**The impacts of international and local factors on the gold market price in Vietnam**

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**Abstract**

This study aims to determine the leader in the gold price market among the United States, the United Kingdom, Hong Kong, Taiwan, and Vietnam and examines which factors dominate the relevance of the global-to-local gold gap. First, by using the Granger causality test we find out that the United States is the price leader among these countries. Second, applying the moderated mediation model, the relevance of the global-to-local gold gap is positively influenced by money supply, the Vietnam stock market index, besides that the negative influence of the exchange rate VND/USD. This paper also proves that the moderated mediation relationship among three factors as the relevance of the global-to-local gold gap, the supply of money, and the currency exchange rate to be the major reasons of disparity.

**Keywords:** Granger causality, Moderated mediation model, Gold price market

1. **Introduction**

There is potential gold market in Vietnam in the Southeast Asia region, Vietnam has the seventh highest demand for gold among countries worldwide. Gold has been used by Vietnamese as a form of conventional savings for untold years. In addition, it is taken as a unit account for any deal that does not contain gold, like a capital unit account for high-value commodity exchanges such as vehicles and real estate. Gold is also popular as a hedge against the weakening of Vietnam’s domestic currency and has expanded its position in Vietnam as a medium of speculation against high inflation rates over time. In fact, betting on the price of gold was quite common during the 2008-2010 global financial economic crisis. During that time, gold trading floors in the major cities of Vietnam were permitted to function legally.

The Vietnam government has changed many legal documents since 1999 until now to manage the domestic gold market. Specifically, the government issued Decree No.24/2012/ND-CP,[[1]](#footnote-1) which enhanced the monitoring effectiveness of economic activities relating to buying and selling gold in the country. Decree 24/2012/ND-CP highlighted that the State Bank of Vietnam plays a pivotal role in implementing the unified management of gold trading activities in Vietnam, and it is allowed to implement stabilization policies in the gold market through licensing activities of gold trading in the domestic market, the organization of gold exports, the importing of raw gold, and the organization of gold mobilization. In addition, the government is a monopoly in the manufacturing, business, raw material gold export, and raw material gold import for processing. Moreover, Saigon Jewelry Company Limited,[[2]](#footnote-2) which is the largest gold production and distribution enterprise in the domestic market and called SJC, is ranked fourth among the top five hundred enterprises in Vietnam and is the only firm recognized by the State Bank of Vietnam to make a decision gold price in Vietnam.

Gold is considered as one of the tools to hedge risk when an economy becomes unstable. Many studies employ gold and precious metals or other factors in order to analyze short-term and long-term comparison, such as Taylor (1998), Hammoudeh et al. (2011), and Beckmann and Czudaj (2013). Gold has also been compared with stock market indices, influence factors, and countries. Through the Toda and Yamamoto, there is a bidirectional relationship between gold and crude oil, whereas there is unidirectional causality between gold and precious metals. Mohamed et al. (2014) and Chang et al. (2013) presented uni-directional causality from New York to Japan, Hong Kong, and Taiwan gold price markets. Do et al. (2009) found that gold could become a substitute commodity for stocks in Vietnam and the Philippines.

Some studies have researched the reciprocal relationship between gold and domestic factors, like stock prices, foreign exchange rates, gold price, crude oil, and inflation in Long and Hien (2018). The disparity between domestic and international gold prices has a positive impact on money demand in the Vietnam economy as shown by Le Thanh (2019). The United States currency has influenced Vietnam’s currency exchange rate to have a negative impact on the gap between Vietnam and global gold price, as presented by Ho and Vo (2019). Using the Vine Copula model, Tuấn and Quảng (2019) presented that the correlation between the exchange rate and the Vietnam stock market index is strong.

This present paper aims to illustrate the value of gold in Vietnam by identifying the leading gold price among five countries through the Granger causality test to figure out where the real disparity comes from. The research also looks at other variables that cause the difference by using the Moderated Mediation model to correlate the relevance of the global-to-local gold gap and other international and local factors.

1. **Literature Review**

Gold nowadays plays the role of a hedge against a recessionary period or major economic or business fluctuations. Taylor (1998) provided evidence to support the hypothesis that precious metals, such as gold, silver, and platinum, act as short-run and long- run hedges against inflation. Capie et al. (2005) found that gold is one hedge tool against fluctuations in the foreign exchange values of the US dollar. Siregar and Nguyen (2013) demonstrated that if gold plays the role of a financial asset, then shifts in its price should be monitored as one of the determining factors of inflation. Beckmann and Czudaj (2013) studied that the usefulness of gold as an inflation hedge for investors critically depends on the time horizon by depending on the regime to adjust the general price level.

Many studies have utilized gold and precious metals or other factors in order to conduct short-term and long-term mutual comparisons. Hammoudeh et al. (2010) examined the conditional volatility and significant correlation of short-run and long-run dependences and interdependences for gold, silver, platinum, and palladium, while accounting for geopolitics within a multivariate system. Mohamed et al. (2014) found a bidirectional relationship between gold and crude oil, whereas there is unidirectional causality between gold and other precious metals. Chang et al. (2013) showed uni-directional causality from New York to the United Kingdom, Japan, Hong Kong, and Taiwan gold price market. Do et al. (2009) investigated how gold could be a substitute commodity for stocks in Vietnam and the Philippines, while it could be a complement commodity for stocks in Indonesia, Thailand, and Malaysia.

A large strand of studies in Vietnam has researched the reciprocal relationship between gold and domestic factors. Long and Hien (2018) found that the real gold price, deposit interest rate, effective exchange rate, and consumer price index have a negative influence on M1. Le Thanh (2019) stated that domestic income and international gold price have a positive correlation while inflation and real exchange rate have a negative correlation in the long run. Tuấn and Quảng (2019) investigated the dynamic relationship among the gold price, VN-index, and VND/USD exchange rate in Vietnam. When the market is turbulent, it leads to co-movement in the gold price and VND/USD exchange rate fluctuations. Ho and Vo (2019) found that the United States currency transforms the Vietnam currency exchange rate with a negative impact on the gap between Vietnam and the global gold price. The import tax has a positive effect on the disparity between international gold price and domestic gold price. Long and Hanh (2019) presented in the long term that there are five negative correlations between VN-index and seven different variables as Consumer price index, exchange rate, Vietnam interbank rate, industrial production, money supply, oil price, and gold price. It shown that there are five negative correlations presented in the comparison.

Some studies investigated for Granger causality to test the relationship among various variables. Li (2019) used the ADF unit root test, the Johansen co-integration test, the Error Correction test, and the Granger causality test to find the relationship of China’s gold futures and actuals. Many research studies have employed the Moderated Mediation model to test for an indirect effect among the testing variables. After the publications by Judd and Kenny (1981) andBaron and Kenny (1986), testing for the mediation effect has become popular in psychology. Such results like the conditional indirect effect were collected by Preacher et al. (2007).

1. **Data and Methodology**

**3.1 Data**

This paper uses a daily database collected from September 24, 2012 to March 9, 2020. The time series database includes 1758 observations. The global gold price database collects the international gold spot price of the United States, United Kingdom, Hong Kong, and Taiwan from the Cmoney[[3]](#footnote-3) database in Taiwan. In Vietnam, the domestic gold price is the average between the buying and selling prices of SJC gold by Saigon Jewelry Company Limited, which is the largest gold trading company in Vietnam market and is also the brand defined by the government of Vietnam as a national trademark of Vietnamese gold standard. The exchange rate data are collected from the Cmoney database in Taiwan.This paper takes Hong Kong, Taiwan, and Vietnam gold prices and converts them into USD with the following formulae.

Table 1: The formula of each country’s currency converted into USD with one ounce of gold

|  |  |
| --- | --- |
| **Country** | **Formula** |
| Hong Kong |  One ounce gold = 0.8310 \* one Hong Kong tael \* Hong Kong exchange rate. |
| Taiwan | One ounce gold = 0.0311 \* one Kilogram gold \* Taiwan exchange rate. |
| Vietnam | One ounce gold = 0.8330 \* one Vietnam tael \* Vietnam exchange rate. |

Aside from other international and local factors, this study adds some domestic factors into the equation. Money supply is represented by M2 and collected from finance.vietstock.vn (unit is VND trillions); inflation rate (IFT) is computed by the Customer Price Index (CPI) sourced from the General Statistics Office of Vietnam (unit is %); the closing level of Vietnam Ho Chi Minh stock index (VNI) is sourced from finance.vietstock.vn; and the closing level of National Association of Securities Dealers Automated Quotations[[4]](#footnote-4) (USI) is sourced from the Cmoney database in Taiwan. Because we run a daily database, the money supply and the inflation rate are collected by the monthly database, and so this study takes a monthly data distribution on each day of a month to become the daily database for our analysis.

**3.2 Methodology**

**3.2.1 Granger Causality Test**

After analyzing whether there is stationarity among five countries in the world, this study also applies the Granger causality test model in order to seek the leader among the gold price of these five countries. Therefore, our study compares each country with the other countries. Which country influences the other countries hence becomes the leader of the world gold market, as seen in this model from equations (1) to (2). These following formulae are based on a comparison between the United States and the other countries, and then the application of these formulae could be replaced by each country to seek out a correlation with the others. Here, *Z* represents each country: United Kingdom, Hong Kong, Taiwan, and Vietnam.

* The United States and the other country

$R\_{t}^{US}=α\_{0}+\sum\_{i}^{n}α\_{1i}R\_{t-i}^{US}+\sum\_{j}^{n}α\_{2j}R\_{t-j}^{Z}+ε\_{1t}$ (1)

$R\_{t}^{UK}=β\_{0}+\sum\_{i}^{n}β\_{1i}R\_{t-i}^{US}+\sum\_{j}^{n}β\_{2j}R\_{t-j}^{Z}+ε\_{2t}$ (2)

The null hypothesis (H0): $\sum\_{j}^{n}α\_{2j}=0$ or$ \sum\_{i}^{n}β\_{1i}=0$

The alternative hypothesis (H1): $\sum\_{j}^{n}α\_{2j}\ne 0$ or $ \sum\_{i}^{n}β\_{1i}\ne 0$

The hypothesis consists of four cases. When $\sum\_{j}^{n}α\_{2j}=0$ and $\sum\_{i}^{n}β\_{1i}=0$, it shows that the United States and the United Kingdom do not affect each other. When $\sum\_{j}^{n}α\_{2j}=0$ and $\sum\_{i}^{n}β\_{1i}\ne 0$, it means that the U.S. affects the UK; conversely, if $\sum\_{j}^{n}α\_{2j}\ne 0$ and $\sum\_{i}^{n}β\_{1i}=0$, then the UK affects the U.S. Finally, if $\sum\_{j}^{n}α\_{2j}\ne 0$ and $\sum\_{i}^{n}β\_{1i}\ne 0$, then they affect each other.

**3.2.2 Moderated Mediation Model**

Through the international factors, our research believes the domestic factors also have as same as original point. Thus, this paper uses the moderated mediation model like checking which domestic factors affect the relevance of global-to-local gold gap. According to three models, this paper defines the relevance of global-to-local gold gap ($GUV\_{t}$), the logarithm of money supply at time t-1 (lnMDM2t-1), the return of the Vietnam stock market index at time t-1 ($R\_{t-1}^{VNI}$), the return of the United States stock market index at time t-1 ($R\_{t-1}^{USI}$), the logarithm of exchange rate to Vietnam currency (VND) for one US dollar at time t-1 ($lnEXC\_{t-1}$), and the inflation rate of Vietnam at time t-1 ($IFT\_{t-1}$). Model 1 examines the relationship between the relevance of the global-to-local gold gap and money supply with the other factors. Model 2 tests the connection of the exchange rate with money supply. Model 3 examines the nexus among three main factors of the moderated mediation model, such as the relevance of global-to-local gold gap, money supply, and the exchange rate of VND/USD.



**Figure 1: The moderated mediation model**

The models belong to the moderated mediation model:

$GUV\_{t}$ = a0+ a lnMDM2t-1 + a1$R\_{t-1}^{VNI}$ + a2 $R\_{t-1}^{USI}$+a3$IFT\_{t-1}$**+**e1 “(3)”

$lnEXC\_{t}$ = c0+ c lnMDM2t-1 + c1$R\_{t-1}^{VNI}$ + c2 $R\_{t-1}^{USI}$+c3$IFT\_{t-1}$**+**e2 “(4)”

$GUV\_{t}$ = d0+ d lnMDM2t-1 + d1$R\_{t-1}^{VNI}$ +d2 $R\_{t-1}^{USI}$+d3$IFT\_{t-1}$**+**b$lnEXC\_{t-1}$+e3 “(5)”

The moderated mediation model, which is also known as conditional indirect effects, tests the causal effect of exploratory variables: money supply (MDM2) on a response variable, where the relevance of the global-to-local gold gap (GUV) is transmitted by a mediator, which is the logarithm of the exchange rate to Vietnam currency for one US dollar (EXC).

**4. Empirical Results**

**4.1 Descriptive Statistics and Unit Root Test**

Table 2 summarizes descriptive statistics for the international and domestic factors during the sample period from September 24, 2012 to March 9, 2020. Panel A indicates the summary statistics for the return of gold price of the five countries during the same period, and panel B summarizes statistics for the global and national factors’ impact on the relevance of the global-to-local gold gap. All gold price returns of the five countries in Panel A are negative over the entire period, which are between -0.0054 and -0.0026. On the contrary, panel B has a positive value, except for the return of the United States stock index and inflation. Relevant findings are interpreted by the Jarque-Bera statistics of all variables in panel A and panel B (p<0.01), and so this paper rejects the null hypothesis, meaning that the dataset does not follow a normal distribution.

[Table 2: Summary Statistics]

In order to examine the stationarity of the time-series, this study applies the ADF unit root test and Philips-Perron test results in Table 3 and Table 4. All factors in these two types of unit root tests: ADF and PP at the levels all accept the null hypothesis (p>0.05). However, all variables reject the null hypothesis of ADF and PP tests at the first difference, but not for the level value, which means all samples are non-stationary in level value, but are stationary after first differencing.

[Table 3: Augmented Dickey-Fuller Unit Root Test]; [Table 4: Philips-Perron Test]

**4.2 Granger Causality Test**

Table 5 shows the results of Granger causality tests to find the leader of gold price among the five countries. First, because of the large gold trading volume of the U.S. and the UK, the study takes the two countries to test against the other three countries in panel A and panel B. In panel A, The United States is not only affected by the other countries with the probability of the results less than the threshold value of 0.05 but also influenced on the other countries. In panel B, the UK also has the same results as with the U.S., meaning that the U.S. and the UK are one of two countries that are gold price leaders. In panel C the study tests the United States and the United Kingdom to find the leader. The result indicates that the U.S. has a significant effect on the UK. Therefore, the United States gold price is the leader in the global gold market among these five countries. Figure 3 depicts the relationship between the gold market leader and the others. Both the US and the UK have an outstanding impact on the other three countries; particularly, the U.S. has a higher competitive advantage than the UK. The United States not only ranked third in the world in 2019 in terms of gold demand, but also dominated in its ability to decide the world gold price, because of its global economic strength.



**Figure 2: The relationship between the gold market leader and the others**

[Table 5: Granger Causality Test]

* 1. **Moderated Mediation Model**

A gap between the United States and Vietnam gold prices in Figure 3 is clearly indicated during the period from 2012 to 2016. The United States gold price fluctuated from the beginning of 2016 to the middle of 2018, but the Vietnam gold price was not affected significantly by the U.S. Therefore, the relevance of the global-to-local gold gap is because of the slower adjustment of the domestic gold price than that of the global gold price. At the same time, the Vietnam gold price is usually higher than the global gold price. Thus, if the gold gap can be predicted or mastered throughout the influence factors, then this will greatly help the Vietnam government to manage the domestic gold market and for investors to timely grasp a buying or selling opportunity.



**Figure 3: The Relevance of the United States-to-Vietnam Gold Gap**

Model 3 of Table 6 depicts international and domestic factors that affect the relevance of the global-to-local gold gap. Those factors are money supply, Vietnam stock market index, and the exchange rate of Vietnam dong to one US dollar. Obviously, the first factor is money supply, which shows a significantly positive affect with the relevance of the global-to-local gold gap (0.18). Moreover, the relevance of the global-to-local gold gap is affected positively (0.221) by the Vietnam stock index. On the other hand, the exchange rate of VND to one US dollar remarkably significantly negatively affects (-0.635) the relevance of the global-to-local gold gap. Therefore, money supply, the Vietnam stock market index, and the exchange rate VND/USD are the influence factors to the relevance of the global-to-local gold gap.

[Table 6: Moderated Mediation Model]

In the moderated mediation model, money supply is the causal factor for the relevance of the global-to-local gold gap. Money supply also significantly impacts the exchange rate between USD and VND. Looking at the order from model 1 to model 3 in Table 7, it shows that money supply significantly affects the relevance of the global-to-local gold gap from 0.107 in model 1 to 0.18 in model 3, and it also significantly affects the exchange rate of VND converted into USD (0.115). Moreover, the exchange rate notably impacts the relevance of the global-to-local gold gap (coefficient value = -0.635). Therefore, the relevance of the global-to-local gold gap is the dependent variable, the money supply is the independent variable, and the exchange rate of VND converted into USD is the mediator.

The correlation between the money supply and the relevance of the global-to-local gold gap is positive. It means the more money that circulates in the Vietnam market, the more the value of the Vietnam dong depreciates. To prevent the depreciating value of the Vietnam dong, residents withdraw money in the bank in order to buy gold. This leads to elevating the domestic gold price and the relevance of the global-to-local gold gap. In addition, the exchange rate converted the exchange rate converted into into USD from VND appreciates. It is thus suitable for the correlation between money supply and the exchange rate, which is positive. Generally, the US gold price is usually lower than the Vietnam gold price in USD value, along with the volume of imported gold accounts for 95 percent. Combining the US gold price usually lower than the Vietnam gold price in USD value, along with the volume of imported gold accounts for 95 percent, when converting to USD the exchange rate in the black market increases dramatically, and the local government, gold wholesaler, and gold buyer need to use more money to convert into USD from VND in order to import international gold. Consequently, the domestic gold price will move higher, and so the relevance of the global-to-local gold gap will be widened.



**Figure 4: The Result of the Moderated Mediation Model**

1. **Conclusion**

Vietnam is a developing country in Asia and also has the seventh highest gold demand globally in 2019. The time series of the United States, the United Kingdom, Hong Kong, Taiwan, and Vietnam for gold prices were collected into a daily database with 1758 observations from September 24, 2012 to March 9, 2020. This study then separates into two analytical processes. First, this paper finds that the leading country in the gold price market is the United States based on the Granger Causality test. The United States not only ranked third in the world in 2019 in terms of gold demand, but also dominates in the power to decide the world gold price, because of its global economic strength. Second, from using international and domestic factors via the moderated mediation relationship, this study finds a positive effect of money supply and Vietnam stock market index to the relevance of the global-to-local gold gap. On the other hand, the relevance of the global-to-local gold gap is affected negatively by the exchange rate of one US dollar to one Vietnam dong. Moreover, this study investigates the moderated mediation relationship among the gap between the U.S. gold price and the Vietnam gold price, the money supply, and the exchange rate of VND converted into USD. We find that when more money outflows Vietnam currency market, then the value of the Vietnam dong depreciates more. To prevent the depreciating value of the Vietnam dong, residents withdraw cash from the bank in order to purchase gold. This case means the domestic gold price increases and the relevance of the global-to-local gold gap also increases. Furthermore, the above situation forces the exchange rate of conversion into USD from VND to move higher, and the money supply indirectly impact to the relevance of global-to-local gold gap through the exchange rate. Finally, when the exchange rate conversion into USD in the black market remarkably increases, the local government, gold wholesaler, and gold buyer need to use more money to convert into USD from VND in order to import international gold. Consequently, the domestic gold price will move higher, and so the relevance of the global-to-local gold gap will be expanded.

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Table 2: Summary Statistics

|  |  |  |
| --- | --- | --- |
|  | **Panel A: Global gold markets** | **Panel B: The other international and domestic factors****on gold market price** |
|  | $$R\_{t}^{US}$$ | $$R\_{t}^{UK}$$ | $$R\_{t}^{HK}$$ | $$R\_{t}^{TW}$$ | $$R\_{t}^{VN}$$ | $$GUV\_{t}$$ | $$lnMDM2\_{t}$$ | $$R\_{t}^{VNI}$$ | $$R\_{t}^{USI}$$ | $$IFT\_{t}$$ | $$lnEXC\_{t}$$ |
| Mean | -0.003 | -0.003 | -0.003 | -0.003 | -0.005 | -0.070 | 15.670 | 0.001 | 0.000 | -0.028 | 10.007 |
| Maximum | 4.581 | 4.281 | 6.147 | 5.225 | 7.098 | 0.033 | 16.191 | 0.038 | 0.077 | 1.591 | 10.061 |
| Minimum | -9.512 | -10.175 | -9.76 | -7.093 | -5.136 | -0.198 | 15.042 | -0.061 | -0.062 | -1.481 | 9.944 |
| Std. Dev. | 0.933 | 0.911 | 0.907 | 0.904 | 0.563 | 0.051 | 0.326 | 0.010 | 0.014 | 0.455 | 0.039 |
| Skewness | -0.744 | -1.002 | -0.489 | -0.198 | 1.136 | -0.053 | -0.163 | -0.700 | 0.318 | -0.904 | -0.282 |
| Kurtosis | 11.46 | 14.14 | 13.549 | 7.864 | 37.474 | 1.881 | 1.783 | 6.776 | 6.133 | 4.762 | 1.571 |
| Jarque-Bera | \*\*\*5401.982 | \*\*\*9379.428 | \*\*\*8216.203 | \*\*\*1743.608 | \*\*\*87381.760 | \*\*\*92.495 | \*\*\*106.859 | \*\*\*1092.016 | \*\*\*687.908 | \*\*\*429.185 | \*\*\*158.887 |
| Observations | 1757 | 1757 | 1757 | 1757 | 1757 | 1616 | 1616 | 1616 | 1616 | 1616 | 1616 |

Notes: Panel A shows that$ R\_{t}^{US}$,$ R\_{t}^{UK}$,$ R\_{t}^{HK}$, $R\_{t}^{TW}$, and $R\_{t}^{VN}$represent the return of variables at time t. One after another they are the gold market price in the United States, the United Kingdom, Hong Kong, Taiwan, and Vietnam during the period from 2012 to 2020. Panel B shows the logarithm of money supply at time t (lnMDM2t); the return of the Vietnam stock market index at time t ($R\_{t}^{VNI}$); the return of the United States stock market index (NASDAQ) at time t ($R\_{t}^{USI}$); the inflation rate of Vietnam from the General Statistics Office of Vietnam at time t ($IFT\_{t}$); and the logarithm of the exchange rate for Vietnam currency (VND) into one Us dollar at time t ($lnEXC\_{t}$); and the relevance of the global-to-local gold gap at time t ($GUV\_{t}$). \*\*\* denotes significance at the 1% level.

Table 3: Augmented Dickey-Fuller Unit Root test

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| --- |
| **The results of the ADF stationary analysis** |
| **Variables** | **Level values** | **First differences** |
| No trend model | Trend model | Intercept model | No trend model | Trend model | Intercept model |
| t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value |
| US | -0.153 | 0.631 | -2.086 | 0.553 | -2.210 | 0.203 | -43.127 | 0.000\*\*\* | -43.254 | 0.000\*\*\* | -43.115 | 0.000\*\*\* |
| UK | -0.182 | 0.621 | -2.115 | 0.537 | -2.236 | 0.194 | -42.343 | 0.000\*\*\* | -42.470 | 0.000\*\*\* | -42.332 | 0.000\*\*\* |
| HK | -0.167 | 0.626 | -2.027 | 0.585 | -2.188 | 0.211 | -43.518 | 0.000\*\*\* | -43.655 | 0.000\*\*\* | -43.506 | 0.000\*\*\* |
| TW | -0.151 | 0.632 | -2.019 | 0.590 | -2.145 | 0.227 | -44.244 | 0.000\*\*\* | -44.386 | 0.000\*\*\* | -44.232 | 0.000\*\*\* |
| VN | -0.431 | 0.528 | -0.501 | 0.984 | -2.041 | 0.269 | -45.029 | 0.000\*\*\* | -45.370 | 0.000\*\*\* | -45.019 | 0.000\*\*\* |

Notes: This table shows the results of the unit root test for stationarity of the personal time series of the United States (US), the United Kingdom (UK), Hong Kong (HK), Taiwan (TW), and Vietnam (VN). Intercept denotes the unit root test only for the intercept term. Trend denotes the unit root test for the trend term and intercepts term. \*\*\* indicates significance at the 1% level.

Table 4: Philips-Perron test

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| --- |
| **The results of the Phillips- Perron stationary analysis** |
| **Variables** | **Level values** | **First differences** |
| No trend model | Trend model | Intercept model | No trend model | Trend model | Intercept model |
| t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value |
| US | -0.153 | 0.631 | -2.066 | 0.564 | -2.233 | 0.195 | -43.121 | 0.000\*\*\* | -43.253 | 0.000\*\*\* | -43.110 | 0.000\*\*\* |
| UK | -0.178 | 0.622 | -2.151 | 0.516 | -2.294 | 0.174 | -42.367 | 0.000\*\*\* | -42.475 | 0.000\*\*\* | -42.356 | 0.000\*\*\* |
| HK | -0.165 | 0.627 | -2.032 | 0.583 | -2.220 | 0.199 | -43.506 | 0.000\*\*\* | -43.637 | 0.000\*\*\* | -43.495 | 0.000\*\*\* |
| TW | -0.150 | 0.632 | -2.018 | 0.591 | -2.171 | 0.217 | -44.205 | 0.000\*\*\* | -44.342 | 0.000\*\*\* | -44.194 | 0.000\*\*\* |
| VN | -0.421 | 0.532 | -0.564 | 0.981 | -2.010 | 0.283 | -45.025 | 0.000\*\*\* | -45.351 | 0.000\*\*\* | -45.016 | 0.000\*\*\* |

Note: This table shows the results of unit root test for stationary of the personal time series of the United States (US), the United Kingdom (UK), Hong Kong (HK), Taiwan (TW), and Vietnam (VN). Intercept denotes the test of unit root only for intercept term. Trend denotes the unit root test for the trend term and intercepts term. \*\*\* indicates significant at the 1% level.

Table 5: Granger Causality test

|  |  |  |  |
| --- | --- | --- | --- |
| **Null Hypothesis:** | **Lag** | **F-Statistic** | **Prob.** |
| **Panel A: The United States and the others** |
| $R\_{t}^{HK}$ does not Granger Cause $R\_{t}^{US}$ | 1 | 0.679 | 0.410 |
| $R\_{t}^{US}$ does not Granger Cause $R\_{t}^{HK}$ | 1 | 1450.890 | 0.000 |
| $R\_{t}^{TW}$ does not Granger Cause $R\_{t}^{US}$ | 1 | 0.075 | 0.784 |
| $R\_{t}^{US}$ does not Granger Cause $R\_{t}^{TW}$ | 1 | 1743.210 | 0.000 |
| $R\_{t}^{VN}$ does not Granger Cause $R\_{t}^{US}$ | 1 | 0.689 | 0.407 |
| $R\_{t}^{US}$ does not Granger Cause $R\_{t}^{VN}$ | 1 | 424.059 | 0.000 |
| **Panel B: The United Kingdom and the others** |
| $R\_{t}^{HK}$ does not Granger Cause $R\_{t}^{UK}$ | 1 | 0.298 | 0.585 |
| $R\_{t}^{UK}$ does not Granger Cause $R\_{t}^{HK}$ | 1 | 676.194 | 0.000 |
| $R\_{t}^{TW}$ does not Granger Cause $R\_{t}^{UK}$ | 1 | 1.462 | 0.227 |
| $R\_{t}^{UK}$ does not Granger Cause $R\_{t}^{TW}$ | 1 | 786.546 | 0.000 |
| $R\_{t}^{VN}$ does not Granger Cause $R\_{t}^{UK}$ | 1 | 0.710 | 0.400 |
| $R\_{t}^{UK}$ does not Granger Cause $R\_{t}^{VN}$ | 1 | 216.162 | 0.000 |
| **Panel C: The United States and the United Kingdom** |
| $R\_{t}^{UK}$ does not Granger Cause $R\_{t}^{US}$ | 1 | 1.186 | 0.276 |
| $R\_{t}^{US}$ does not Granger Cause $R\_{t}^{UK}$ | 1 | 186.901 | 0.000 |

Note:$ R\_{t}^{US}$,$ R\_{t}^{UK}$,$R\_{t}^{HK}$,$R\_{t}^{TW}$,$R\_{t}^{VN}$represent the return of variables at time t. One after another they are the gold market price in the United States, the United Kingdom, Hong Kong, Taiwan and Vietnam. The United States and the other nations: $R\_{t}^{US}=α\_{0}+\sum\_{i}^{n}α\_{1i}R\_{t-i}^{US}+\sum\_{j}^{n}α\_{2j}R\_{t-j}^{Z}+ε\_{1t}$, $R\_{t}^{UK}=β\_{0}+\sum\_{i}^{n}β\_{1i}R\_{t-i}^{US}+\sum\_{j}^{n}β\_{2j}R\_{t-j}^{Z}+ε\_{2t}$. The hypothesis consists of four cases, when$\sum\_{j}^{n}α\_{2j}=0$, $\sum\_{i}^{n}β\_{1i}=0$, it shows that the United States and the United Kingdom don’t have affective each other. When$\sum\_{j}^{n}α\_{2j}=0$, $\sum\_{i}^{n}β\_{1i}\ne 0$, it means that the US affects to the UK, conversely $\sum\_{j}^{n}α\_{2j}\ne 0$, $\sum\_{i}^{n}β\_{1i}=0$, the UK affects to the US. And finally, $\sum\_{j}^{n}α\_{2j}\ne 0$, $\sum\_{i}^{n}β\_{1i}\ne 0$, they have affected each other.

Table 6: Moderated mediation model

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1 | Model 2 | Model 3 |
|  | $$GUV\_{t}$$ | lnEXCt | $$GUV\_{t}$$ |
| $$lnMDM2\_{t-1}$$ | 0.107\*\*\* | 0.115\*\*\* | 0.180\*\*\* |
| (0.002) | (0.001) | (0.011) |
| $$R\_{t-1}^{VNI}$$ | 0.219\*\*\* | -0.004 | 0.221\*\*\* |
| (0.084) | (0.025) | (0.082) |
| $$R\_{t-1}^{USI}$$ | 0.013 | -0.003 | 0.015 |
| (0.063) | (0.018) | (0.061) |
| $$IFT\_{t-1}$$ | -0.003 | -0.001\* | -0.003 |
| (0.002) | (0.000) | (0.002) |
| $$lnEXC\_{t-1}$$ |  |  | -0.635\*\*\* |
|  |  | (0.097) |
| Constant | -1.749\*\*\* | 8.212\*\*\* | 3.467\*\*\* |
|  | (0.039) | (0.009) | (0.800) |
| R-Square | 0.478 | 0.941 | 0.492 |
| Adjusted R-Square | 0.477 | 0.941 | 0.490 |
| Observations | 1616 | 1616 | 1616 |

Note: \*\*\*, \*\* and \* denote the significant at the 1%, 5% and 10% level, respectively. The table focused on the equation of the moderated mediation models: $GUV\_{t}$= a0+alnMDM2t-1+a1$R\_{t-1}^{VNI}$ +a2$R\_{t-1}^{USI}$+a3$IFT\_{t-1}$+e1 (Model 1);$lnEXC\_{t}$= c0+ clnMDM2t-1+c1$R\_{t-1}^{VNI}$ +c2$R\_{t-1}^{USI}$+ c3$IFT\_{t-1}$+ e2 (Model 2); $GUV\_{t}$= d0+ dlnMDM2t-1 + d1$R\_{t-1}^{VNI}$ + d2$R\_{t-1}^{USI}$+ d3$IFT\_{t-1}$+ b$lnEXC\_{t-1}$+ e3 (Model 3). The table indicates the relevance of global-to-local gold gap at the time t ($GUV\_{t}$); The logarithm of money supply at the time t-1 (lnMDM2t-1); The return of Vietnam stock market index at the time t-1($R\_{t-1}^{VNI}$); The return of the United States stock market index at the time t-1 ($R\_{t-1}^{USI}$), The inflation rate of Vietnam at the time t-1 ($IFT\_{t-1}$); and the logarithm of exchange rate to Vietnam currency (VND) by one dollar at the time t-1 ($lnEXC\_{t-1}$).

1. <https://vanbanphapluat.co/decree-no-24-2012-nd-cp-on-gold-business-activities> [↑](#footnote-ref-1)
2. <http://www.sjc.com.vn/trang-chu.html> [↑](#footnote-ref-2)
3. <http://www.cmoney.com.tw/> [↑](#footnote-ref-3)
4. NASDAQ: National Association of Securities Dealers Automated Quotations. [↑](#footnote-ref-4)