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Gold, Foreign Exchange and Bitcoin as Hedge or Safe Haven for Stocks: Evidence from Tehran Stock Exchange (TSE) using Smooth Transition Regression (STR) Models

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EXTENDED ABSTRACT

The presence of risk and uncertainty in the financial markets has always plagued investors and has greatly increased the need for investment portfolio diversification and investment risk management. In addition to stocks and gold, currencies and more recently digital currencies and e-money, especially bitcoin, are alternatives to stocks in Iran. This study investigates the feature of risk hedging and safe haven for three alternative assets for stocks in the Tehran Stock Exchange, including foreign exchange, gold coin, and bitcoin, based on the non-linear model of smooth transition (STR) and using time series data with daily frequency for common working days from 2014 to 2019.

In this context, the data on the return of each of the three assets - gold, foreign exchange, and bitcoin- were calculated and modeled separately. In the specified triple models, first, the return to the price of gold is explained in terms of the first-order lag of its return and the returns of assets in the form of stocks, foreign exchanges, and bitcoin. Second, the return of the exchange rate is defined as a function of its first-order lag; the return of stocks, gold, and bitcoin, and finally, the return of bitcoin is defined as a function of its first-order lag, the return of stocks, gold and foreign exchange. After specifying the models using the J-Multi software and using time series data,

the calculated return of these three models was tested and estimated. The results of this study show that firstly gold coins and bitcoin are weak risk hedges for stocks in Tehran Stock Exchange, but these two assets are strong safe havens for stocks in Tehran Stock Exchange. Second, the results show that the foreign exchange asset exhibit both strong hedging and strong safe haven properties for stocks in the Tehran Stock Exchange. Based on this research, constructing an investment portfolio consisting of stocks, foreign exchange, gold, and bitcoin can help manage the investment risk and reduce the impact of asset price fluctuations. Because foreign exchange acts as a powerful hedging tool for stocks and can greatly reduce the risk of investment in the Tehran Stock Exchange. It is therefore recommended that a percentage of the investment portfolio of those actively working in the capital market be allocated to foreign exchange so that the overall risk of the portfolio can be reduced through it. Additionally, given the risk hedge and safe haven roles that gold, bitcoin, and foreign exchange investments play for stock assets, it is recommended that investors use these assets as safe havens to protect their capital in the face of increased risk and price declines in the stock market. The findings of this study provide valuable guidance for investors and financial market participants wishing to reduce investment risks caused by stock price fluctuations.

INTRODUCTION

Stock market investors are always looking for alternatives to stock investments to hedge their risks by diversifying their investment portfolios so that they can minimize losses and protect their assets as much as possible in the event of a stock market crash. In Iran, in addition to stocks and gold, foreign exchange and more recently digital and e-money especially bitcoin, are alternative assets to stocks. High inflation, fluctuations in the value of the local currency, volatility, and large increases in these assets against the local currency, make these assets of interest to investors and speculators.

Therefore, various studies are carried out around the world to evaluate these characteristics of alternative assets to stocks. These studies explore the potential for hedging assets or creating safe havens, especially for stocks and gold. However, a very important point in this context is that the relationship between the stock market and other alternative assets, especially gold, can be assessed at a number of different phases. For example, if the return on equity is high and positive, the relationship is different than if the return on equity is negative and in a recession. Therefore, we cannot apply

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valid time series models and must use non-linear models instead. Linear models will no longer be able to assess the risk-hedging and safe haven characteristics for stocks. Therefore, we need to apply a model that has the maximum processing power of the relationships and identifies the non-linear relationships. Non-linear models are a family of non-linear regression models that allow the regression relationship to be modeled in a non-linear manner by specifying a non-linear relationship between the dependent and explanatory variables, the inter-phase transition threshold, and the transition variable. Therefore, when the transition variable reaches a threshold, the relationship between the dependent variable and the set of explanatory variables will change and thus can change from a significant relationship to a non-significant relationship or from a positive significant to a negative significant relationship. This transition between phases is modeled in a variety of ways, but one of the most widely used non-linear models is the smooth transition model. Unlike the threshold model, in the STR model the transition between phases is smooth and constant, which is more consistent with reality. On the other hand, volatility and heteroscedasticity are among the important characteristics of asset prices. Therefore, besides the non-linear relational modeling, heteroscedasticity modeling is also important to validate the estimation results.

Following the above, what has not been discussed in previous empirical studies and is considered to be the challenge of this study is to simultaneously consider the role of risk hedging or safe haven for the three alternatives to equity assets based on appropriate econometric methods that can accommodate the characteristics of heteroscedasticity and non-linear behavior. To this end, the STR model along with heteroscedasticity in investigating the role of risk hedging or safe haven of financial assets alternatives to stock is proposed as an innovation of the article.

Methodology

The STR model is a generalized version of the univariate threshold autoregressive model (TAR) presented by Tong (1990) and the univariate Smooth Transition Autoregressive Models (STAR) model presented by Chan and Tong (1986). The standard STR model complies with the following regression form:

$$y_t = \pi' z_t + \theta' z_t G(s_t, \gamma, c) + u_t \quad (1)$$

Where, $z_t = (W_t', X_t')$, in a way that $W_t = (1, y_{t-1}, \ldots, y_{t-p})$, where p equals the optimal lag for auto-regression of the dependent variable that must be

determined. On the other hand, $X_t = (x_{1t}, \ldots, x_{kt})$ contains the independent variable "k". π and θ represent the vector of estimable parameters. s_t is the transition variable, which can be any of the explanatory variables or a lag of the dependent variable or the time series variable, and also "γ" is a uniform parameter that shows the speed of transition between phases, and "c" equals to the threshold value of the transition variable, in transition between different phases. In equation (1), $G(s_t, \gamma, c)$ is the transition function and can be defined as logistic or exponential.

Findings

The first model:

In the first model, the explanatory variables can explain 17% of the variation of the dependent variable. There are two phases of changes in this model. when the transition variable (exchange rate return) crosses the threshold value of -3.45% to the second threshold which is equal to 11.52%, the relationship between the gold return, foreign exchange, stocks, and bitcoin variables follows a linear model, and when the value of the transition variable is lower than the lower threshold of -3.45%, or higher than the upper threshold of 11.52%, the relationship between the dependent variable and set of explanatory variables moves from phase 0 to phase 1 and will change from a linear relationship to a non-linear one. The results show an impact factor of -0.04 for the linear part of the stock return, which is not statistically significant. therefore, gold is considered a low-risk hedge against stocks, because the coefficient of the equity return variable in this equation is not significant. On the other hand, the total impact factor for equity returns is positive and significant for both the linear and non-linear parts. Indeed, the non-linear part has an impact factor of 1.36 on stock returns, which is much larger and statistically more significant than this coefficient for the linear part. Therefore, we can say that gold is a strong safe haven for stocks.

The second model:

The estimated regression coefficient for the second model is 19%, indicating that the independent variables can explain 19% of the change in the dependent variable. The linear part of the stock return variable has a significant and positive coefficient of 0.2, suggesting that foreign exchange is a strong risk hedge for stocks due to its significance. On the other hand, the sum of the Impact Factors of the stock return in the linear and non-linear parts is significant (since they have their own significance in both parts), so it can be said that foreign exchange assets are a strong safe haven for stocks. The inter-

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phase transition speed, which has the same slope as the transition function, equals 10 in the estimated model for foreign exchange assets, and the values of the first and second thresholds of the transition variable, i.e. the first-order lag of the exchange rate return, are estimated to be -5.59% and 7.24%. In other words, the relationship between the foreign exchange and other assets goes from phase 0 to phase 1 at a high and significant speed and becomes a non-linear relationship when it crosses the upper threshold i.e. 7.24% or when the value of the transfer variable is less than the lower threshold i.e. -5.59%. In addition, when the value of the transition variable is less than the lower threshold or more than the upper threshold, the model will be linear.

The third model:

In the third research model, the Bitcoin price return variable is set as a dependent variable as well as a function of the rate of return of foreign exchange, stocks, gold, and the first-order lag of the Bitcoin rate of return. Based on various studies and results, the first-order lag variable of Bitcoin return is considered a transition variable in this model. The model that is retained to estimate the third model is the STR model with single-phase alternations. Therefore, a threshold value and a value for the inter-phase transition rate will be estimated. As the results show, the coefficient of determination in this regression is 0.16. The set of independent variables generally explains 16% of the dependent variable. Therefore, we can say that this regression is generally not significant. The weak connection between the Bitcoin price and the prices of other assets in the model is the reason for obtaining such a result. The Impact Factor of stock return in phase 0 is positive and non-significant, therefore Bitcoin cannot be a strong risk hedge against stocks. On the other hand, the Impact Factor of stock return in phase 1 is negative, significant, and a much larger number than the same value of this coefficient in phase 0. Therefore, the sum of the stock return coefficients in both linear and non-linear parts is negative and significant, so it can be said that Bitcoin is a strong safe haven for stocks. The Impact Factor of gold and foreign exchange prices are not significant in any of the phases 0 and 1. Based on the results, the inter-phase transition speed is estimated to be 1.14 and the threshold of phase change for the first-order lag variable of Bitcoin return is 21.17%. Therefore, when this number is exceeded and with a transition speed of 1.14, the relationship between Bitcoin and other assets will move from phase 0 to 1. It seems that In comparison with other assets such as gold and foreign exchange, the transition speed in the estimated model for Bitcoin is lower. In fact, the speed of inter-phase damping in the estimated model for

Bitcoin is lower than other assets. This means that when the return of a previous period of Bitcoin reached 21.17%, the relationship between Bitcoin and other assets changes at a low speed.
The error terms of the third model are serially de-correlated and homoscedastic. Furthermore, there is no non-linear behavior in the error terms of the model. These results indicate the validity of the estimated model. Therefore, it is possible to rely on and interpret the results.

Conclusion

The purpose of this study was to test the possibility of creating a risk hedge or a safe haven for stocks using its three alternative assets, including gold, foreign exchange, and digital currency (Bitcoin). For this purpose, in this study, daily time series data from 2014 to 2019 and the non-linear time series econometric model of a smooth transition or STR were used.
The results indicate that the gold asset is a strong safe haven for stocks, but it cannot be a strong risk hedge for the stocks of the Tehran Stock Exchange. Foreign exchange asset is a strong hedge and safe haven for stocks in Tehran Stock Exchange. Ultimately, Bitcoin may be a strong hedge for stocks, but it is a strong safe haven for stocks on the Tehran Stock Exchange. In this way, all three hypotheses specified in this article are accepted.
According to the results, investors in the Tehran Stock Exchange should choose their investment portfolio as a mix of foreign exchange and stocks because the foreign exchange acts as a strong risk hedge against stocks and can significantly reduce the risk of investing in the Tehran Stock Exchange.

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