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Special Article

The Effects of Exchange Rate and the Latent Variable of Government Activities Shocks on Gold Prices and Tehran Stock Exchange Returns

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Abstract

Exchange rate fluctuations can have wide-ranging impacts on macroeconomics, international trade, and financial markets. Governments, as primary actors in the economy, utilise various tools to manage and control exchange rate volatility. In some cases, certain government activities (particularly in oil-revenue-dependent and developing countries) are significant factors in creating exchange rate fluctuations. This study aims to address these issues by using quarterly data from 1993 to 2020 and employing an augmented factor vector autoregressive model with stochastic volatility. The research focuses on two main objectives: (1) estimating the hidden variable of government fiscal policies; (2) analysing the effects of exchange rate shocks, in the presence of the hidden government variable, on gold prices and Tehran Stock Exchange returns; and (3) assessing the predictive power of the proposed model compared to other competing models. The findings indicate that the effects of exchange rate shocks on gold prices and stock returns vary over time, with a notable intensification since 2019. Additionally, a shock to the hidden variable of government fiscal policy leads to an increase in exchange rates, while gold and stock returns decrease.

JEL Classification: *E62, C32, E44.*

1. Introduction

The exchange rate is one of the critical economic variables with a decisive role in economic cycles and is a significant factor influencing economic development. Following the Bretton Woods Agreement, which led to the replacement of fixed exchange rates with floating rates, the fluctuations in exchange rates have increased, bringing about heightened importance to exchange rate volatility. Consequently, considerable research has been devoted to examining the effects of exchange rates and their fluctuations on stock prices. Furthermore, trade liberalization has underscored the

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significance of exchange rate impacts, rendering it a crucial element influencing stock markets.

The exchange rate in developing countries is one of the crucial variables influencing financial markets. Given that companies and institutions in these countries primarily meet their needs through imports from developed countries, exchange rate fluctuations are significant factors affecting the valuation and settlement of debts. An increase in the exchange rate, on the one hand, leads to a rise in foreign debt levels and, on the other hand, increases the cost of production and services offered by these companies. The rise in company debt results in liquidity shortages, which negatively impact profit distribution, stock returns, and price indices. Additionally, the increased production costs lead to reduced profit margins, lower stock prices, and returns, and consequently a decline in the stock index (Diamandis and Drakos, 2011).

Stock returns and gold coin prices are influenced by numerous factors, one of which can be exchange rate fluctuations. Theoretically, uncertainty regarding exchange rate volatility affects not only the foreign trade sectors but also the domestic economy, particularly the stock market. Exchange rate fluctuations can be seen as a type of risk in international transactions that can disrupt exports, imports, and capital flows (Caporale et al., 2014). Therefore, if exchange rate changes are appropriately regulated, they can create a more conducive environment for production, trade, and investment. Exchange rate fluctuations lead to changes in the prices of goods and services, production, and production factors, thereby affecting the current and expected future cash flows and, consequently, the stock returns of economic enterprises. For instance, the depreciation of the local currency increases demand for domestically produced goods due to the higher relative price of foreign goods, resulting in a general increase in price levels. Conversely, it reduces the import of intermediate and capital goods due to their higher prices, increasing production costs and reducing investment. This, in turn, lowers demand for stocks and decreases stock market returns. Exchange rate fluctuations can create market turbulence, causing artificial competition among buyers, increasing demand, and raising the prices of certain products. In a stable economic environment with reduced exchange rate volatility, it becomes possible to meet consumer needs more systematically and supply through the stock exchange (Adjasi et al., 2011).

The economy is in a constant state of flux due to the complex interactions between numerous factors. This dynamism means that economic variables such as interest rates, exchange rates, inflation, and gross domestic product are continuously influenced by both internal and external factors. Influential factors driving economic dynamics include changes in monetary and fiscal policies, external shocks like oil price fluctuations, technological advancements, and changes in consumer and investor behavior. In econometric models, coefficients represent the impact of explanatory variables on the dependent variable. However, these coefficients are not fixed and can change over time due to structural changes, economic shocks, technological developments, shifts in economic agents' expectations, and other reasons. This aspect has often been overlooked in studies examining the impact of exchange rate shocks on

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key variables. Therefore, the present study aims to investigate the effects of exchange rate shocks on stock market returns and gold prices by considering the hidden variable of government fiscal policies and adopting a time-varying parameter approach.

2. Literature Review

A substantial body of research has explored the impact of exchange rate shocks on the stock market and gold prices. However, given that the primary objective of this study is to examine this issue with a time-varying perspective, only those studies that have analysed the subject using time-varying or nonlinear approaches will be discussed here.

Cao (2012), using monthly data from China for the period 2005 to 2012 and employing a time-varying parameter vector autoregressive model, demonstrated that with the implementation of reforms aimed at increasing exchange rate flexibility, the short-term effects of exchange rate changes on stock returns have increased. In the long term, the impact of interest rate changes on stock returns is minimal, whereas an increase in the exchange rate is not considered a detrimental factor for the Chinese stock market. Toparlı et al. (2019), using monthly data from Turkey for the period 1988 to 2017 and employing a time-varying parameter vector autoregressive model, demonstrated that the variables used have significant time-varying effects on stock market returns. The influence of real crude oil price shocks is less pronounced compared to that of exchange rates and interest rates. As expected, production shocks have a positive impact on stock returns. The forecast error variance decomposition over time indicates that fluctuations in exchange rates and interest rates primarily explain stock returns.

Zheng et al. (2019), using monthly data from Hong Kong for the period 2000 to 2018 and employing a time-varying parameter vector autoregressive model, demonstrated that exchange rates have a negative correlation with Hong Kong stocks. Additionally, intervention in the foreign exchange market leads to increased volatility in the stock market.

Sheikh et al. (2020), using monthly data from Pakistan for the period 2004 to 2008 and employing the NARDL model, demonstrated that following the global financial crisis, investors have only responded to positive shocks in gold prices, interest rates, and exchange rates in the long term.

Sui et al. (2021), using monthly data from Turkey, the United States, and Peru for the period 1994 to 2018 and employing Quantile-on-Quantile Regression (QQR) and Quantile-on-Quantile Correlation (QQCOR) models, demonstrated that gold can protect against currency fluctuations and inflation in Turkey and the United States at all times, except during Turkey's hyperinflation period. In Peru, gold serves as a good hedge if the Consumer Price Index (CPI) change exceeds 3.29% or the currency depreciation rate surpasses 3.24%.

Huang et al. (2021) examined the relationship between exchange rates and stock markets in BRICS countries using monthly data from 2005 to 2019 and employing the TVP-VAR model. The results indicated that there are differences in the changes,

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direction, and duration of the impact of exchange rate fluctuations on stock markets. Specifically, for Brazil, the process of exchange rate volatility affecting stock market returns is almost entirely driven by the financial account, while in Russia, the current account predominates. The stock market responses to exchange rate shocks in India, China, and South Africa depend on both the current account and the financial account.

Akbar et al. (2021) researched whether gold can serve as a safe-haven against currencies such as the Chinese Renminbi, Euro, British Pound, Japanese Yen, and US Dollar. Using monthly data from 1999 to 2018 and employing a time-varying parameter vector autoregressive (TVP-VAR) model, they investigated this topic. The results showed that: 1) gold cannot hedge against long-term currency depreciation; 2) gold can hedge against dynamic short-term currency depreciation risks; 3) gold can act as a safe-haven for hedging short-term dynamic risks of the Euro, Dollar, and Pound, but not for the Renminbi and Yen; 4) the Yen often appreciates significantly when international risks rise, thus it can be considered a safe-haven compared to other currencies.

Zhu et al. (2022) investigated the relationship between exchange rates and stock markets in BRICS countries using monthly data from 2009 to 2020 and employing a quantile threshold regression model. The results indicated that the effects of crude oil prices and exchange rates on stock returns in BRICS countries are heterogeneous. Positive oil price shocks have the greatest impact during bull markets, while negative shocks have the most significant effects during bear markets.

Barkhordari et al. (2022) examined the effects of exchange rate shocks on the value of selected industries in the Tehran Stock Exchange in Iran, using quarterly data over the period 2011 to 2018 and employing the TVP-VAR model. The results indicated that in the cement, lime, and gypsum industry, exchange rate shocks had positive effects on company values during 2011-2013 and 2018, but negative effects during 2014-2017. Given that foreign exchange market instability poses significant challenges for long-term planning by investors and producers, it is recommended that policymakers and decision-makers adopt economic policies that mitigate fluctuations in capital and foreign exchange markets.

Houshmandi et al. (2022) researched the effect of Exchange Fluctuations on the Petroleum Products Stock Index by using MS-VAR in the Tehran Stock Exchange and using monthly data over the period 2009-2020. The empirical findings of the study reveal that in a regime characterized by high fluctuations (the first regime), there is a causal relationship where an increase in the exchange rate leads to a rise in the petroleum products stock index. However, the petroleum products stock index does not influence the exchange rate. Furthermore, the results show that the petroleum products stock index is more stable in the regime with low fluctuations (second regime) compared to the regime with high fluctuations (the first regime).

Roudari et al. (2022) examined the transmission and reception of volatility, as well as the causal relationships between exchange rates, inflation, housing, and the stock market from March 2006 to March 2022 using a time-varying parameters vector

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autoregression model. The findings indicate that the primary relationships between the volatilities of these variables occur in the short term. Continued short-term exchange rate volatility can lead to medium-term inflation and housing volatility, which in turn can transfer volatility back to the exchange rate. Increased exchange rate volatility will also cause stock market volatility.

Sujit and Ray (2023) investigated the nonlinear relationship between exchange rates, the stock market, and gold in the United Arab Emirates using daily data from 2015 to 2022 and employing the NARDL model. The results indicated that exchange rates play a significant role in influencing gold prices and the stock market in both the short and long term. Additionally, the study revealed that negative shocks have different impacts compared to positive shocks.

Javaheri et al. (2024) explored the interactive dynamics and spillover effects among the currency, stock exchange, and cryptocurrency markets using a vector autoregression model with time-varying parameters (TVP-VAR) analyzed daily from 2011 to 2022. The findings indicate that both the currency and cryptocurrency markets experienced positive net outflows, while the stock market had a negative net outflow. Additionally, the analysis of the interconnections among the three markets reveals that their relationships have fluctuated significantly over the studied period, ranging between 0.35% and 11.98%. The weakest connection occurred in 2018, and the strongest was observed from 2021 to 2022.

3. Methodology and Data

3.1 Econometrics Methodology

Linear and nonlinear vector autoregressive (VAR) and regime-switching models are flawed because they cannot incorporate structural breaks and cyclical changes in time series in a time-varying manner. In contrast, the TVP-FAVAR model used in this study can address this weakness, thus enabling a more precise examination of the relationships between the model's variables (Stock and Watson, 2008).

Let X_t for $t = 1, \ldots, T$ be an $n \times 1$ Vector of variables, which includes the vector y_t (an $s \times 1$ vector of key macroeconomic variables) and f_t as the latent factor variable representing fiscal policy.

$$x_t = \lambda_t^y y_t + \lambda_t^f f_t + u_t \tag{1}$$

$$\begin{bmatrix} y_t \\ f_t \end{bmatrix} = c_t + B_{t,1} \begin{bmatrix} y_{t-1} \\ f_{t-1} \end{bmatrix} + \cdots + B_{t,p} \begin{bmatrix} y_{t-p} \\ f_{t-p} \end{bmatrix} + \varepsilon_t \tag{2}$$

In the above equation, λ_t^y are the regression coefficients for the macroeconomic variables, f_t is the latent factor variable, λ_t^f is the coefficient of the latent factor, and $(B_{t,1}, \ldots, B_{t,p})$ are the VAR coefficients. u_t and ε_t are error components with zero mean, normal distributions, and covariances Q_t and V_t, respectively.

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The disturbance term of this equation has stochastic volatility, meaning. ε_t represents unknown shocks with a time-varying covariance matrix. The stochastic covariance matrix of the disturbance term $(\varepsilon_t)$is expressed as follows:

$$var(\varepsilon_t) = \Omega_t = A_t^{-1} H_t (A_t^{-1})' \; ; \; H_t = \textstyle\sum_t \sum_t{}' \quad (3)$$

The time-varying diagonal matrix $(\sum t)$ and the time-varying lower triangular matrix (A_t) are represented as follows (Prüser & Schlösser, 2020).

$$\textstyle\sum t = \begin{bmatrix} \sigma_{1,t} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \sigma_{1,t} \end{bmatrix} A_t = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ \alpha_{n1,t} & \cdots & 1 \end{bmatrix} \quad (4)$$

The loading coefficients $\lambda_t = ((\lambda_t^f)', (\lambda_t^y)')'$ and the VAR model coefficients are extracted according to a time-varying random walk process.

$$\beta_t = (c_t', vec(B_{t,1})', \dots, vec(B_{t,P})') \quad (5)$$

$$\lambda_t = \lambda_{t-1} + v_t \quad (6)$$

$$\beta_t = \beta_{t-1} + \eta_t$$
(7)

In this context, $v_t \sim N(0, W_t), \eta_t \sim N(0, R_t)$. All errors in the above function are uncorrelated with each other and over time, thus have the following structure (Koop and Korobilis, 2013).

$$\begin{bmatrix} u_t \\ \varepsilon_t \\ v_t \\ \eta_t \end{bmatrix} \sim N\left(0, \begin{bmatrix} V_t & 0 & 0 & 0 \\ 0 & Q_t & 0 & 0 \\ 0 & 0 & W_t & 0 \\ 0 & 0 & 0 & R_t \end{bmatrix}\right) \quad (8)$$

In a more compact form, the following relationships hold.

$$x_t = z_t \lambda_t + u_t u_t \sim N(0, V_t)$$
(9)

$$z_t = z_{t-1} \beta_t + \varepsilon_t \varepsilon_t \sim N(0, Q_t) \quad (10)$$

$$\beta_t = \beta_{t-1} + \eta_t \eta_t \sim N(0, R_t)$$
(11)

$$\lambda_t = \lambda_{t-1} + v_t v_t \sim N(0, W_t)$$
(12)

Here, $\lambda_t = (\lambda_t^y, \lambda_t^f)'$. Note $\tilde{f}_t$ is the estimate of the latent factor components of f_t based on x_t, such that $z_t = [\begin{smallmatrix} y_t \\ f_t \end{smallmatrix}]$ and $\tilde{z}_t = [\begin{smallmatrix} y_t \\ \tilde{f}_t \end{smallmatrix}]$. Additionally, if a_i is a vector, $a_{i,t}$ represents its i^{th}element, and if A_t is a matrix, $A_{ii,t}$represents its $(i,i)^{th}$ element. The algorithm in

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this study extends the algorithm by Doz et al. (2011) for TVP-FAVAR, comprising two main stages and iterating $t = 1, \dots, T$ (Si et al., 2021).

3.2 Model Specification

First, based on Equations 1 and 2, two vectors are specified to estimate the TVP-FAVAR model: 1- a vector comprising the primary and target variables, and 2- a vector including variables for modelling and extracting the latent variable.

3.2.1 Specification of Vector y, Comprising the Primary and Target Variables

The primary and target variables are included in the model in the form of vector y:

$$y_t = [exch_t, coin_t, stock_t] \quad (13)$$

where $exch_t$ represents the growth rate of the exchange rate in the informal currency market, $coin_t$ represents the growth rate of the Azadi Gold Coin price, and $stock_t$ represents the return of the Tehran Stock Exchange All-Share Index.

3.2.2 Specification of the Model Including Observable Variables for Estimating the Unobservable Variable

In this study, following Khodaei et al. (2018), the variables of government current expenditures, government capital expenditures, tax revenues, oil revenues, and other revenues are used as indicators of fiscal policy implementation to extract the unobservable latent fiscal policy variable.

$$f_t = f(Curr_t, Cap_t, Tax_t, Oil_t, Other_t)$$
(14)

The latent fiscal policy variable f_t is a function of the growth of current expenditures $Curr_t$, the growth of capital expenditures Cap_t, the growth of tax revenues Tax_t, the growth of oil revenues Oil_t, and other government revenues $Other_t$.

3.3 Data

The data utilised in this study are quarterly and from Iran for the period 1990 to 2020. These data were extracted from the Central Bank of the Islamic Republic of Iran's website. Considering that one of the conditions for estimating VAR models is the stationarity of the variables, all variables have been differenced after logarithmic transformation. Furthermore, since the variables used are seasonal, they have been seasonally adjusted using the TRAMO/SEATS method. Subsequently, they have been converted to real variables using the Consumer Price Index (CPI).

4. Empirical Results

4.1 Government Fiscal Policy Index

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When discussing the concept of the latent variable for government fiscal policy, it refers to a composition of various types of variables such as tax revenues, government expenditures, oil revenues, and more. To create a composite index of the different government activities, the TVP-FAVAR model has been estimated. This model can estimate and extract the unobservable government fiscal policy variable by combining the observable fiscal policy variables. According to Figure 1, the fiscal policy index in Iran has been estimated.

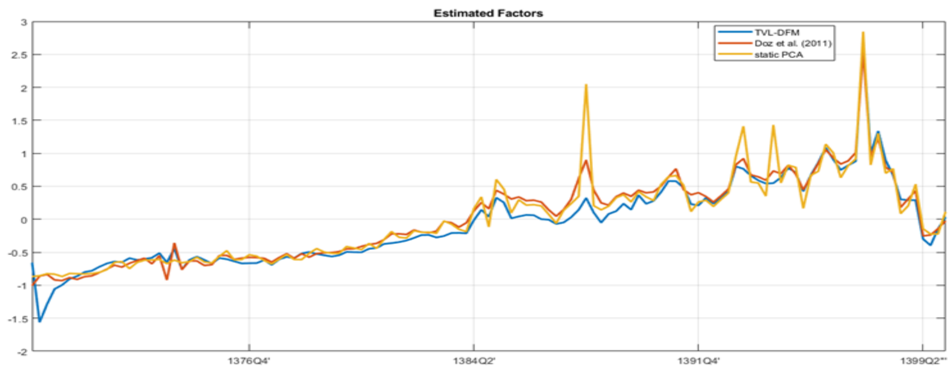

Figure 1. Fiscal Policy Index in Iran
Source: Research finding.

4.2 Impulse Response Functions to Shocks on the Fiscal Policy Index

One of the most significant gaps in research concerning the effects of fiscal policies and exchange rates is the lack of investigation into the impact of shocks from the latent fiscal policy variable on financial market variables over time. This study addresses this gap by examining this issue comprehensively.

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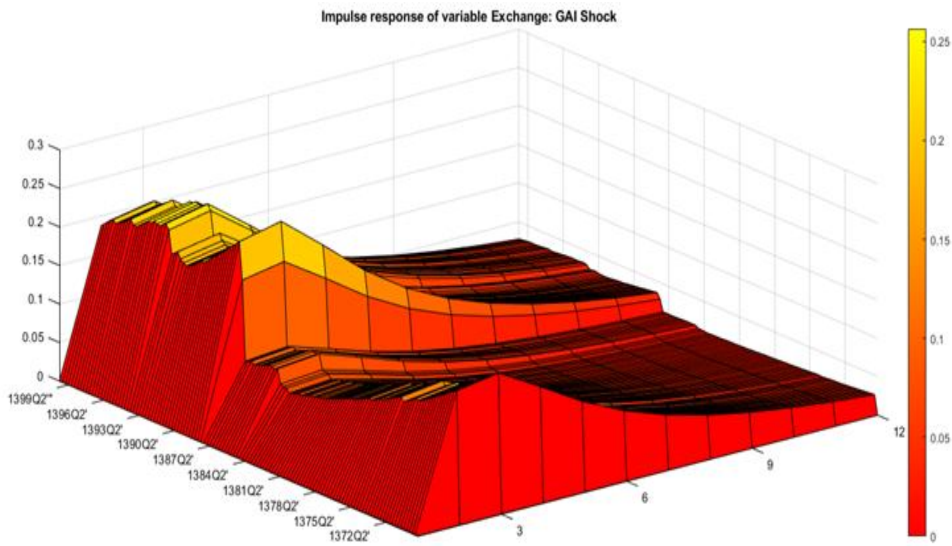

Figure 2. Impulse Response Function of Exchange Rate to Latent Fiscal Policy Index Shocks

Source: Research finding.

According to Figure 2, a shock equivalent to one standard deviation to the latent fiscal policy variable has led to an increase in the exchange rate over time. This effect has been observed for up to 12 periods, with the impact dissipating towards the end of this period. Thus, the shock to the latent fiscal policy variable has a positive effect on the exchange rate, with its intensity increasing significantly since 2008.

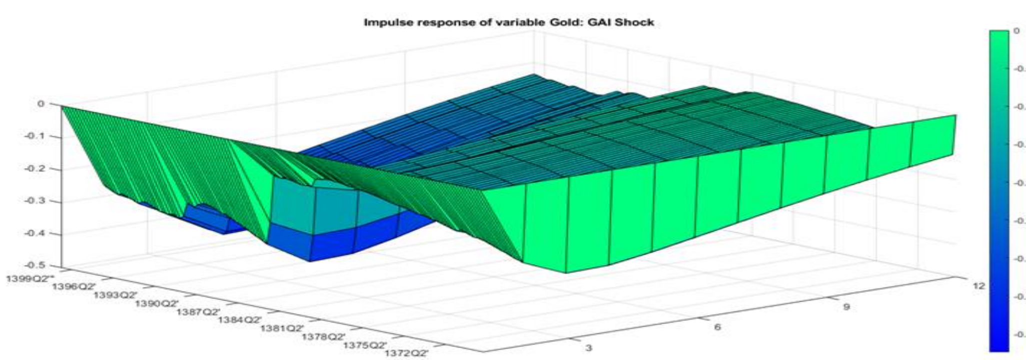

Figure 3. Impulse Response Function of Gold Price Returns to Latent Fiscal Policy Index Shocks

Source: Research finding.

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In Figure 3, a shock equivalent to one standard deviation in the latent fiscal policy variable has led to a decrease in gold prices over time for up to 12 periods. Initially, the impact is more pronounced, but it gradually diminishes towards the end of the period. Overall, fiscal policy fluctuations have negatively influenced gold prices, exacerbated by persistent inflation and unrealized income from oil exports, resulting in long-term price declines in gold.

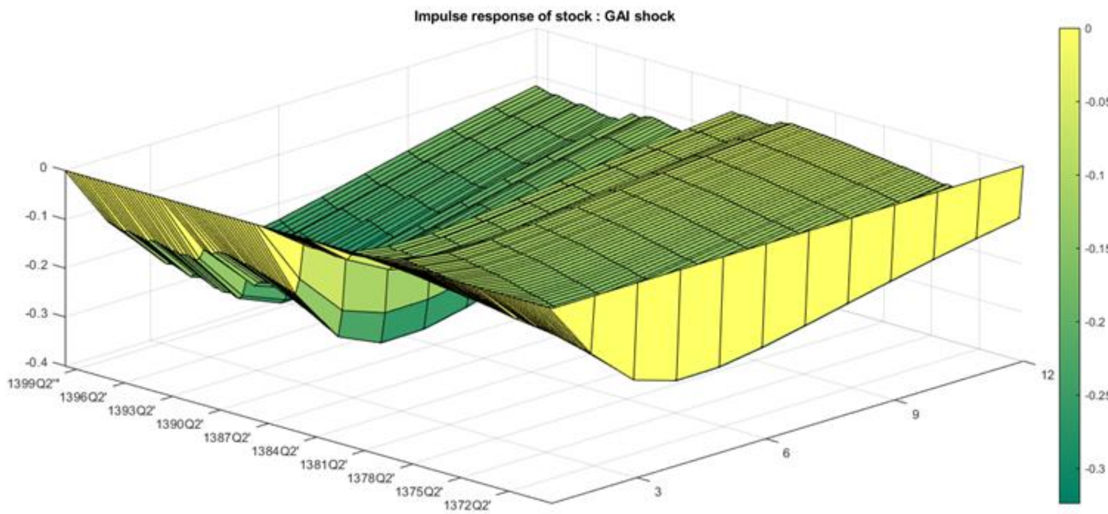

Figure 4. Impulse Response Function of Tehran Stock Exchange Index Returns to Latent Fiscal Policy Index Shocks

Source: Research finding.

Figure 4 illustrates that a shock equivalent to one standard deviation in the latent fiscal policy variable has caused a reduction in the returns of the Tehran Stock Exchange Index over time. The negative effect is more significant at the beginning of the period and diminishes towards the end. Therefore, when a shock hits the latent fiscal policy variable, it leads to an increase in the exchange rate, while reducing the returns of both gold and the stock market.

4.3 Impulse Response Functions to Exchange Rate Shocks

This section examines the impulse response functions to shocks imposed on the exchange rate variable.

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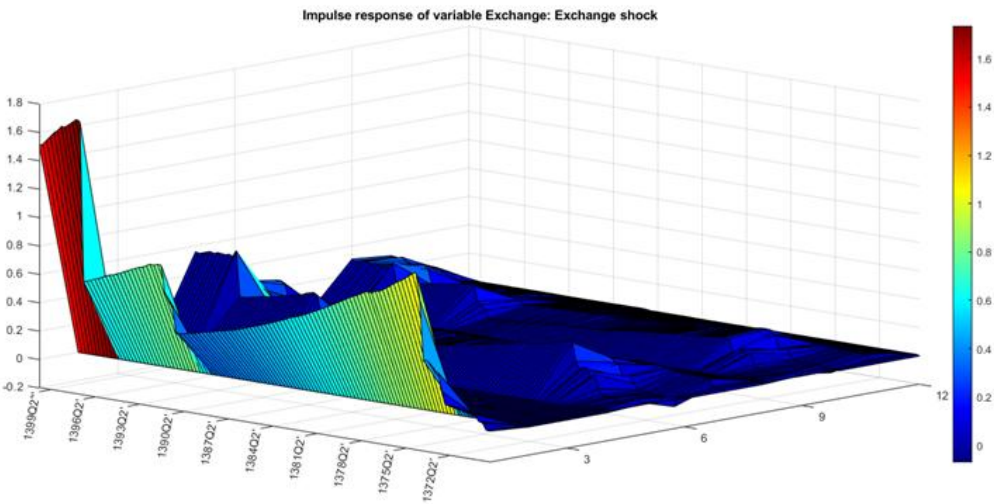
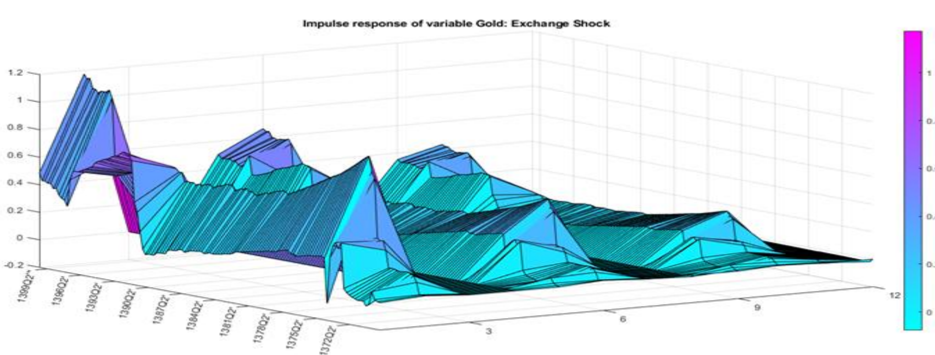


Figure 5. Impulse Response Function of Exchange Rate to Exchange Rate Shocks

Source: Research finding.

The response function of the exchange rate to shocks in the exchange rate variable, depicted in Figure 5, indicates that a shock in the exchange rate initially leads to an increase in the exchange rate itself during the first period. From 2018 onwards, this effect has significantly increased, while it was accompanied by a decrease after 1996, continuing until 2011. Post-2011, shocks in the exchange rate have notably impacted the exchange rate variable, resulting in a pronounced response in the exchange rate.

Figure 6. Impulse Response Function of Gold Price Returns to Exchange Rate Shocks



Source: Research finding.

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Figure 6 displays the response functions of gold prices to shocks in the exchange rate. It shows how the impact of exchange rate shocks on gold prices varies over time, reflecting specific reactions at each time point. From 2011 to 2020, gold prices exhibited the strongest response to changes in the exchange rate. Given that growth rates of variables are utilised, the y-axis represents changes in growth units. In most years and seasons examined, a 1% increase in the exchange rate led to less than a 1% increase in gold prices. However, during the years 2016 to 2018, a 1% increase in the exchange rate resulted in more than a 1% increase in gold prices.

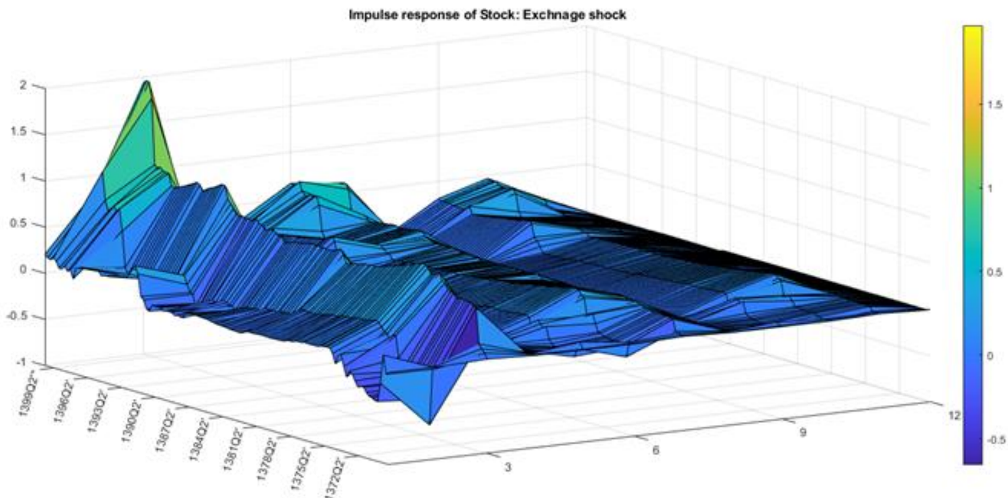

Figure 7. Impulse Response Function of Tehran Stock Exchange Index Returns to Exchange Rate Shocks

Source: Research finding.

According to Figure 7, the impact of exchange rate shocks on the Tehran Stock Exchange Securities Index returns varies over time. In some periods, it has led to an increase, while in others, it has caused a decrease in returns. Generally, in all seasons and the first period, exchange rate shocks have initially increased the Tehran Stock Exchange's returns. In most of the examined seasons, a 1% increase in the exchange rate resulted in less than a 1% increase in the stock market returns. However, between 2014 and 2018, in some periods, the increase in stock market returns was greater than the increase in the exchange rate.

4.4. Prediction Performance of TVP-FAVAR Model

According to Table 1, the TVP-FAVAR model exhibits superior predictive performance compared to VAR, TVP-VAR, ARDL, MS, and MS-VAR models based

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on metrics such as Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE), and the Root Mean Squared Error (RMSE) in forecasting exchange rates.

Table 1: Comparison of Predictive Power of TVP-FAVAR Model with Competing Models

Model	MAPE	MAE	RMSE
VAR	32.25	120.48	366.36
TVP-VAR	9.12	50.11	128.47
TVP-FAVAR-SV	6.18	25.78	50.98
ARDL	15.36	68.17	151.11
MARKOV-SWITCHING	10.10	61.36	145.98
MS-VAR	10.19	62.55	149.89

Source: Research finding.

5. Conclusion

This paper investigates the impact of exchange rate shocks and hidden government financial activities on the price of gold and the return of the Tehran Stock Exchange using the Time-Varying Parameter Factor-Augmented Vector Autoregressive with Stochastic Volatility (TVP-FAVAR-SV) model. The study period covers quarterly data from 1990 to 2020.

The TVP-FAVAR-SV model represents an innovative approach for analysing the effects of exchange rate shocks and government financial policies on various economic variables. This model enables researchers to dynamically examine the effects of shocks over time and analyse changes in influential parameters across different time intervals. While many previous studies have separately examined the effects of exchange rate shocks or government financial policies, this study simultaneously analyzes both types of shocks. This comprehensive approach allows researchers to understand the complex interactions between fiscal and exchange rate shocks and their joint effects on financial markets. The results of the current study are examinable from two perspectives.

5.1 Shock to the Hidden Government Financial Policy Variable: Implications and Effects

The results indicate that the occurrence of a shock equivalent to one standard deviation of the hidden government financial policy variable leads to an increase in the dollar price. This effect has been examined over a period of 12 cycles and diminishes towards the end of the period. The intensity of this effect has increased since 2008. Positive shocks to government fiscal policy, such as increased government expenditures or reduced taxes, can lead to an increase in liquidity in the economy and an increased demand for foreign currency. This, in turn, raises the exchange rate (reducing the value of the national currency). Furthermore, the increased intensity of these effects from

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2008 onwards could be due to structural changes in Iran's economy, sanctions, and greater fluctuations in financial and monetary policies.

The occurrence of a shock equivalent to one standard deviation in the hidden government financial policy variable results in a decrease in the price of gold over a period of 12 cycles. Initially, the impact is more pronounced and diminishes over time. Increased government expenditures or reduced taxes can lead to higher interest rates and reduced demand for gold as a safe asset. This decrease in demand may contribute to a decline in the price of gold. In the long term, increased inflation and unrealized oil revenues can lead to decreased economic growth and reduced demand for gold, as investors seek higher-yielding assets.

A shock equivalent to one standard deviation in the hidden government financial policy variable results in a decrease in the return of the Tehran Stock Exchange Index. This effect is more pronounced in the early stages and diminishes over time. Increased government expenditures may lead to higher interest rates, which can increase financial funding costs for companies and reduce profitability and stock returns. Additionally, reducing taxes may increase disposable income, leading to increased demand for goods and services and, consequently, inflation. Inflation can also reduce the real value of future corporate profits and decrease stock returns.

In the short term, the negative effects of fiscal policy shocks on the stock market are more severe as markets quickly react to policy changes. However, these effects diminish in the long term as markets gradually adjust to a new equilibrium.

5.2 Shock to the Exchange Rate

The impulse response function of the exchange rate to its shocks revealed that an exchange rate shock causes the exchange rate itself to increase in the first period. This effect has intensified significantly since 2018. Additionally, there were observed decreases from 1996 to 2011, followed by substantial impacts from exchange rate shocks post-2011. Exchange rate shocks can stem from sudden changes in the supply and demand for foreign currency or from political and economic developments. An increase in the exchange rate typically signals a depreciation of the national currency. The heightened effects of exchange rate shocks since 2018 can be attributed to economic sanctions, volatility in oil revenues, and political instability, leading to significant turmoil in the currency market.

Furthermore, it was found that the effect of exchange rate shocks on the price of gold in Iran is time-varying. From 2012 to 2020, the price of gold showed the most significant response to changes in the exchange rate. In most years and seasons, a 1% increase in the exchange rate resulted in less than a 1% increase in the price of gold. However, from 2016 to 2018, a 1% increase in the exchange rate led to more than a 1% increase in the price of gold. An increase in the exchange rate leads to higher import costs, consequently driving up the price of gold as a safe-haven asset. These changes indicate the sensitivity of the gold market to exchange rate fluctuations. The marked increase in the gold price's response to the exchange rate during 2016-2018 may be due to heightened economic uncertainty and a greater reliance on gold as a safe investment.

The effect of exchange rate shocks on the Tehran Stock Exchange (TSE) index return showed that in some periods, these shocks led to increased returns, while in other periods, they caused returns to decrease. In most quarters, an exchange rate shock increased the TSE index return. From 2014 to 2018, in some periods, the increase in the TSE index return was greater than the increase in the exchange rate. An increase in the exchange rate can raise the cost of importing raw materials and equipment for companies, reducing their profitability. However, it can also boost the export revenues of export-oriented companies. In periods where the exchange rate increase led to a greater rise in stock returns, export-oriented companies likely played a significant role. Enhanced exports and foreign currency revenues can lead to higher profitability and, consequently, increased stock returns.

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