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Investigating the impact of financial stress shocks on economic uncertainty: a non-linear TVAR approach

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EXTENDED ABSTRACT

INTRODUCTION

The financial sector is an integral part of any country's economy because it plays a vital role in allocating capital resources, monitoring investments, facilitating trade and promoting risk management. vestments, facilitating trade and promoting risk management. Therefore, any failure in the financial system can have devastating effects on the economy. Financial stress is one of the types of this dysfunction, because it is often associated with reduced availability of credit and higher costs of financial intermediation due to increased friction and information asymmetry in financial markets (Hakkio & Keeton, 2009). Previous literature has shown that financial stress can negatively affect several aspects of the economy. For example, it can lead the economy to a state of uncertainty (Davig & Hakkio, 2010) and increase the volatility of production (Mallick & Sousa, 2013), reduce trade (Choudhry & Hassan, 2015), or reduce the flow of foreign direct investment. (Stoddard & Noy, 2015; Nguyen & Duong, 2014).

METHODOLOGY

In this study, the Threshold Vector Autoregression (TVAR) method has been used to investigate the effect of financial stress on economic uncertainty in Iran. The model used in the present study is the same as that of Balcilar et al et al. (2022) which used three variables of industrial production, inflation and interest rate to calculate economic uncertainties, with the difference that instead of interest rate variable (explanation of monetary policy), the money volume variable is used.

In this regard, the two-regime (one-threshold) TVAR model is estimated. The two-regime TVAR model is explained as follows:

$$y_t = \begin{cases} \alpha_1 + A_1(L)y_t + \varepsilon_{1t} & \text{if} \quad q_t \le \gamma_1 \\ \alpha_2 + A_2(L)y_t + \varepsilon_{2t} & \text{if} \quad q_t > \gamma_2 \end{cases} \qquad (1)$$

where the y_t is the vector of endogenous variables consists of the difference of industrial production logarithm (DLIP), consumer price index logarithm (LCPI) and difference of money volume logarithm (DLM). qt is a threshold variable, which is the Financial Stress Index (FSI). If the financial stress index is equal to or less than its threshold value, the variables are in the low regime; Otherwise, the variables are in the high regime, for this purpose,

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three models with three dependent variables of economic uncertainty indicators consisting of the difference of industrial production logarithm (DLIP), consumer price index logarithm (LCPI) and difference of money volume logarithm (DLM) in two regimes of low and high financial stress specified.

FINDINGS

Before estimating the model in time series analysis, it is necessary to verify the stationarity of the research variables. Considering that all variables utilized in the threshold vector autoregression model must be stationary, if a variable is nonstationary, its difference should be used for modeling. The results of the augmented Dickey-Fuller (ADF) unit root test show that the two variables FSI and LCPI are stationary in the level, but the variables LIP and LM are non-stationary and cumulative of I(1), so their first difference should be used in the TVAR model. To test the threshold effects, three main variables of the research, i.e. difference of industrial production, inflation and difference of money volume have been considered. In this way, the moving average of financial stress with one lag is determined as a threshold variable in three models, and the optimal lag of the TVAR model is based on the threshold variable in both first models (the first model with the dependent variable of the difference in industrial production and the second model with the dependent variable of inflation) lag 2 was determined and the third model (with the dependent variable of the difference in money supply) lag 1 was determined. So, the best Akaike value with the financial stress threshold variable with lag 2, which was smaller than the Akaike value with the financial stress threshold variable with lag 1, was selected as the threshold variable. The above results along with the three tests of linearity are reported. The null hypothesis of the test comparing the linear VAR model to the non-linear VAR model is refuted and not accepted. Estimation of the vector autoregression model is therefore performed in TVAR format. In addition, based on evaluations of threshold effects, the threshold value of 24.689% in the first model with the dependent variable of the industrial production logarithm difference, the threshold value of 24.689% in the second model with the dependent variable of CPI and the threshold value of -61.223% in the third model with the dependent variable of the money volume logarithm difference, the two-regime TVAR model was considered as the optimal model for estimation.

Given that the VAR model is summarized in the form, its coefficients cannot be interpreted economically. In order to accomplish simultaneous

relationships between the variables, the diagrams below depict and analyze the impulse response functions of the variables extracted from the two-regime TVAR models. These diagrams are for 15 periods and are based on a shock to the production industrial logarithm difference of one and two standard deviations in the first model, a shock to the inflation of one and two standard deviations in the second model, and a shock to the money volume logarithm difference of one and two standard deviations in the third model. The point is that in the TVAR model, due to the nonlinearity of the model, unlike the linear VAR model, the magnitude and direction of the shocks can influence how the variables influence one another. In other words, unlike the linear VAR model, where the effect of a negative shock is precisely the same as a positive shock (but in the opposite direction), there is no such symmetry in the TVAR model, and shocks of varying magnitudes and directions can have different outcomes. Therefore, in this study, in addition to the results of the shock of one standard deviation, the results of the shock of two standard deviations are also reported; however, as can be seen, both forms of shock produced nearly identical results.

CONCLUSION

1. This study's primary objective is to examine the effect of financial stress shocks on economic uncertainty in Iran during the period 1991:2-2022:1 with in the framework the nonlinear TVAR. based on the threshold tests and the moving average variable of financial stress with one lag was calculated as the threshold variable in three models and based on the threshold variable, the optimal lag of the TVAR model of financial stress with two lag was calculated as the threshold variable in three models.
2. Also, by determining the threshold value of 24.689% in the first model with the dependent variable of the industrial production logarithm difference, the threshold value of 24.689% in the second model with the dependent variable of CPI and the threshold value of -61.223% in the third model with the dependent variable of the money volume logarithm difference, the two-regime TVAR model was considered as the optimal model for estimation.
3. The estimation of the TVAR model with the financial stress threshold variable and the extraction of impulse response functions indicate that in the regime of low financial stress, an increase in financial

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stress leads to an increase in industrial production, a decrease in inflation and an increase in the money volume, that is, in a low financial stress, economic uncertainty decreases. In the regime of high financial stress, the results show that the increase in financial stress leads to a decrease in industrial production, an increase in inflation and a decrease in the money volume, that is, in a high financial stress, economic uncertainty increases. According to the results, it can be said that in different financial conditions, financial stress has a different effect on economic uncertainty in Iran.

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