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Review on the Impact of Fiscal and Monetary Policies on Economic Growth in Iran Focusing on Financial Sector Stress

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Abstract

Recent developments in the global economy have resulted in a reassessment and clarification of some economic concepts. One of the changes in economic and financial theories is the great importance of the relationship between the real sector and the financial sector in the economy. After the global financial crisis of 2007, the impact of monetary and fiscal policies on the real sector has been controversial. Accordingly, the present study seeks to investigate the impact of economic growth on monetary and fiscal policies in Iran's economy over the period 1990-2018, taking into account the stress in the financial sector. The results show that the response of economic growth to fiscal policy stimulus does not depend on the state of financial sector stress. Yet, the implementation of this policy is more effective than monetary policy, and also leads to lower volatilities in economic growth.

Keywords: Fiscal Policy, Monetary Policy, Financial Stress Index, Threshold Vector Autoregression Model.

1. Introduction

The financial system plays a crucial role in any economy in achieving sustainable growth, job creation and social welfare. This becomes evident when a systematic financial crisis occurs. The scale and severity of financial instability can disrupt the mediating role of this sector and even bring it to a halt. In this case, the real sector suffers significant losses, unemployment increases and sometimes leads to social and political instability. The consequences of this show that in such a situation, financial turmoil and recession reinforce each other and an automatic exit mechanism is not conceivable. Therefore, overcoming recession and reducing financial instability requires active policies by policymakers and central banks (Kremer, 2016). The two main instruments of monetary and fiscal policy are the tools that economic policymakers use to deal with economic volatilities and mitigate recession or prosperity.

Before the 2007 financial crisis, the financial sector played a minor role in macroeconomic models (Borio, 2011). As a result, many models downplayed financial imbalances and rising financial stress. At the same time, it is critical for policymakers to develop theoretical models and empirical approaches in order to identify potential early deviations in financial markets. Policymakers need to be able to monitor the financial sector and measure its stress. In addition, it is critical to identify the causes of stress and ways to deal with them, and to have a comprehensive view of the destructive effects of financial stress. Therefore, monitoring and

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supervising the proper functioning of the financial sector is an indispensable task for financial and monetary authorities. In particular, an accurate analysis of financial stress is one of the most important tools in micro- and macro-prudential policy. To achieve this, an indicator and quantitative review are needed. Therefore, financial and monetary institutions in the world (e.g., the European Central Bank, the International Monetary Fund, the Federal Reserve, etc.) have developed indicators that reflect financial stress (Aboura et al., 2017). On the other hand, how policymakers respond to financial stress and affect real sector variables is controversial; so that the impact of economic growth in times of financial stress has become a contentious issue.

1-1. Fiscal Policy and Financial Stress

In general, there are two ideas about the magnitude and direction of the effects of fiscal policy. Proponents of expansionary fiscal policy argue that such policies have a multiplier greater than one. Opponents, on the other hand, believe that austerity can revive the economy because the multiplier is equal to zero (Pragidis et al., 2018).

Economic events in the years following the 2007 crisis have sparked new debates about the relationship between aggregate demand and government spending (as drivers of economic activity). The question of the significant influence of government spending on aggregate output and its components, as well as the possibility of nonlinearity of this influence, has been given special attention by researchers. On the one hand, according to general equilibrium models in which factors of production are at full employment, the shock of government spending affects output by changing the quantity of factors of production or technology.[1] These models predict a negative impact of high government spending, mainly because of the alternative effects on investment and private consumption, and even if positive, their effect is negligible. Moreover, the general equilibrium models do not provide a reason for the nonlinear effects of output and its components to be affected by government spending. Keynesian models, on the other hand, predict that factors of production are not always fully utilized in some periods because of the lack of demand. When output is below its potential, an increase in government spending directly improves output by hiring unemployed agents. In this case, it is necessary that investment and consumption respond positively to the government spending shock and that the multiplier of fiscal policy is greater than one. Traditional Keynesian paradigms emphasize that the multiplier in spending is relatively high over many intercepts because full employment of factors of production occurs in a few moments (the economy is not necessarily in recession). When the agents unemployment is low and employment is near full, these models suggest that the multiplier will be small because of the completion of the substitution effect. Therefore, in Keynesian models, the possibility of an impact of fiscal policy on the macroeconomy over time and its nonlinearity is very likely (Fazzari et al., 2015).

Instability in the financial sector and its components is cited as a source of the release of shocks that amplify volatilities in the economy. For example, in the credit cycle model developed by Kyotaki & Moore (1997), business cycle volatilities are assumed to be amplified when the credit market is in deficit and borrowers do not have to repay their debts. Hence, lenders seek capital for collateral. However, in times of recession and crisis, the value of collateral declines, so the propensity to lend money that can be spent on capital expenditures declines. Therefore, output will fall sharply compared to times when these financial frictions do not exist.

Some studies on dynamic stochastic general equilibrium (DSGE) have emphasized that the effects of fiscal policy are determined by fiscal stability (e.g., Fernandez-Villaverde, 2010; Carrillo & Poilly, 2013; and Kara & Sin, 2010). In these studies, the effect of fiscal policy is found to be strong when financial instability is high

[1]. It should be noted that the sign of this effect can be positive or negative. The shock of rising expenditures and interest rates can be associated by an increase in labor supply or a decrease in capital formation. In the first case, there may be an increase in output, while the second case is accompanied by a decrease in output.

and credit is scarce. So that fiscal policy shock is reinforced by a reduction in real interest rates and better access to credit, which leads to accelerated economic growth.

Following the 2007 global financial crisis, a large literature was developed on the state of the financial sector and government debt, on the one hand, and their impact on macroeconomic performance, on the other. Policymakers expected to stabilize demand with fiscal stimulus packages and reduce the severity of the crisis with bailouts, both of which were accompanied by increased government debt (Afonso et al., 2018). In the past, linear approaches and models were used to address this issue (e.g., Blanchard & Perotti, 2002). However, recent research has focused on the nonlinear effects of fiscal policy on the economy.

Studies that address the nonlinear effects of fiscal policy fall into three general categories: In the first category, the effectiveness of fiscal policy depends on the level of government debt (e.g., Reinhart & Rogoff, 2010); in the second category, the effect of the economy on fiscal policy depends on the state of business cycles (e.g., Taylor et al., 2012); and in the third category, it is emphasized that financial stress plays a crucial role in the impact of fiscal policy, so that this impact is nonlinear depending on the degree of stress (e.g., Afonso et al., 2011). The main theme of theoretical studies (e.g., Stein, 2012a, 2012b; Brunnermeier & Oehmke, 2012, 2013) is that financial stress affects the impact of fiscal policy on economic growth through changes in risk premia (especially bond spreads). Brunnermeier & Oehmke (2012) explain this through the diabolic loop: when the price of government debt falls due to the sunspot equilibrium, government debt held by banks exceeds a certain level or bank assets fall below a certain level. In this case, banks are at risk of bankruptcy and financial stress increase. In such a situation, fiscal policy cannot influence economic growth through changes in debt (Proaño et al., 2014).

The 2007 crisis was preceded by severe financial instability and recession. Historical evidence has shown that severe financial stress and recessions are often linked (Cardarelli et al., 2011). During periods of severe financial stress, the proportion of non-performing loans held by banks increases and negative market sentiment and expectations reduce the value of financial assets. As a result, a distract in financial markets due to the accumulation of non-performing loans on banks' balance sheets can lead to a recession by reducing lending to other sectors. In such cases, countercyclical fiscal policy can help overcome the recession in two ways: 1) increasing government spending to offset the decline in private sector demand; 2) reducing taxes to offset the constraints on lending from the weak financial sector. In addition, government support to the weakened financial sector through the bailouts may positively change sentiment and expectations and help revive the economy. On the other hand, it is important to keep in mind that expansionary fiscal policy may be associated with increased financial stress. Granting bailouts increases the government's financial constraints and undermines the government's ability to repay its debt. Moreover, it may raise concerns about the sustainability of government debt in the economy (Afonso et al., 2018).

2-1. Monetary Policy and Financial Stress

Achieving financial stability through monetary policy is highly controversial among economists and policymakers for a variety of reasons (e.g., inflation). Believing in leaning against the wind, some proponents argue that monetary policy should be actively pursued to reduce risk in financial markets. Yet, some opponents believe that monetary policy cannot achieve multiple objectives. In practice, empirical evidence confirms that central banks that regulate interest rates have behaved differently in the face of escalating financial stress. Baxa et al. (2014) examined the behavior of central banks in four advanced economies with respect to financial stress. They argue that central banks have pursued expansionary monetary policies in response to escalating financial stress. Martin & Milas (2013) also state that the Bank of England responds non-linearly to financial stress so that when financial stress increased in 2007, the intensity of the response was higher than in other periods (Floro & Roye, 2017).

In general, the two main objectives of central banks are financial stability and monetary stability. The disruption or bankruptcy of the financial system affects the real sector and is reflected in the gap between output and inflation. Financial instability can also arise because of imbalances in other sectors of the economy. The performance of central banks in the twentieth century shows that these banks played a fundamental role in preventing and mitigating financial shocks. At that time, the central bank's key issue, financial stability, was far more important than monetary stability. For this reason, the Bretton Woods Agreement after World War II led to the emergence of stable financial markets, even though the general price level experienced little stability with the onset of severe inflation (Schoenmaker, 2013). The financial turmoil of 2009-2008 sparked controversy in the literature about the effectiveness of monetary policy. During the financial crisis, many countries reached interest rates close to zero. In this situation, it appeared that expansionary monetary policy alone would not be able to reverse the substantial decline in demand. Therefore, doubts arose about the effectiveness of monetary policy in times of financial crisis. Indeed, the mechanism of action of monetary policy is a central issue in macroeconomics (Kim, 2018).

Historically, central banks have mainly pursued expansionary monetary policies when an external financial shock occurred. Indeed, many theoretical and empirical studies (e.g., Chadha et al., 2004; Baxa et al., 2013) have shown that monetary policy systematically responds to changes and fluctuations in financial sector variables by lowering interest rates. At the same time, the timing of monetary policy intervention is controversial. In particular, when financial sector stress is low, central banks have adopted different monetary policy approaches. Bayoumi et al. (2014) found that, prior to the 2007 crisis, emerging market economies placed more weight on financial imbalances in the implementation of monetary policy than advanced economies. This revealed truth may be the result of benign neglect; a situation in which monetary policy responds only to asset prices when the stability of inflation and output is at stake (Floro et al., 2017). There are limits to monetary policy that constrain its effectiveness. For example, the economy may be in a liquidity trap and interest rate cuts may not be possible. In addition, many countries are members of monetary unions (e.g., the European Union), which creates a situation where independent monetary policy is not possible (Hayat & Qader, 2016).

The global financial crisis has led to highly expansionary monetary policies (through interest rate cuts) in advanced economies to stabilize the financial sector and economic activities. While fiscal stress was contained and fiscal conditions improved through the use of prudent policies, monetary stimulus was needed to support economic recovery. These developments led to a focus on the impact of monetary policy due to the financial situation and vulnerability of this sector. In this context, some economists have focused on the nonlinearity of this effect. On the one hand, giving the leaning against the wind viewpoint, the right monetary policy, if stable in the long-run, can reduce financial stress. On the other hand, experience in Sweden and Norway has shown that such an approach is difficult to implement. Moreover, the effect of monetary policy on output depends nonlinearly on the state of the financial sector. When financial stress is high, the introduction of expansionary monetary policy by the central bank requires considerable intensity and stability (Hatzius et al., 2010). Blinder (1987), Bernanke & Gertler (1989), and Bernanke et al. (1996) provide important theoretical support for this group of studies. The main theme of these studies is that the negative shock of monetary policy is amplified by weakening credit and perpetuates the recession (Saldías, 2017).

The severe recession that followed the 2007 global financial crisis demonstrated the importance of the central bank's response in the early stages of the financial stress to reduce its impact on the overall economy. Extensive studies have been then conducted on financial sector surveillance, its impact on macroeconomic variables, and how best to respond to imbalances and escalating stress in the sector. In this context, the concept of reforming monetary policy strategy to simultaneously stabilize prices and the financial sector has recently become popular among economists and monetary authorities. Before the global financial crisis, central banks tended

to adopt the "clean after birth[1]" approach. This view recommends that the central bank focus only on price stability and ignore imbalances in the financial sector. This is because achieving price stability brings stability to economic growth and stability to financial markets. This view emphasizes that the central bank is only allowed to intervene in this sector when a financial crisis occurs. And do so in a way that reduces the impact of the crisis. At the other end of the spectrum is the "leaning against the wind" view. This approach suggests that the central bank should play an active role in managing financial stress with monetary policy and prevent financial crises from occurring (Çamlıca, 2016).

In light of the above, research on the impact of fiscal and monetary policies in times of economic crises and the presence of instability in developing countries requires further investigation. This means that these policies may have different effects on economic stability or instability for each country. In Iran, however, the use of fiscal and monetary measures by the government and the central bank has always been very controversial. Therefore, this study attempts to compare the effects of fiscal and monetary policies on economic growth, taking into account the stress[2] in the financial sector in Iran.

The remainder of this paper is organized as follows. Section 2 describes the research method and the case study. After presenting the variables used and the model in question, an index is developed to measure financial stress. In Section 3, using the vector autoregression method, the thresholds for the nonlinear effects of fiscal and monetary policy are calculated and examined. Finally Section 4 gives a summary and concludes the paper.

2. Research Methodology

Threshold vector autoregression models are part of linear models with different autoregression matrices in each regime. These regimes are determined by a transfer variable, which is either an endogenous or an exogenous variable. In other words, the threshold vector autoregression model is modeled by splitting the observations into different regimes according to a transfer variable. In this way, the available time series during each regime is described by a linear model.

In general, the vector autoregression model of order p is as follows:

$$Y_t = \alpha + \sum_{i=0}^{p} A_i Y_{t-i} + \varepsilon_t \qquad (1)$$

Where Yt is the vector of endogenous variables, A is the parameter matrix, α is the constant parameter, p is the optimal interval length of the endogenous variables, and ε_t is the vector of error terms. The dependence between the variables is measured by the response functions, which show the response of the endogenous variables to the shocks on ε_t.

Threshold vector autoregression model is a special case of vector autoregression in which variables move between regimes as a function of thresholds. When there is one threshold and consequently two regimes, Equation 1 can be written as a vector autoregression model of the thresholds of the two regimes as follows:

$$Y_t = I\left[C_{t-d} \le \gamma\right](\alpha^1 + \sum_{i=0}^{p} A_i^1 Y_{t-i}) + I\left[C_{t-d} \ge \gamma\right](\alpha^2 + \sum_{i=0}^{p} A_i^2 Y_{t-i}) + \varepsilon_t \qquad (2)$$

Where C is the threshold variable and γ is the threshold value; I[0] is a function of a virtual index whose value is one if $C_{t-d} \le \gamma$ and zero otherwise; C_{t-d} is the intermittent threshold variable of d period. In this study, Yt is a vector that includes monetary policy instruments (growth in the monetary base), fiscal policy instruments (growth in the ratio of government spending to GDP), seasonally adjusted fixed-price economic growth, and growth in the financial stress index. The period under study includes quarterly data from 1990-2018, and the

[1]. Reaction to the asset bubble after it bursts.

[2]. Stress or stress in financial markets refers to the force influencing the behavior of economic agents in the form of uncertainty and changing expectations. Critical values of financial stress are called financial crisis.

data source is the Economic Time Series Database of the Central Bank of the Islamic Republic of Iran. For more information on the variables used, see Appendix 1 of the article.

3. Results

In this section, the research results are presented. First, considering the variables representative of the financial sector, the principal components of the financial stress index are analyzed. Next, the results of the estimation of the threshold autoregression model are described.

3-1. Development of Financial Stress Index

The following variables were used to construct the financial stress index for the Iranian economy:[1]

Exchange rate premium (the difference between the official exchange rate and the free market; EXSP), the ratio of bills and coins to M1; M1, the ratio of M1 to M2; M1M2, the ratio of long-term deposits to total deposits; DES, rent price index for major cities; HP , total stock exchange price index; TEPIX, bank spreads (difference between the average interest paid on deposits from the average interest received on the facility; SP, risk premia (difference between short-term interest rate and long-term interest rate; RP).

Investigating the presence of correlations between variables is the first step in applying the basic components approach. Table 1 shows the results of Bartlett's test. In this test, the null hypothesis is that there is no correlation between the data.

Table 1: Bartlett's test results

Index created	Degree of freedom	Value	Probability level
FC	7	72.06	0.00

Source: Research findings

According to the above table the null hypothesis cannot be accepted. Thus, there is a strong correlation between the variables and it is possible to formulate a financial status index using the principal component analysis approach using the variables mentioned above.

Table 2: First three component analysis

Variable	DES	EXSP	HP	M1	M1M2	RR	SP	TEPIX
Component I	0.45	-0.34	0.47	0.13	0.44	-0.14	0.25	0.39
Component II	0.5	0.05	-0.15	-0.25	-0.15	-0.39	0.55	-0.42
Component III	0.01	-0.02	-0.01	-0.73	0.1	0.61	0.25	0.05

Source: Research findings

According to the researchers' estimates, about 89% of the dispersion of the data set is reflected by the first three components. Therefore, weighting was done using the above three components. Information on the first three components can be found in Table 2. The normalized weights were calculated using the information obtained. In order to calculate the weights, first the squares of the values of the first three components of the variables are added. Then, the sum of the absolute values of the values of the first through third components is divided by the previous sum. This method ensures that the sum of the weights is equal to one. Since the

[1]. The reason for using each of the variables and how they affect the financial sector is described in Appendix 1.

variables have different units, it is necessary to normalize them. For this purpose, the min-max method and Equation 3 were used:

$$V_{it}^{*} = \frac{V_{it} - Min(V_i)}{Max(V_i) - Min(V_i)} \quad (3)$$

Where V_{it} is the values of variable *i* at time *t*, $Min(V_i)$ and $Max(V_i)$ are the minimum and maximum values of variable *i* at time *t* respectively, and V_{it}^{*} is the normalization value of variable i at time t. Based on Equation 3, the normalization process converts all variables to the same range of [0-1].

Equation 4 shows the linear composition of the normalized variables to construct the financial status index:

$$FC_t = 0.08DES_t + 0.12EXSP_t + 0.08HP_t + 0.19M1_t + 0.09M1M2_t + 0.18RP_t + 0.14SP_t + 0.11TEPIX_t \quad (4)$$

According to the normalization of the weights and variables, the obtained index will have a value between zero and one. Since the variables of the total stock index and the ratio of long-term deposits to total deposits are associated with decreasing stress in the financial sector, their value has decreased after the normalization of one. This process ensures that when the financial stress index approaches one/zero, it means stress/calm in financial conditions. Figure 1 illustrates the drawn index.

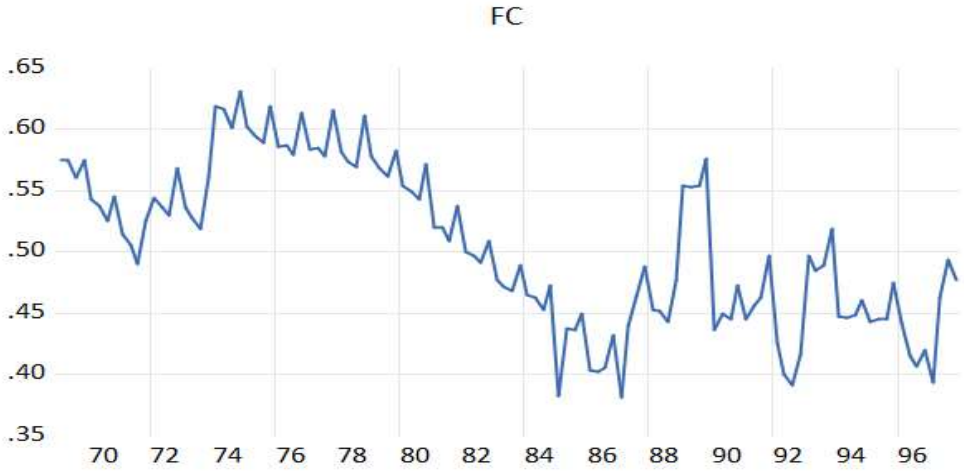

Fig. 1: Financial stress index

Source: Research findings

As shown in Figure 1, the financial sector of the Iranian economy was most strained in 1995. Since then, the financial sector stress decreases and reaches its minimum in 2005. Then, the financial sector is again put under stress by the inflow of oil revenues, the Dutch disease, and rising inflation. After the imposition of international sanctions following the nuclear activities in the late 2000s, the index jumped, due to the rise of the index related to the real estate sector and the suppression of exchange rates and other determining variables. After the peak and the return of sanctions, stress in the financial sector increased from the early 2018, which is shown in Figure 1.

3-2. Estimation of the Threshold Vector Autoregression Model

As mentioned in the methodology section, to achieve the research objectives, the variables of monetary policy instrument (growth of monetary base), fiscal policy instrument (growth of the share of government spending in GDP), economic growth at constant prices, and growth of financial stress index were used. The use of variables in the growth rate condition guarantees their reliability, which is also shown in Appendix 2 using the augmented Dickey-Fuller test. Thus, the resulting estimates do not have the problem of spurious regression.

The first step in estimating threshold models is to select the transfer variable and test for nonlinear effects. In this study, the probability level test was used. In these tests, the probability level and critical values were calculated by the bootstrap method with 1000 repetitions of the simulation according to Lo & Zivot (2001).

Based on the result of the mentioned test, the threshold value(s) is then determined. In the next step, the model is specified and the results are analyzed. Table 2 shows the results of the probability level test.

Table 3: Nonlinearity test

Hypotheses	T-statistic	Probability level	Threshold value
H_0: VAR model (one regime) H_1: TVAR model with one threshold (two regimes)	63.46	0.00	H_0 rejected
H_0: VAR model (one regime) H_1: TVAR model with two thresholds (three regimes)	104.27	0.01	H_0 rejected
H_0: TVAR model with one threshold (two regimes) H_1: TVAR model with two thresholds (three regimes)	40.81	0.13	H_0 accepted

The test results show firstly: the explanation of the relationship between the variables introduced in linear patterns cannot be accepted. Second, this relationship with two thresholds and three regimes cannot be specified for two models. Finally, Equation 6 is considered assuming the existence of one threshold and two regimes for both models.

Since the virtual variable in Equation 2 is discontinuous, it is not possible to estimate the threshold parameter, nor is it possible to estimate a quadratic minimization or maximization logarithm estimator using conventional optimization methods. This problem can be solved by minimizing the following function.

$$\hat{\theta} = arg \min_{\theta} SSR(\theta) \quad (5)$$

It is possible to minimize the above function by network searching. In this method, the values of the variables are sorted. Then, a certain percentage of the first and last values[1] is extracted to ensure that there are a small number of observations in each regime. For each of the selected values, the SSR is estimated and the SSR value that minimizes the above function is selected as the threshold parameter. The network search method in econometrics is also known by other names such as centralized least squares and conditional least squares. Figure 2 shows the search result of the functional network (5) for the research model.

[1]. In this study, 15% is considered.

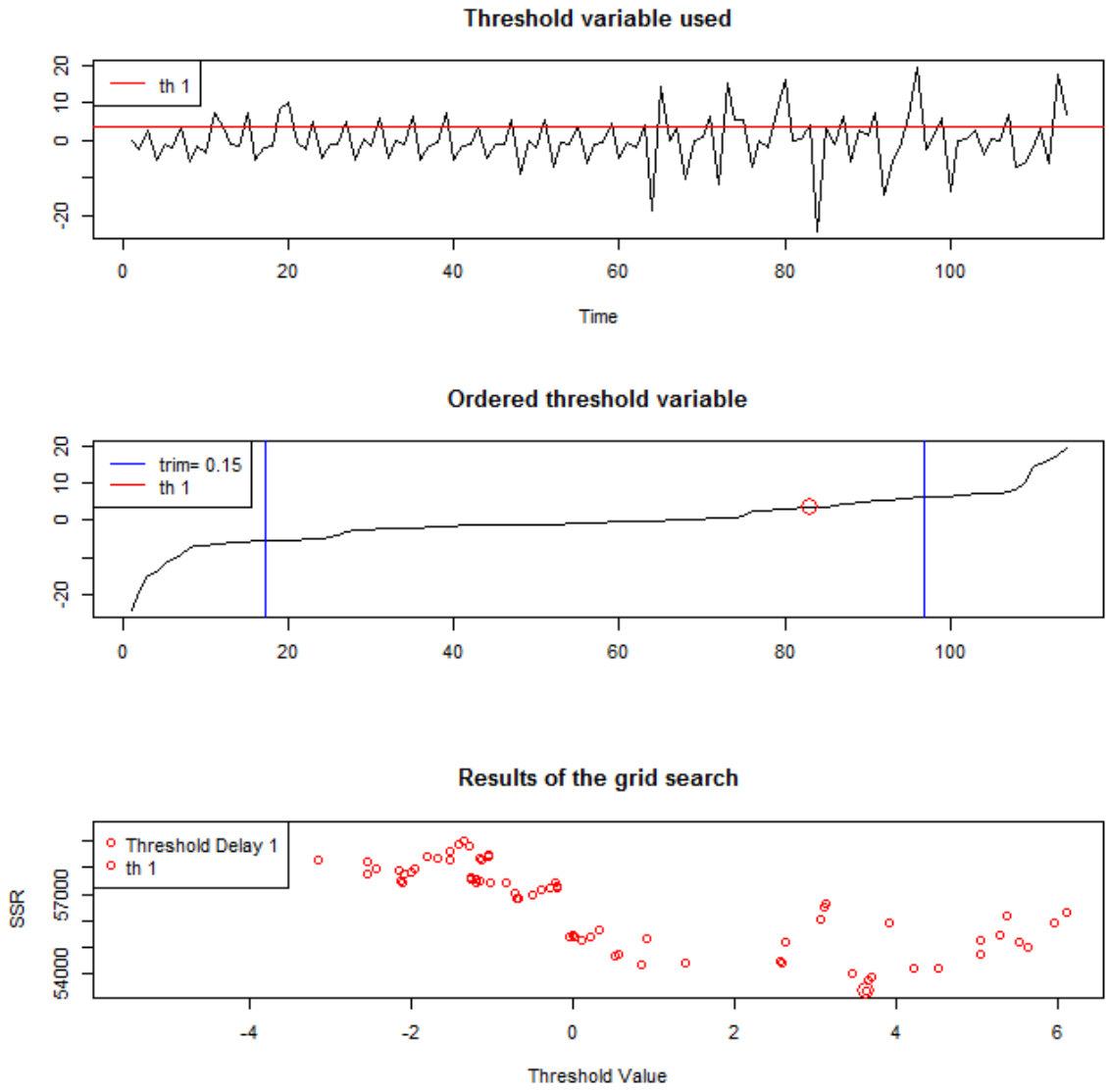

Fig. 2: Results of the network search to find the growth threshold of the financial stress index
Source: Research findings

As shown in Figure 2, a threshold effect led to the U-shaped diagram of network search. The threshold value in this model is 3.63%. In other words, the growth rate of 3.63% for the financial stress index plays the role of a threshold, and causes the relationship between the variables in the first model to be different. Based on this value, 72.8% of the observations are before the threshold (high stress regime) and 27.2% are after (low stress regime).

As with the linear vector autoregression models, the relationship between the variables is analyzed using generalized instantaneous response functions.

Figures 2 and 3 illustrate the response of economic growth to the shock of fiscal and monetary policy.[1]

[1]. The black line corresponds to the low stress regime (before the threshold), and the blue line corresponds to the high stress regime (after the threshold).

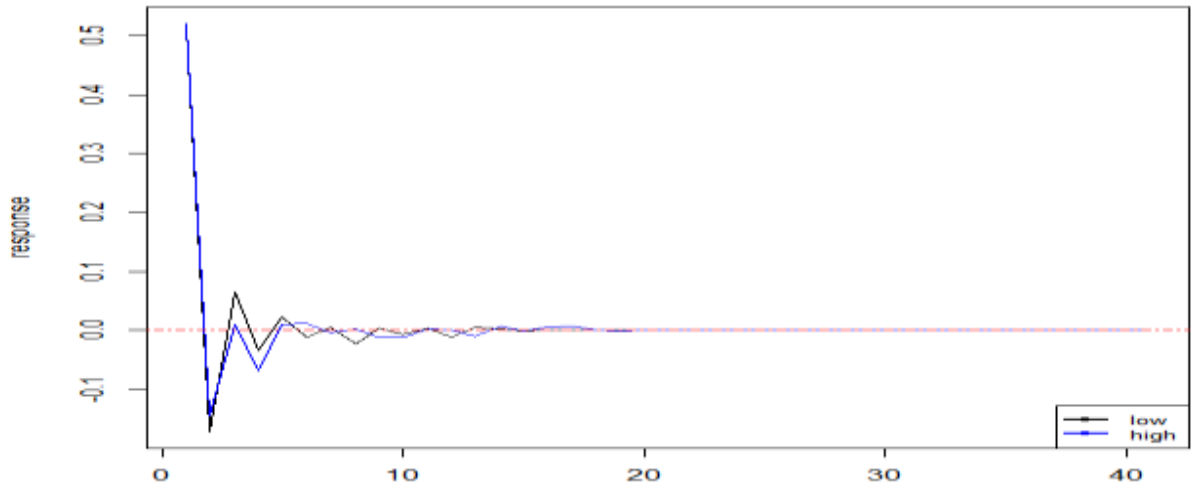

Fig. 3: Generalized instantaneous response function of economic growth to the shock of fiscal policy
Source: Research findings

According to Figure 3, the response of economic growth to the shock of fiscal policy does not depend on financial sector stress. Regardless of the state of financial stress, economic growth will increase in the face of expansionary fiscal policy. Accordingly, the view of Afonso et al. (2018) that the application of fiscal policy increases stress by provoking stress in the financial sector and has no positive impact on the Iranian economy is not confirmed.

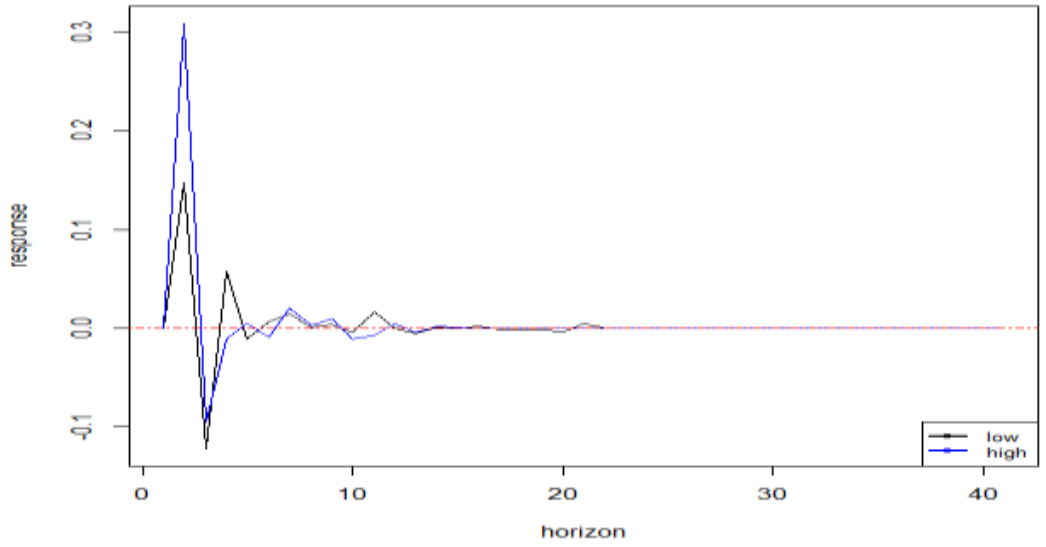

Fig. 4: The function of generalized instantaneous response of economic growth to the shock of monetary policy
Source: Research findings

According to Figure 4, the impact of monetary policy on economic growth depends on the stress in the financial sector. When financial sector stress increases, the effectiveness of monetary policy increases. Accordingly, the view of Hatzius et al. (2010) is confirmed that the effectiveness of monetary policy for the Iranian economy is nonlinear and depends on the stress in the financial sector.

Comparing Figures 3 and 4, the difference between the effects of fiscal and monetary policies on economic growth, taking into account the stress situation in the financial sector, is as follows:

First, unlike fiscal policy, the effectiveness of monetary policy depends on financial sector stress; second, the effect of fiscal policy is larger than that of monetary policy in absolute terms regardless of the state of stress; third, the response of economic growth to monetary policy shocks is more volatile than that to fiscal policy

shocks. That is, in a situation where the financial sector is in a high stress state, the response of economic growth is accompanied by more volatilities. While the response of economic growth to economic shocks is not only less stressful, but also does not depend on the state of financial sector stress.

4. Conclusion

Before the 2007 financial crisis, the financial sector played a minor role in macroeconomic models. As a result, many models downplayed financial imbalances and rising financial stresses. At the same time, accurate analysis of financial stress is one of the fundamental tools in micro and macro prudential policies. To achieve this, an indicator and quantitative review are needed. On the other hand, how policymakers respond to financial stress and affect real sector variables is questionable so that the impact of economic growth in times of financial stress has become a controversial issue. In this regard, the present study developed an index of financial reporting in the Iranian economy in the first phase. The highest stress in the financial sector of the Iranian economy occurred in 1995. After that, the stress in the financial sector decreased and reached its lowest point in 2005. Then, the financial sector was again under stress due to the inflow of oil revenues, Dutch disease, and rising inflation. After the imposition of international sanctions following the nuclear activities in the late 2000s, the index jumped, due to the rise of the index related to the real estate sector and the suppression of exchange rates and other determining variables. After the peak and the return of sanctions, stress in the financial sector increased from the early 2017. Subsequently, using the threshold vector autoregression method and taking the financial stress index created in the previous phase as the model threshold variable, we examined how economic growth is affected by fiscal and monetary policy in the face of financial stress. The results of this study show that in the Iranian economy, the response of economic growth to the shock of fiscal policy does not depend on the stress state of the financial sector. The implementation of this policy is not only more effective than monetary policy, but also leads to lower fluctuations in economic growth. Moreover, unlike fiscal policy, the effectiveness of monetary policy depends on financial sector stress. Therefore, policymakers are advised to use fiscal policy first and then monetary policy to influence the real sector and reduce volatility when financial sector stress increases.

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Appendix 1: Variables Used in the Construction of the Financial Stress Index

Considering the conditions of the Iranian economy, the following variables are considered as variables for constructing the financial stress index.

Volume of bills and coins to M1: If the volume of bills and coins increases relative to the volume of money, it indicates that exchange through money has increased and the use of demand deposits for economic exchange has decreased. An increase in this ratio reduces the monetary multiplier and consequently reduces the creditworthiness of banks, indicating decreasing confidence in the banking system or incomplete development of the banking system in providing services to facilitate transactions and economic exchange. According to the proposed definition of financial stress, an increase in this ratio is associated with or can be seen as a sign of uncertainty and stress in the financial sector.

M1 to M2 ratio: This ratio shows the composition of assets based on their degree of liquidity. The larger this ratio is, the lower the banking system's ability to endow resources by attracting long-term deposits. If the above ratio increases, which in turn leads to more financial stress, the banking system performs the function of facilitating transactions but is unable to perform another basic function of providing and directing resources for investment. An increase in this ratio means that inflationary expectations have intensified and, under the conditions of the Iranian economy (average inflation of 20% over the last 40 years), will lead to investment in unproductive things such as intermediation.

Durability of long-term deposits: The stability and duration of long-term deposit contracts with the banking system is one of the most important factors in assessing the state of the banking sector. The durability of long-term deposits will decrease in a situation of financial stress due to the uncertainty in the banking system, the increase in the expected return of depositors and also the instability of their behavior due to the rapid changes in their expectations and society. Therefore, an increase in this variable, i.e. a decrease in stress, leads to an increase in the power of policymakers to implement and carry out their desired policies. This index was considered as the ratio of long-term deposits to total deposits.

Price index for rental housing in large cities: In empirical studies, variables related to housing prices are considered as assets. The relationship of assets to the real sector via consumption is controversial. When asset prices increase, consumption and consequently aggregate demand are positively affected, and as a result, economic growth changes. As this index rises, the incentive to allocate resources to this sector increases, which is associated with uncertainty in the financial markets.

Total Equity Price Index (TEPIX): Total equity price index is one of the most important financial markets in any stock market-oriented economy. The stock market plays a key role in the macroeconomy as it influences the endowment and allocation of financial resources. TEPIX is an important indicator to measure the situation in this market. When the TEPIX increases, financial resources are expected to be attracted to this market. In this case, more resources will be available to producers, and investment will increase. The real sector will be positively affected by increased investment. Therefore, improvements in stock conditions may indicate economic agents' confidence in the financial system and may be associated with the reduction of stress and the entry of resources into the competitive unproductive markets.

Exchange rate premium: Foreign trade-related channels show a close relationship between foreign exchange policy and fiscal and monetary policy. These channels are very important in influencing the real sector. The exchange rate channel is known as the most important of them. The introduction of multi-currency systems disrupts the proper allocation of foreign exchange.

Bank spread (SP): By definition, the bank spread is the difference between the average interest paid on deposits and the average interest received on the facility. When the bank spread is high, banks have tried to make a profit by raising the interest rate on the facilities granted and lowering the interest rate on deposits (or a combination of both). In this case, due to lack of efficiency and inability to reduce costs, banks and credit institutions have chosen the easiest way to increase their operating profit. Therefore, the bank spread is considered to be one of the variables that indicate the efficiency of the banking sector. Another application of bank spread is to measure the structure of the banking sector. The growing gap between interest rates on facilities and deposits indicates that the market is moving away from competition. The higher the value of this variable, the more likely the increase in the cost of financing economic activity is due to the monopoly power of banks. Based on the above, an increase in bank spreads can be expected to adversely affect the real sector by reducing bank efficiency and increasing funding costs.

Risk Premia (RP): In this study, risk premia is equal to the difference between the short-term interest rate and the long-term interest rate. Regardless of the risk position of depositors, banks and credit institutions offer higher interest rates on long-term deposits to attract resources when the financial situation is risky. Therefore, part of the financial situation and its expected trends is reflected in the risk premia. Since financial sector variables contain important information about the future values of real variables, an increase in the risk premia as a leading variable is expected to unfavorably predict the situation of the real sector in future periods. Thus, if the risk premia and the probability of recession in the real sector increase, first, financial resources will be diverted to unproductive activities; second, as the outlook for economic activity dims, investment is likely to decline.

Appendix 2: Unit Root Test Results

Table A: Unit root test

Variable	With Y-intercept and no trend*		With origin-intercept and including the trend**	
	T-statistic	Probability level	T-statistic	Probability level
RFC	-13.16	0.01	-3.46	0.00
FPOLICY	-11.19	0.00	-10.87	0.00
MPOLICY	-4.67	0.00	-4.67	0.00
GROWTH	-13.26	0.00	13.18	0.00

Notes: *, ** and critical values at a confidence level of 95% are -2.88 and -3.45, respectively.
Source: Research findings

As can be seen, both variables are stationary in all specifications in level. Therefore, there is no need to investigate the stationarity of the variables in the first order difference mode and to investigate cointegration.