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Original Research Article

The Impact of Exchange Rate and Investor Confidence Uncertainty on Monetary and Economic Uncertainty in Iran

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Failure to timely identify the occurrence of various shocks in the foreign exchange market due to the close relationship with the monetary, macroeconomic, and financial uncertainty can lead to crises and imbalances. In this paper, the effect of exchange rate and investor confidence on monetary and economic uncertainty in Iran is investigated, specifying a Multivariate GARCH model and the Granger-causality method over 2001-2018. The research findings have shown a significant positive correlation between exchange rate and macroeconomic uncertainty in the short run. But, there is no two-way Granger relationship between the real exchange rate, investor confidence in financial markets, and money growth uncertainty. Exchange rate uncertainty affects the real economy through a channel other than the capital market. Also, there is a significant effect of Investor confidence on monetary uncertainty in the short run. As a result, monetary uncertainty is affected by investor confidence uncertainty just through movements in money growth.

Keywords: Financial Markets, Monetary Transmission Mechanism, Granger-causality Method**.**
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1 Introduction

The financial markets as one of the financing and resource allocation channels in the economy can play an important role in the general equilibrium of the economy and the transmission of shocks. The conditions of these markets have

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a strong impact on the real economy and are also affected by other sectors. The stock exchange is one of the most important components of financial markets, which impresses macroeconomic variables such as money and GDP growth. Money is impacted by the stock index as a macro-level policy variable and as part of an individual's portfolio. On the other hand, a change in the stock price index can affect the price and output stabilization with the effect on consumption expenditures (through the Wealth Effect) and investment expenditures (through Tobin's Q) (Bayat et al., 2016).

Global financial markets have always faced significant volatilities and uncertainties in recent years, so the uncertainty regarding the return on invested assets has worried many investors and financial analysts. Investors believe that uncertainty is the most important factor in pricing any financial asset in a way that can affect the entire economy. On the other hand, macroeconomic instability and uncertainty will lead to the uncertainty of economic agents about future developments. As a result, economic agents will not predict a clear vision of the future. (Heidarpour & Pourshahabi, 2012).

The value of the national currency plays a key role in determining the economic costs related to investment, exports, and imports and their impact on economic growth in an international system. Substantial volatilities in real exchange rates can reduce the disruption of the stability of the real exchange rate by creating an uncertain situation. The savings-investment process deviates from its long-run value by disturbing the stability of the real exchange rate, and it will not be possible to allocate resources optimally. Increasing volatilities in the real exchange rate led to an increase in the price of goods and the risk of covering unforeseen exchange rate changes. Therefore, it can be concluded that the effect of exchange rate fluctuations on important variables such as economic growth depends on other factors such as the level of development of the financial markets (Basirat et al., 2015). According to Joseph (2002), exchange rate fluctuations significantly impact firm competitiveness through their effects on the price of inputs and products. Yau and Nieh (2009) conclude that their sales and export profits will decrease as the exchange rate increases. Consequently, their stock prices will decrease due to the lack of competitiveness of export firms in the international market. On the other hand, the competitiveness of imported firms in domestic markets increases. Also, a decrease in the exchange rate will have opposite effects for exporting and importing firms (Yau & Nieh, 2009).

Erdal (2001), during a study, concludes that the irreversibility of investing in access to new information makes firms' investment decisions more sensitive to real exchange rate uncertainty. Given that the exchange rate is one of the

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components associated with asset portfolio risk, according to the Markowitz model, changes in the exchange rate of this asset can affect their demand and subsequently cause changes in stock prices (Heydari & Bashiri, 2012).

In addition, confidence theory is one of the theories proposed in behavioral finance that is used to explain part of the behavior of investors. According to this theory, as the degree of investor confidence increases, the volume of their exchanges increases. In other words, the most important reason for the high exchange is the overconfidence of investors (Eslami Bidgoli & Tehrani, 2011).

Most of the previous studies have focused on investigating one-to-one relationships of the factors related to foreign exchange and financial markets, monetary policy, and economic activity. The interaction of monetary policy, capital market, and the real economy are investigated in these studies. Therefore, few studies have reviewed the impact of financial and currency exchange markets on Iran's monetary and real economy simultaneously. It is important to recognize these relationships in macroeconomic decisions and policies and to adopt the optimal policy at the right time. Accordingly, the main purpose of this study is to identify how financial and foreign exchange markets uncertainty affects money growth and economic activities.

The remainder of this paper is organized as follows. Section 2 Reviews the relevant literature; the theoretical principles will be discussed in Section 3; Section 4 presents the methodology used in this paper; Section 5 describes the data and the preliminary statistics; Section 6 discusses the multivariate GARCH models' estimation results, empirical results of the models, and methods; and finally, Section 7 summarizes the main conclusions.

2 Literature Review

Lawal & Ijirshar (2013) study the growth of key indicators of macroeconomic, including exchange rate fluctuations and inflation rates, on stock market performance during the period 1986-2013 using the vector error correction model (VECM) and the GARCH model (1,1). The results show long-run volatilities in exchange rates and inflation have a strong negative effect and interest rates have a positive effect on changes in the performance of the Nigerian stock market.

Heydari and Bashiri (2012) investigate the relationship between real exchange rate fluctuations and the stock price index on the Tehran Stock Exchange during 1999-2011 using monthly data. For this purpose, they used a bivariate generalized autoregressive conditional heteroscedasticity model. According to the results, there is a negative and significant relationship

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between real exchange rate uncertainty and the stock price index. As a result, policymakers must refrain from pursuing policies that cause more volatility in the foreign exchange market and create uncertainty to provide the basis for sustainable growth of the stock market and its price index.

Fallahi et al. (2014) examined the correlation structure in the daily exchange rate returns data, stock market index, and gold coin prices from 23/07/2011 to 09/22/2013 using the dynamic conditional correlation method (GARCH-DCC). According to the results, there is a high conditional correlation between exchange rate returns and gold coins as well as a low conditional correlation between stock market index returns and exchange and gold coin rates. The empirical results support that it is better to allocate a significant part of the investable assets in the stock market.

Serletis & Rahman (2009) identified the controversial effect of monetary policy on the economy in the last decade using the Multivariate GARCH. They concluded that monetary growth fluctuations have a significant negative effect on the real GDP growth rate.

Jalili et al. (2017) examined the effect of monetary policy on the stock market during the years 2005 to 2012 using the 5-variable Structural Vector Autoregressions (SVARs). According to the results, changes in monetary policy through the liquidity channel and facilities granted to the non-governmental sector have a significant and positive effect on the overall stock market index. Changes in monetary policy have a significant negative effect on the index through exchange rates and real profits.

During a study, Zorzi et al. (2020) examined the effect of the transmission of monetary policy shocks between member states of the EU and the United States. They conclude that the effects of the monetary policy shocks of the European and American economies on their consumer prices have been negligible, while the monetary policy shocks of the US Federal Reserve on the financial markets and the real sector of European economies are much greater than the effects of monetary policy shocks of European banks on the American economy. In addition, the Central Bank of America has a much greater influence on other world economies in determining monetary policy than European central banks.

Bekaert et al. (2009) analyzed the role of financial markets and the relationship between property prices, consumption growth, and dividends. An increase in output fluctuations will have two opposite effects on property prices due to the negative correlation between consumption and fluctuations and a positive correlation between consumption and dividends. It increases stock prices due to the effect of structure, and the second part will lead to a

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negative cash flow effect. Also, accumulating dividend fluctuations increases property market fluctuations due to increased money costs and better growth options. Finally, risk aversion and financial market uncertainty negatively correlate with consumption.

Jovanovic (2011) study the response of the US stock market uncertainty to the Federal Reserve's monetary policy. According to the results, monetary policy leads to significant stock market confidence. Using monthly stock closing prices as a proxy for stock market uncertainty and a copula-based approach, Markov suggests a stable non-linear relationship between confidence and uncertainty. Thus, monetary policy on the stock market uncertainty can be divided into linear and non-linear sectors, and monetary policy directly affects the investor confidence, and their fluctuations have only a significant effect in the medium-long run, which itself has a non-linear relationship with financial uncertainty.

Guerello (2016) examined financial markets' uncertainty, money growth, and GDP growth between 1959-2011 using US data and the Multivariate GARCH, and shows how the effects of asset valuation affect the relationship between monetary policy and macroeconomic growth with an emphasis on the role of uncertainty. According to research results, macroeconomic uncertainty negatively affects GDP growth. High investor confidence can explain high financial stability, while high macroeconomic uncertainty will lower asset prices.

Mousavi et al. (2020) investigated the effect of financial stability on the monetary policy transmission mechanisms during 1991-1996 in Iran. According to the results, monetary policy can affect investor confidence and its fluctuations directly only in the long run, and there is no significant relationship between the uncertainty of the oil-free economy and GDP growth. In addition, the results show that there is no Granger relationship between the uncertainty of macroeconomics without oil and GDP growth, and there is a negative effect between GDP growth and its fluctuations in the medium-long run.

3 Theoretical Issues

Financial markets are affected by various factors, including monetary policies and exchange rate volatilities. Exchange rate fluctuations are accompanied by uncertainty and activity in financial markets that require long-run planning and affect the best decision. Hence, exchange rate fluctuations have always been of interest to policymakers and economic agents in developing and developed countries due to their implications for the financial markets

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(Taghinezhadomran & Haji Babaei, 2014). However, there is no agreement on drawing the most important conditions affecting the relationship between exchange rate changes and economic performance. A group of economists believes that the relationship between the economy and the flow of foreign capital and the degree of openness of the economy is very important (Komijani & Ebrahimi, 2013). Aghion, Bacchetta, Ranciere, and Rogoff (2009) suggest the development of the financial sector as an important factor that significantly affects the relationship between exchange rate volatilities and growth. (Aghion et al., 2009).

Three general views on the dynamic relationship between the exchange rate and stock prices can be distinguished. After introducing flow-oriented models, Dornbusch and Fisher (1980) assume that the country's current account and current balance are two important factors determining the exchange rate. (Dornbusch & Fisher, 1980). Accordingly, changes in exchange rates have a significant effect on international competition and the trade balance, and thus on the real variables of the economy, such as real output and income, as well as on the future and current liquidity flows of companies and their stock prices. Therefore, the exchange rate has a significant positive effect on the stock price in these models. The second view is known as the stock-oriented model view. The capital account in these models is assumed as the determining factor of the exchange rate. These models include portfolio balance and monetary model. In the portfolio model, Branson (1980) found a negative relationship between exchange rates and stock prices. According to this model, as the stock prices reduce, the wealth of domestic investors reduces; this leads to lower demand for money with lower interest rates. The reduction of interest rates causes capital outflows to foreign markets by assuming the stability of other conditions, the devaluation of the domestic currency, and the exchange rate appreciation (1989). According to Gavin's monetary model, in contrast to the last two models, there is no relationship between exchange rates and stock prices (Branson, 1983).

Based on these three models, it is impossible to provide a definite result in the relationship between the foreign exchange market and stock prices (Heydari et. al, 2013). According to Yau and Nieh (2009), regarding the relationship between exchange rate uncertainty and stock price index, as exchange rates increase, sales and profits of export firms will decrease as they lose their competitiveness in the international market, and consequently, their stock prices decrease. On the other hand, the competitiveness of importing firms in domestic markets increases. As a result, their profits and stock prices increase (Yau & Nieh, 2009).

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One of the controversial topics among economists has always been the "wealth effect" on household consumption decisions. Although Keynes has pointed to the variability of consumption from changes in wealth, the Keynesian consumption function placed more emphasis on disposable income than on wealth, but according to Modigliani's life cycle theory and Friedman's permanent income hypothesis, wealth plays an influential role in consumption. These two theories form the basis of the classical realization of how fluctuations in the value of assets affect the whole economy. Each of them recognizes the importance of fluctuations in the value of wealth over consumption from two different but complementary perspectives. According to theoretical foundations, rising stock prices affect the economy through two channels: investment and consumption (through the wealth effect). Consumption depends on the present value of lifetime income, and stocks represent an important component of total wealth. Therefore, as wealth increases, the growth of consumer spending increases, which is justified by Modigliani's life cycle theory and Friedman's permanent-income theory[1] (Bayat et al., 2016).

On the other hand, the wealth effect means a change in total demand due to a change in the value of assets such as stocks, bonds, and real assets. The increase in the market value of assets induces wealthy owners to feel rich (even if they have not earned any extra money), and most of them tend to increase spending and reduce savings. The life-cycle-permanent income Hypothesis confirms the appropriateness of current consumption to total wealth and directly raises the issue of maximizing broker utility under the lifetime budget (Bayat et al., 2016).

Over the last decade, uncertainty has played a key role in explaining the real economy dynamics. The researches were done by Bloom (2009) and Bloom et al. (2012) have shown that uncertainty shocks are a key factor in creating and directing business cycles. Uncertainty in the assets market or money growth affects the real economy via three channels. First, as in Boyle and Peterson (1995), an increase in output uncertainty changes the interest rate and decreases the assets' rate of return and it positively affects money demand. Second, As Choi and Oh (2003) argued, by including money and financial services in the model with the assumption of a household utility function, uncertainty affects the demand for money and financial services due to high

[1] Asset prices can affect investment and actual activities from other channels, such as through Tobin's Q. In this study, only the channel of the effect of wealth on consumption has been considered.

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fluctuations in money growth or output growth. This phenomenon is the so-called "wealth effect." However, if the shock to money growth or output growth strikes again, the final sign of the reaction of the real main variables will be ambiguous. This is because the wealth effect can have two opposite effects: (Guerello. 2016)

1) Substitution effect. Risk-taking households replace consumption with money by increasing uncertainty resulting from the growth of money or output.
2) Precautionary effect. People prefer to save more money and spend less in situations where money (output) volatility is high. This increases the demand for money and financial services (Guerello. 2016).Substitution effect. As the uncertainty related to money growth (output) increases, the households, who dislike risk, substitute consumption with money (money with consumption), because less risky.
3) Precautionary effect. In a situation of high money (output), volatility people prefer to save more (less) and consume less (more). Hence there is an increase (decrease) in demand for money and financial services (Guerello. 2016).

4 Methodology

The intensity of fluctuations of economic variables has made economic models' particular attention to decision-making in terms of uncertainties. The Conditional Heteroscedasticity model is one of these methods that assumes that the variance of the error component changes over time. Both predictable and unpredictable components are obtained from this model (Abbasinejad & et al., 2015).

For this purpose, the MGARCH model, and the VECH model, have been used in this study. The uncertainty estimate is possible using the GARCH model. In particular, the possibility of examining the conditional variance-covariance has been provided by the Multivariate GARCH-in-mean approach using a conditional process for error terms (Guerello, 2016). This analysis is based on a multi-variable GARCH-in-mean estimator presented by Guerello (2016) and Lawal & Ijirshar (2013). It examines the relationship between real exchange rates, investor confidence, real growth rate, and the real economy. This method makes it possible to simultaneously examine the relationships between variables and their uncertainties. Therefore, a model used to examine this issue is based on the Multivariate GARCH model, which is defined as follows: (Guerello, 2016).

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$$Y_{i.t} = \sum_{p=1}^{P} B_{1.p} Y_{i.t-p} + B_2 X_t + u_t \quad (1)$$

In this equation, the vector of dependent variables of $Y_{i,t}$ contain eight variables of average and conditional variance of investor confidence (PEG), the growth rate of real GDP, real money growth rate (M2), and real exchange rate (RER). On the right, in addition to the amount of lagged dependent variables, the external return matrix contains a constant term, a process, and a period of estimation with a lagged conditional variance of the same model MGARCH (1,1)-VECH-VAR (2) used to estimate the variance in the first step.

Although regression analysis examines the dependence of a variable on other variables, it does not necessarily use the meaning of causation isn't interpreted from it. A test by Granger is presented for causality discussion, in which the present value of each variable is a function of the values with its lag and other variables. Therefore, considering the variables X and Y, this test consists of the following regressions (Souri, 2013).

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + U_{1\,t} \quad (2)$$

$$X_t = \sum_{i=1}^{m} \lambda_i X_{t-i} + \sum_{j=1}^{m} \delta_j Y_{t-j} + U_{2\,t} \quad (3)$$

Of course, it is assumed that the components of U_{1t} and U_{2t} are uncorrelated. Equations (1) and (2) involve the assumption that the present Y is associated with the previous values of the X and Y to n related lags, and X is also associated with previous values of X and Y to m lags (Souri, 2013).

5 Empirical Model

This study is of great importance due to the use of quarterly data to show more fluctuations in the data. The variables used include the Price-Earnings on Earnings growth ratio (PEG), the Gross Domestic Product (GDP), money stock (M2), and real exchange rate (RER). PEG takes into account the potential growth factors of the company such as human capital, brand and expectations and therefore reflects more investor confidence. Reporting the economic situation, it is necessary to rely on a single variable to capture macroeconomic volatility. The most common variable is GDP. Furthermore, the growth rate of liquid monetary stocks can explain most money stock volatility. Money growth is influenced by changes in money demand and

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monetary policy decisions, and this gives us more information about household and corporate decisions to hold money.

The variables of GDP and the growth rate real M2, are both divided by CPI. To show the fluctuations of the foreign exchange market, the real exchange rate variable (RER) is used as CPI_{US}/CPI_{IR}.NER=RER in which CPI_{US} is the US Consumer Price Index, CPI_{IR} is the Iranian Consumer Price Index and NER is the Informal Iranian Exchange Rate. In the model, the growth rate of the above variables is considered. The study's statistical population includes all companies accepted in the Tehran Stock Exchange for the period of 2001Q1-2018Q4 (1380Q1-1397Q4). The data are from the statistics of the Central Bank of the Islamic Republic of Iran and the performance reports of the Tehran Stock Exchange and Securities Organization in the period under review. A descriptive analysis of the data of the main variables used in this study is presented in Table 1.

Table 1
Descriptive statistics of variables

variables	**PEG**	**Gdp**	**m2**	**rer**
Mean	-0.281	-0.025	0.019	0.009
Median	-0.645	-0.030	0.020	-0.012
max	52.518	0.151	0.132	1.113
min	-69.922	-0.284	-0.081	-0.182
Std. Dev.	11.168	0.085	0.041	0.1507
Skewness	-2.049	-0.073	0.078	5.8152
Kurtosis	29.276	2.962	3.687	42.180
Jarque-Bera	2092.277	0.068616	1.468990	4941.487
Probability	0.000	0.966274	0.479748	0.000

Source: Research Findings

The time trend of the variables is shown in Figure 1. This figure shows that the time series has experienced cluster volatilities, so low volatilities have occurred together and high volatilities in succession.

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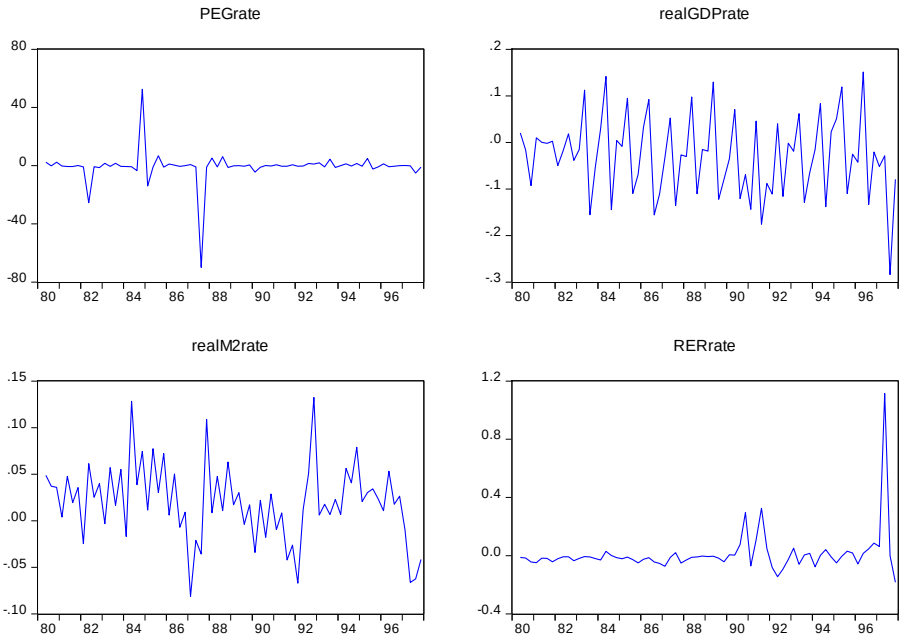

Figure 1: Time Series of the Analyzed Variables.

The time series trend of the real exchange rate (RER) variable shows volatilities between 2011 (1390) and 2013 (1392). In 2011 (1390), as a result of the developments in the global gold market, the developments in the country's macroeconomic, the escalation of sanctions against Iran (The release of information relating to international sanctions on Iran from 2012 (mid-1390), the beginning of the sanctions of the Central Bank of Iran by the United States in 2011 (1390) and approval of the purchase of oil from Iran by the EU in 2011 (1390)), led to intense fluctuations in the currency market, and subsequently a significant reduction in foreign exchange earnings. On the other hand, the increase in the general level of prices as a result of the implementation of targeted subsidies plan (from the end of 2010), along with the effects of continuous growth of liquidity and the devaluation of the national currency, and the tendency to use speculations have led to liquidity influx in the currency market.

The high growth of currency prices was the result of these developments. The exchange rate showed a decreasing process until 2012 (1391), followed by the start of the currency exchange center in 2012 (1391) and measures taken

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by the Central Bank of Iran, through the announcement of the amendment related to the set of central bank policies, as well as the establishment of relative stability in the currency market. Subsequently, the Iranian oil sector sanctions by the European Executive in 2012 (1391) and the expansion of Iranian oil sanctions approved by the United States in 2012 (1391) made the exchange rate rise again. The variable exchange rate process has been dropped from half of February and continued until 2013 (until late 1392). In 2018 (1397), we see more stress and fluctuation in the currency market compared to the years 2011 (1391) and 2012 (1392), with the departure of the United States from the Joint Comprehensive Plan of Action (JCPOA) and re-activating the above factors.

As is shown in this figure, this variable has been fluctuated in the time series of investors, along with political and economic changes in the global financial crisis in 2008 (1387) and targeted subsidies in 2010 (1389). The Supreme Leader communicated general policies of Article 44 of the Constitution in 2006 (1385), which created good confidence in investors and the stock exchange on the decision-making. This year, peace dominated the capital market, and the indicators had a balanced situation. The possibility of capacity building was provided simultaneously with the arrival of large firms into the capital market, and new investors entered the market. The price of oil was reached $ 130 in 2007 (1386). Before the global financial crisis began, the price of oil heavily dropped at once, with the onset of the crisis in 2007 and early in 2008, which came down to $ 30. It caused the price of goods to be reduced globally due to the global financial crisis, and, consequently, the profitability of enterprises was affected.

On the other hand, this has hurt Iran's refineries. The Tehran Stock Exchange Market is affected by a sharp decline in prices due to the decline in profitability of export and import companies, the mental space of the market, and reduced investor confidence. Finally, the global crisis was managed at the end of 2008 (second half of 1387) with a gradual decline in prices, and the market reached the end of the year. In the following, with the supply of companies to implement the principle of 44 of the constitution, a group of investors entered the capital market again; A few months later, the global economy was improved, prices gradually rose, and the stock market took place, and the market trend was upward.

The MGARCH model is analyzed based on several basic assumptions, which must first be considered. The augmented Dickey-Fuller test was used in this study to check the stationary of model variables indicating that all variables are stationary at a significance level of 95%. Therefore, the order of

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the variables used in the collective model is 0, and thus one of the important conditions for estimating the model is met. The latter assumption that should be checked in the analysis of the MGARCH model is the constant or variable variance of the error term. According to the results, the variance of the variables cannot be constant. The third major assumption refers to the lack of autocorrelation between the errors. It is necessary to identify the optimal lag of the variables before estimating the VAR model. The maximum lag length with the meaning obtained from the variables among equations is the number of suitable lags for the VAR model, the Schwartz benchmark (SC) with two lags.

Table 2
Pearson correlation coefficients between variables

variables	**peg**	**gdp**	**m2**	**rer**
Peg	1.0000	-	-	-

Gdp	0.1338*	1.0000	-	-
	1.1222**	----		
m2	0.1947	0.4359	1.0000	-
	1.6495	4.0234	----	
Rer	-0.0168	-0.0548	-0.2318	1.0000
	-0.1400	-0.4562	-1.9802	----

Notes: * The first-row numbers show the correlation value of two variables and ** second-row numbers show the value of t-student statistics.
Source: Research Findings

Pearson correlation coefficient has been used to examine and determine the value, type, and direction of the relationship between the model's variables. According to the results presented in Table 2, the correlation coefficient between the two variables of real money stock growth and real GDP growth is 0.4359. Therefore, there is a relatively strong correlation between these two variables. There is a negative and relatively weak correlation between the actual currency variable and investor confidence and real GDP. There is a stronger negative correlation between real exchange rate and real money stock, equal to 0.2318. The variable of investor confidence has shown the highest correlation with real money stock, while the correlation between investor confidence with real GDP is less and equal to 0.338. Of course, this analysis is straightforward and should be interpreted carefully.

The GARCH model was used to determine the influence of variables on each other. The conditional equations are as follows:

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$$\text{Pegrate} = c(1) + c(2) * \text{pegrate}(-1) + c(3) * \text{pegrate}(-2) + c(4) * \text{realgdprate}(-1) + c(5) * \text{realgdprate}(-2) + c(6) * \text{realm2rate}(-1) + c(7) * \text{realm2rate}(-2) + c(8) * \text{rerrate}(-1) + c(9) * \text{rerrate}(-2) \quad (4)$$

$$\text{Realgadprate} = c(10) + c(11) * \text{pegrate}(-1) + c(12) * \text{pegrate}(-2) + c(13) * \text{realgdprate}(-1) + c(14) * \text{realgdprate}(-2) + c(15) * \text{realm2rate}(-1) + c(16) * \text{realm2rate}(-2) + c(17) * \text{rerrate}(-1) + c(18) * \text{rerrate}(-2) \quad (5)$$

$$\text{Realm2rate} = c(19) + c(20) * \text{pegrate}(-1) + c(21) * \text{pegrate}(-2) + c(22) * \text{realgdprate}(-1) + c(23) * \text{realgdprate}(-2) + c(24) * \text{realm2rate}(-1) + c(25) * \text{realm2rate}(-2) + c(26) * \text{rerrate}(-1) + c(27) * \text{rerrate}(-2) \quad (6)$$

$$\text{Rerrate} = c(28) + c(29) * \text{pegrate}(-1) + c(30) * \text{pegrate}(-2) + c(31) * \text{realgdprate}(-1) + c(32) * \text{realgdprate}(-2) + c(33) * \text{realm2rate}(-1) + c(34) * \text{realm2rate}(-2) + c(35) * \text{rerrate}(-1) + c(36) * \text{rerrate}(-2) \quad (7)$$

Table 3
The results of estimating conditional mean equations

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
C(6)	186.1650	97.6239	1.9069	0.0565
C(7)	220.2912	5.0508	0.7998	0.4238
C(8)	13.1559	13.1559	2.6047	0.0092
C(9)	32.3206	31.9453	1.0117	0.3117
C(11)	0.0013	0.0004	-3.0078	0.0026
C(12)	-0.0003	0.0002	-1.2657	0.2056
C(15)	-0.8537	0.1732	-4.9291	0.0000
C(16)	1.2029	0.6469	1.8593	0.0630
C(17)	-0.3195	0.02408	-13.2679	0.0000
C(18)	-0.0869	0.1074	-0.8096	0.4182
C(20)	-0.0010	0.0001	-7.5761	0.0000
C(21)	-0.0002	0.0001	-1.1629	0.2448
c(22)	-0.0309	0.0374	-0.8252	0.4092
c(23)	0.0300	0.0578	0.5202	0.6029
c(26)	-0.1117	0.0123	-9.0711	0.0000
c(27)	-0.0830	0.0126	-6.5478	0.0000

Source: Research Findings

According to the Schwartz criterion, the following model has been used to analyze the relationship dynamics between investor confidence, real exchange rate, money stock, and GDP growth.

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$$GARCH = M + A1.* RESID(-1) * RESID(-1)' + B1.* GARCH(-1) \quad (8)$$

Table 4
The results of estimating conditional variance-covariance equation

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
M	1.88	1.35	1.3898	0.1646
a1	0.1023	0.0472	2.1678	0.0302
b1(1,1)	0.9340	0.0393	23.7136	0.0000
b1(1,2)	0.9352	0.0290	32.1515	0.0000
b1(1,3)	0.9322	0.0325	28.6657	0.0000
b1(1,4)	0.9865	0.0316	31.2051	0.0000
b1(2,2)	0.9365	0.0287	32.6297	0.0000
b1(2,3)	0.9335	0.0274	33.9652	0.0000
b1(2,4)	0.9879	0.0276	35.7402	0.0000
b1(3,3)	0.9305	0.0343	27.0796	0.0000
b1(3,4)	0.9847	0.0326	30.1572	0.0000
b1(4,4)	1.0421	0.0360	28.9174	0.0000

Source: Research Findings

6 Discussion

Causality is one of the main issues in analyzing the relationship between economic variables. It is used to determine the direction of variables with no explicit theoretical foundations. The conventional method for examining causality is known as the Granger-causality test. Table 4 shows the test results on the variables and their variances (the letter h indicates the variance at the beginning) as a criterion for measuring uncertainty.

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Table 5
Granger causality test results

	Lags	realM2	realGDP	PEG	realRER	hrealM2	hrealGDP	hPEG	hrealRER
realM2	1		0.049	3.201*	0.077	1.982	0.152	0.084	5.911**
	2		18.468***	9.255***	0.166	2.648*	0.113	0.289	3.315**
	4		4.873***	4.690***	0.127	1.791	0.355	0.312	2.227*
	8		1.698	2.585**	0.373	0.874	0.157	0.305	1.390
	12		1.213	1.871*	0.536	0.780	0.321	0.583	0.973
realGDP	1	0.326		1.184	0.226	1.064	1.023	0.611	0.036
	2	4.328**		1.089	0.098	1.027	0.536	0.301	0.098
	4	1.586		1.310	1.040	1.531	0.302	0.411	1.189
	8	1.187		0.972	0.449	1.121	0.818	0.511	1.585
	12	0.603		1.787*	0.759	1.562	0.828	1.432	1.444
PEG	1	3.886*	0.008		0.083	0.009	0.288	8.800***	0.003
	2	4.443**	0.498		0.045	2.335	0.677	4.435**	0.003
	4	0.912	0.831		0.0132	1.322	0.364	2.019	0.003
	8	1.079	0.696		0.028	0.690	0.205	0.803	0.006
	12	0.925	0.302		0.028	0.491	0.197	61.685***	0.018
RealRER	1	6.653**	19.471***	0.094		13.846***	5.204**	0.016	344.866***
	2	4.765**	11.977***	0.152		7.052***	6.694***	0.041	174.110***
	4	0.520	7.098***	0.116		3.528**	3.674***	0.228	99.521***
	8	1.438	2.455**	0.087		1.865*	2.171**	0.187	61.195***
	12	0.854	1.978*	0.056		0.955	1.401	0.082	37.196***
HrealM2	1	0.741	0.051	2.816*	1.823		0.232	2.791*	0.503
	2	1.075	0.107	1.962	0.756		2.147	7.652***	0.344
	4	2.462*	0.672	1.698	0.365		1.970	8.987***	0.168
	8	1.269	0.315	0.666	0.409		0.735	4.067**	0.228
	12	0.804	0.368	1.953*	0.372		0.672	3.663	0.277
HrealGDP	1	0.005	0.068	1.259	0.062	0.152		0.898	0.210
	2	1.805	0.645	0.980	0.038	0.587		0.502	0.173
	4	1.482	1.042	2.940**	0.690	2.160		0.281	0.423
	8	2.699**	1.172	1.194	0.664	1.430		0.532	0.285
	12	2.176**	0.887	1.541	0.568	0.872		1.315	0.408
HPEG	1	0.482	1.237	0.259	0.221	1.719	0.725		0.196
	2	0.211	0.472	0.141	0.192	2.625*	0.711		0.134
	4	0.605	0.342	0.088	0.129	1.385	0.729		0.082
	8	0.632	0.388	0.113	0.140	0.631	0.526		0.088
	12	0.773	0.493	4.920***	0.209	0.561	0.251		0.088
HrealRER	1	2.140	2.224	0.004	1.231	0.010	4.310**	0.052	
	2	0.161	2.452*	0.032	0.871	0.842	2.430*	0.036	
	4	0.556	0.719	0.075	0.808	1.184	1.688	0.068	
	8	0.864	0.563	0.044	0.856	0.535	1.032	0.110	
	12	0.989	1.025	0.034	1.115	0.323	0.731	0.044	

Notes: H0 is rejected only when *ρ <0.10 or **p<0.05 or ***p<0.01.
The numbers in Table (5) represent the F-statistic of the variables.
Source: Research Findings

The F-statistics in Table 5 show that the variable of investor confidence affects money growth only in the short run. It can be explained that increasing

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the income or profit of companies has reduced investor confidence (due to the presence of income or profit at the denominator of the investor confidence ratio). On the other hand, they seek more financing through the banking system with optimistic expectations of these companies about their future revenue stream (due to the bank-oriented financing system in Iran), which leads to increased money growth. Moreover, it follows by a change in GDP growth.

In other words, there is an indirect effect of investor confidence on GDP growth. GDP growth increases in a very short time after a negative shock in money growth with at least two lags. Therefore, the increase in money growth in Iran negatively affects the economy's real sector in the short run and causes to decrease in GDP growth. It can be said that people's expectations for the expected inflation rate are adjusted with a decrease in money in the short run. Therefore, people move towards GDP growth and short-run investment in it with a positive expected return on GDP growth and a decrease in the expected return on speculation in parallel financial markets. Therefore, implementing monetary policy using the money growth policy tools cannot lead to an increase in the level of GDP changes in the long run. Furthermore, the policy response (i.e., an increase in real M2 growth) to a negative shock in the real economy has two lags.

The response of investor confidence uncertainty and monetary uncertainty to a positive shock in real exchange rate uncertainty aren't significant, and none of them is Granger-causality for another variable. In other words, given that the policy of the Central Bank of the Islamic Republic of Iran is based on unifying the exchange rate to stabilize the foreign exchange market; therefore, the uncertainty of this policy variable has no effects on investor confidence and monetary uncertainty. The real exchange rate uncertainty can only affect the GDP uncertainty variable in the short run with a 1 to 2 lags. According to the research results, this effect can be from other channels besides the capital market.

The effect of investor confidence uncertainty shock on GDP growth uncertainty is also observed, whereas there is a positive correlation between financial markets uncertainty and GDP growth uncertainty. However, based on the results of the Granger-causality test, this latter effect is not statistically significant. In other words, due to the bank-oriented financing system in Iran's economy, it is not possible to provide investment resources for enterprises from the capital market and issue sufficient shares and bonds. Therefore, larger firms and smaller firms gain a high share of the resources needed to invest through the money market and cause the high impact of monetary

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variables on macroeconomic variables. As Guerello (2016) also found, the correlation between PEG and GDP growth fluctuation is positive, and so on the GDP growth fluctuation is positively Granger-causes of the PEG fluctuation. In addition, Monetary uncertainty is affected by investor confidence uncertainty just through movements in money growth.

According to the results of this study, there is the response of money growth uncertainty after a positive shock to investor confidence uncertainty with two lags. On the other hand, it is observed that the real exchange rate uncertainty channel cause GDP uncertainty and exchange rate uncertainty has effects on GDP uncertainty with 1 to 2 lags in the short run. In other words, exchange rate uncertainty from channels other than the capital market leads to uncertainty and fluctuations in Iran's real sector of the economy.

7 Conclusion

Developing countries, including Iran, have a high degree of instability of macroeconomic variables. In these countries, exchange rates, stock prices, and money stock have fluctuated more than developed economies, creating an uncertain environment for investors. Today, exchange rate uncertainty is considered a key factor in economic policy-making. On the other hand, the relationship between the real exchange rate, financial market stability, and economic growth is an effective factor in choosing the appropriate exchange rate system in developing countries (Heydari & Bashiri, 2012).

The effect of exchange rate volatilities on economic growth depends on other factors such as the level of development of the financial system. Real exchange rate volatilities create an uncertain environment in the economy, so the process of saving and investing deviates from its long-run value, and optimal allocation of resources will not be possible. Uncertainty in the economy disrupts financial decisions within firms and reduces investment and economic growth in the country (Basirat et al., 2015). In addition to financial and exchange rate uncertainty, the effect of uncertainty on monetary growth is also an important issue for central banks. Monetary policy in the form of the Monetary Policy Transmission Mechanism through the capital market is affected by the price of this type of asset. This effect on consumption and investment expenditures and consequently on the real economy plays an important role in the general balance of the economy and the transmission of economic shocks in society.

This study aims to investigate the effect of exchange rate and investor confidence uncertainty on monetary and economic uncertainty in Iran. The data used in the quarterly series is from 2001 to the end of 2018. Based on the

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results obtained, there is an equilibrium relationship between the studied variables. According to the study results, there is a negative relationship between RER and other variables. Our study shows that the uncertainty resulting from foreign exchange market shocks leads to changes in the opposite direction in the three sectors of the economy. However, there is a positive correlation between the PEG, real GDP growth, and real M2 growth uncertainty. Examining the relationship between variables based on their correlation is considered a preliminary assessment. It is necessary to use the Granger-causality test to examine the causal relationship between variables.

The results of the Granger-causality test have confirmed that investor confidence only affects real money growth in the short-run, and this is due to the adjustment of people's expectations for corporate profitability, which affects money stock in the short run. It can be concluded that by including money and financial services in the model with the assumption of a household utility function, uncertainty affects the demand for money and financial services due to high fluctuations in money growth or output growth. (the wealth effect). Money, as a policy variable and part of an individual's portfolio, can be affected by financial uncertainty. Investor confidence can affect economic activity and price stabilization by affecting consumer spending through the wealth effect. Williams (2012) shows that uncertainty about financial crises causes significant changes in monetary policy. On the other hand, investor confidence uncertainty does not directly affect the uncertainty of the real economy due to the bank-oriented financial sector in Iran's economy and insufficient development of the capital market. Investor confidence uncertainty is the only cause of money uncertainty in the short run.

According to the research variables uncertainty studied, exchange rate uncertainty is the cause of uncertainty in the real economy. As a result, policymakers must refrain from policies that create more uncertainty in the foreign exchange market in order to achieve economic growth. Also, exchange rate uncertainty does not affect investor confidence and monetary uncertainty. So it implies that the shock created by the exchange rate in the economy has been transmitted to the real economy from a channel other than the capital market. However, as stated in the section on theoretical foundations, according to Gavin (1989), there is no relationship between the exchange rate and investor confidence. Therefore, by considering the flow of foreign capital and the degree of openness of the economy, the effect of exchange rate changes on economic activity will be different. Fallahi and Jahangiri (2015) show that the phenomenon of transmission does not exist between the foreign exchange and the stock market.

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