's economic and institutional circumstances.

In their study that analyzed the relation between macroeconomics and financial variables in 21 OECD countries, Claessens et al. (2008) concluded that recessions in the aftermath of high financial stress have deeper and long-term impacts when compared to other periods. Hakkio and Keaton (2009) found out that in the USA loan standards increase, contracting economic activity when financial

stress is on the increase. In their study covering 17 advanced economies, Cardarelli et al. (2011) concluded that financial stress results in economic contraction in most of the countries.

Elekdağ and Kanlı (2010) reached a similar conclusion in their study on Turkey. The results of their study indicate that financial stress has a remarkable impact on economic activity. Besides, in their study covering the period 1997-2010, Çevik et al. (2013) concluded that financial stress index is a leading indicator of general economic activity in Turkey. Based on this, for this period, financial stress affected economic activity in Turkey.

To show the relation between financial stress index and economic activity, data on growth rate of industrial production, foreign trade volume, and domestic loan usage rate were used in this part of the study. Data on industrial production were gained from the website of TUIK (Turkish Statistical Institute), and data on foreign trade volume and domestic loan usage rate were gained from the website of The Central Bank of the Republic of Turkey (CBRT). To find out the relation between financial stress index and economic activity, Granger (1969) causality analysis and Vector Autoregressive Model (VAR) are used, but to use both, the variables need to be stationary. The unit root tests used to this end show that all series are static.[9] Firstly, factor analysis was applied by using the variables showing economic activity to determine the impact of financial stress index on economic activity. The variable gained as a result of the factor analysis was identified as economic activity variable.

To indicate the causal relationship between variables, Granger (1969) causality analysis was applied. When Table 1 is analyzed, null hypothesis is rejected according the the significance level of F-statistics, which is significant at 5 percent. The results of Table 1 show that there is a one-way causal relationship between financial stress index and economic activity, which is from financial stress index towards economic activity.

Table 1: The Results of Granger Causality Test[10]

	F-statistics	**Prob.**
Economic activity does not granger cause of financial stress index	0.25206	0.9577
Financial stress index does not granger cause of economic activity	2.56238**	0.0221

Note: ** is significant at 5 percent.

[9] The results can be presented upon request.

[10] The financial stress index and the results of the Granger causality test applied for the variables of industrial production, foreign trade volume, and domestic loan usage are presented in Annex 1.

As a result, the findings show that financial stress is granger cause of economic activity. To determine the direction of this effect, an impulse-response function was developed and its results were presented in Figure 2[11].

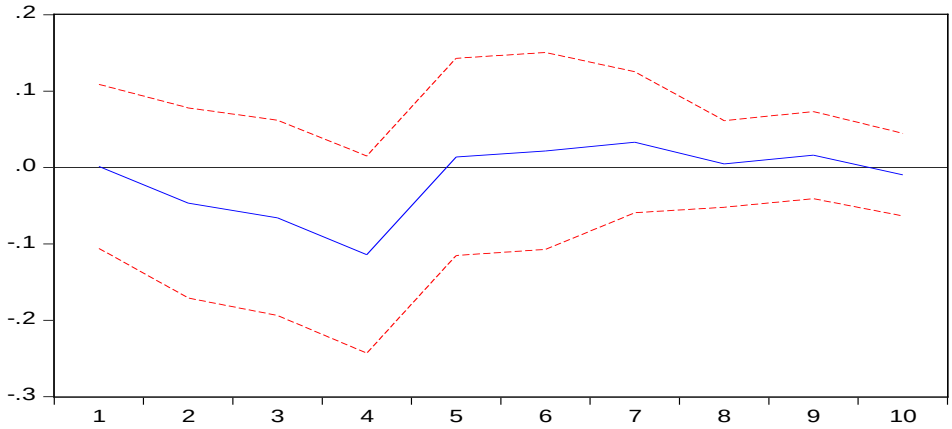

Figure 2: The Response of Economic Activity to Financial Stress

The impulse-response function presented in Figure 2 shows that when a random shock is given to the financial stress index, this random shock has a decreasing impact on economic activity. As a matter of fact, when financial stress increases, economic activity decreases. These results support the findings of Çevik et al. (2013). But, in comparison with the study by Çevik et al. (2013), our study found out that the impact of financial stress on economic activity is lower. The main reason for this difference is that Çevik et al. (2013) analyzed the period 1997-2010 in their study. In post-2002 period, some important reforms were implemented to ensure financial stability in Turkey. It can be argued that thanks to these reforms, the confidence of financial actors in the market increased, and some important steps were taken to ensure financial stability.

V. CONCLUSION

Until the latest global financial crisis, financial market variables were not included into standard macroeconomic models. As a result, in these models, the scope of the financial crisis and its persistence were estimated to be lower. The most important feature of financial stress is its impact on real economy. Therefore, we firstly constructed a financial stress index for Turkey and explored the relation between financial stress index and economic activity.

By constructing a financial stress index for Turkey which depends on daily data for the period 1/1/2002-28/10/2014, we found out that political and/or economic shocks resulting from both internal and external factors increase financial stress. Based on this finding, we argued that when there is uncertainty, financial

[11] The financial stress index and the results of impulse response function applied for the variables of industrial production, foreign trade volume, and domestic loan usage are presented in Annex 2.

stress increases. The results of the Granger causality test used to determine the relation between financial stress that was measured for Turkey and economic activity showed that there is a one-way causal relationship between the two. In other words, in Turkey, when financial stress increased, economic activity contracted in the period analyzed.

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ANNEX 1: GRANGER CAUSALITY RESULTS BETWEEN ECONOMIC ACTIVITY SERIES AND FINANCIAL STRESS INDEX

Table 2: Granger Causality Results

	F-statistics	**Prob.**
Industrial production does not granger cause of financial stress index	0.42574	0.8609
Financial stress index does not granger cause of industrial production	2.45311**	0.0275
Credit usage does not granger cause of financial stress index	0.84661	0.5634
Financial stress index does not granger cause of credit usage	2.68771*	0.0089
Foreign trade volume does not granger cause of financial stress index	0.55100	0.6986
Financial stress index does not granger cause of foreign trade volume	2.58832**	0.0393

Note: * is significant at 1 percent, ** is significant at 5 percent.

ANNEX 2: IMPULSE RESPONSE FUNCTION RESULTS BETWEEN ECONOMIC ACTIVITY SERIES AND FINANCIAL STRESS INDEX

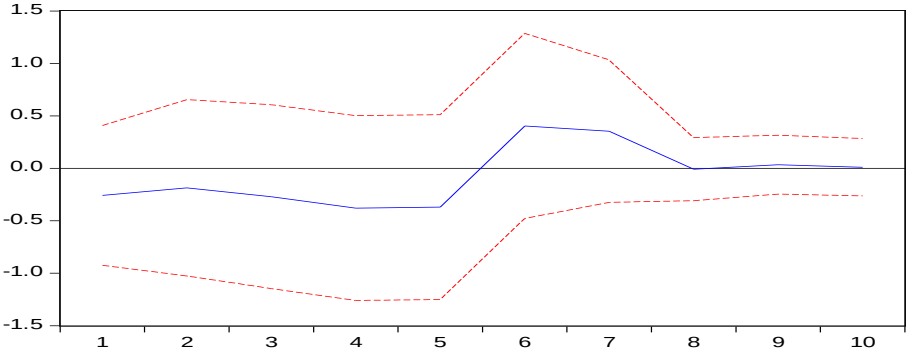

Figure 3: The Response of Industrial Production to Financial Stress

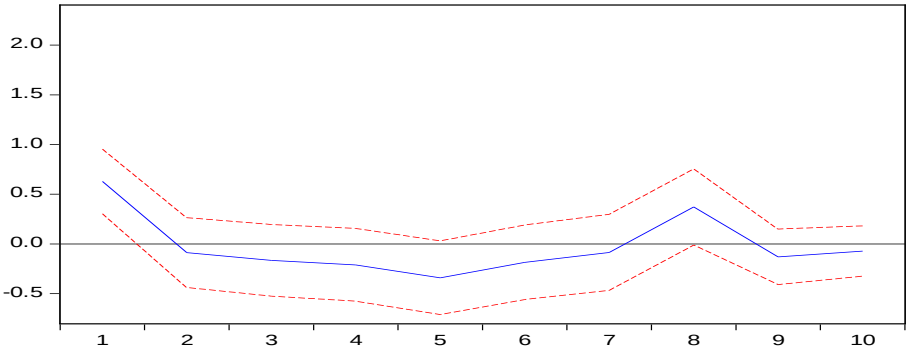

Figure 4: The Response of Credit Usage to Financial Stress

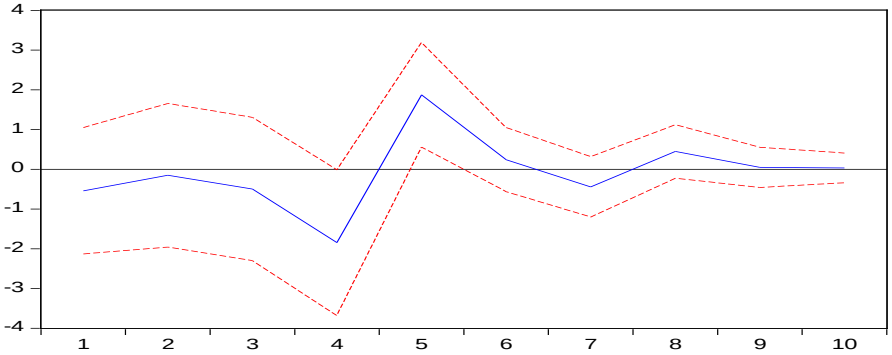

Figure 5: The Response of Foreign Trade Volume to Financial Stress