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The Influence and Comovement of International Market on Chinese Gold Market

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Abstract

Nowadays the gold market plays a more and more important role in the financial market, and the gold price has become a reflection of economic conditions and government's strategies. Focusing on Chinese gold market, with the Shanghai gold exchange as an example, the results show that the gold price has a strong correlation with the factors stock index, the dollar, and crude oil prices. Based on the gold price data of Shanghai gold market and New York gold exchange market under the influence of global economic crisis and epidemic, the results show that Chinese gold price is positively correlated with American gold price, and will be affected by American gold price.

Keywords

Comovement; Gold Market; Regression; ADF Test; Granger Casual Test.

1. Introduction

The gold market is a financial market that specializes in gold trading. In the global financial market, gold can not only be traded as goods, but also as a kind of currency with the characters as the international financial property. Compared with other currencies, gold has better stability and a high level of liquidity, and is widely invested to avoid or diversify risks. In addition, gold, as a scarce resource, is widely recognized as a currency that has limits in issuance, which is why it is highly used as a reserve by governments. What's more, central banks also control the supply of money by selling or buying gold in the gold market and adjusting international gold reserves work well. In this method, gold is used as a hedging tool for monetary policy operations.

According to the characteristics and advantages of gold above, the gold market is playing an increasingly important role in the global economy. Thus, the trend of gold price has become one of the most important standards to reflect how the economic situation and financial market will move. The paper will do researches on the influencing factors of the gold market, which can better analyze the reasons for the changes in the gold price and can help investors to learn the market and make the estimation. Compared with developed countries with relatively mature gold market, China's gold market is still incomplete, but it has been rapidly improved in recent years. The emergence of "Shanghai Gold" priced in RMB in 2016 also opened up a new world for the development of Chinese gold market. Therefore, this paper also studies speed of China's gold market to reflect the changing economic situation and how it affects or is affected by the global gold market.

2. Literature Review

Ewa Drabik (2020)[1] pointed out that gold, due to its value and uses, has been playing an increasingly significant role in balancing the financial market and economic development. Especially in the event of crisis, its value preservation has made it an important factor in stabilizing the economy, and even can prevent economic disasters. Tang Lie (2014)[4] believes that after the Shanghai Gold Exchange began to have the pricing power, the pricing influence of

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Chinese gold market has greatly increased. In the global gold market, a triad of "London gold", "New York gold" and "Shanghai gold" had been formed since then. However, there still is a large gap between "Shanghai gold" and the other two better developed kinds of gold in many aspects such as volume and influence. He also takes into account the impact of increased market instability on the overall international market when gold is affected by a major event, such as the epidemic. For this, he studied the volatility, spillover effect and robustness of the three markets before and after the epidemic. The results showed that the return rate and volatility of "Shanghai gold" after the epidemic were lower than those of the other two markets, reflecting that China had worked well on epidemic control, which helped gold market to be more relatively stable. At the same time, compared with before the outbreak of the epidemic, the average value of the volatility spillover index after the epidemic increases, the risk linkage of domestic and foreign gold markets increases, the market is more closely connected, and the market sentiment will be transmitted from one market to another market. In addition, the average of the volatility spillover index after the epidemic increased significantly. This showed that the risk linkage of domestic and foreign gold markets increased, markets were more closely connected, and the market sentiment could be transmitted from one market to the others. The existing research results affirm the interaction between markets, but the research on "who moves first" is not enough. The existing research results affirm the interaction between gold markets, but lack of the research on "who moves first". This paper will focus on the linkage between the Shanghai gold market and the U.S. gold market, and take the 2008 global economic crisis and COVID-19, which are the pariods when the global gold market is more volatile, as examples to further verify the comovement effect and the sequential relationship between the gold markets. Results will show which market is more sensitive to systemic risks and can more highly influence the global gold market.

3. Influence Factors of the Chinese Gold Market

With accordance of the gained results, the following factors can affect the trend of gold price. First, the exchange rate of US dollar has a positive relation with the gold price, because the international gold price is based on dollar. Second, the oil price, which is also pegged to the dollar, is positively correlated with the gold price. Third, the inflation rate and the consumer price index can also influence the gold price. When inflation is serious, the gold price will go up. Fourth, monetary policies from the central bank will also affect the price of gold. When the central bank implements quantitative easing, interests will be low and the price of gold will rise. This paper will put China's gold market in a global environment and explore how international factors influence Chinese gold market.

3.1. Data Collection

Shanghai Gold Exchange is the only national market in China legally engaged in gold trading, which can centrally reflect the development trend and market situation of China's gold. Therefore, this paper collects the gold spot price of Shanghai Gold Exchange on 698 trading days from January 1st, 2018 to December 31st, 2020 as the dependent variable. Shanghai Stock Exchange Composite Index, S&P 500 Index, US Dollar Index, international crude oil price data as independent variables. Data is from Resset Database and the official website of Shanghai Gold Exchange.

3.2. Modeling

Assume that the price of gold is related to the exchange rate of the US dollar, domestic and foreign stock prices, and the price of crude oil. To create an expression as the follow:

$$G_t = \beta_0 + \beta_1 SH_t + \beta_2 DOL_t + \beta_3 SP500_t + \beta_4 OIL_t + \varepsilon_t$$

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Table 1. Variables

Variables	Name
G_t	Gold price in Shanghai Gold Market during
SH_t	Shanghai Stock Exchange Composite Index during
DOL_t	Dollar index
$SP500_t$	S&P 500 index
OIL_t	Crude oil price
ε_t	Errors

3.3. Residual Analysis

Here, this paper uses Durbin-Watson test as the independence test. It is assumed that the error term does not exist first-order autocorrelation, that is, $\varepsilon_t = a\varepsilon_{t-1} + w_t$, a is the correlation coefficient between the error terms. The null hypothesis is H0: a = 0, and the alternative hypothesis is H1: a ≠ 0. The result is P=0.063>0.05. The null hypothesis cannot be rejected, which means the model is independent. Then this paper uses ncvTest to carry out the homoscedasticity test, and the result is P=0.135>0.05. There is no heteroscedasticity. QQ-plot and residual plot are plotted for normality and linearity test. The results shows that the distribution is normal and consistent with the linear regression model.

3.4. Regression Result

The results (Table 2) show that the Shanghai Composite Index, the US dollar index, the S&P 500 index and the crude oil price are all correlated with the gold price at a significance level of 0.01, which is the factor that affects the gold price. Among them, the gold price is positively correlated with the stock index, and negatively correlated with the US dollar exchange rate and the crude oil price. The R^2 of the model equals 0.8942, which indicates that the regression line has a high fit to observations.

Table 2. Regression

G_t	Coefficients	S.t errors	t-value	p-value
SH_t	0.17659	0.01716	10.292	0.000***
DOL_t	-7.56224	1.36888	-5.524	0.000***
$SP500_t$	0.35264	0.01203	29.313	0.000***
OIL_t	-9.82862	0.23990	-40.970	0.000***
$\_cons$	1212.96742	168.43897	7.201	0.000***

4. How Chinese Gold Price Changes in Crisis and Why

After the breakdown of the Bretton Woods system, financial properties of gold had replaced its monetary properties. Since then, it had important practical significance to study the fluctuation of gold price, analyze and predict the trend of gold price. In the next part, this paper will focus on the financial crisis in 2008 and the COVID-19 epidemic in 2020 to study the impact of external factors on the gold market, and compare the changes of gold prices between normal times and times with crisis.

Data collected shows that during both crises, the price of gold rose significantly, reaching a peak in the nearby period, and the volatility during the periods was more pronounced than in normal times. In 2007, when the US subprime mortgage crisis emerged, due to the delayed reaction of the market, Chinese gold price was still relatively stable. In March 2008, the gold price firstly began to fall, and in November, the gold price rose again. After a short decline, it ushered in a new peak, and the frequency of fluctuations increased significantly. During the COVID-19, the

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market stability decreased and volatility increased, coupled with reduction of people's income, people became pessimistic and more cautious in investment. At this time, gold prices had reached a record high, apporaching 1.7 times larger than the average level of the last 16 years. This was not only happening in the Chinese gold market, but also in the U.S. gold market. On March 9, 2020, when the market opened, the U.S. stock market plunged. The S&P 500 index quickly fell to 7%, triggering the first circuit breaker. However, the gold price rebounded on the day, hitting an intraday high of $1703.1 per ounce, which was its highest level since December 2012. The reason why gold did well during recessions is that slower growth usually increases panic of investors. When panic strikes, gold is a natural safe haven. By comparing the performance of gold price in the current credit crisis with the trend of economic slowdown in the past, it can be seen that the emergence of credit risk is the key factor affecting the price of gold in the financial crisis. Gold can hedge risks and is an effective hedging tool, showing weak commodity attributes and strong currency attributes.

5. Empirical Research on Comovement of Chinese and American Gold Market

5.1. Data Collection

According to the analysis above, when the financial market is highly moved by the crisis, the gold price will highly change. Thus, this paper takes the data during the global economic crisis in 2008 and COVID-19 as an example to conduct the model and do research on the price comovement of Chinese and American gold markets. This paper chooses the time when the financial crisis was more serious, use gold spot closing prices of 170 trading days on Shanghai Gold Exchange and New York Gold Exchange from August 27, 2008 to May 27, 2009 as samples. The unit is USD/ounce. Data source: Resset database and official website of Shanghai Gold Exchange Market.

5.2. Correlation Analysis

Here, I use Pearson Correlation Analysis. By calculating correlation coefficient ρ_ij, I test the correlation between two sets of data. The equation is $\rho_{ij} = \frac{Cov(x_i,x_j)}{\sqrt{Var(x_i)}*\sqrt{Var(x_j)}}$, in which i and j represent two time series, $Cov(x_i, x_j)$ is their covariance, and $\sqrt{Var(x_i)}, \sqrt{Var(x_j)}$ are their standard variables. The result is $\rho_{ij} = 0.96736, 0.6 < \rho_{ij} < 1.0$. The two series have a strong relation.

5.3. ADF Test and Cointegration Test

Before causal test, we need firstly conduct a single root test to see whether the series are stable. In this paper, the ADF test method is adopted. The time series of the gold price in Shanghai gold Market is set as "SH" and the gold price in New York gold market is set as "NY". The results are shown in Table 3. The original time series of Shanghai gold market price and New York gold market price have not passed the stationarity test, and there are unit roots in the original time series. After first difference, both time series pass the test. Therefore, the two sets of data are the single integral series in the same order. We can keep on with the analysis.

The cointegration test can further explore the long-term equilibrium relationship between them. In this paper, the “Engle-Granger” two-step test method is used to perform OLS regression on the original data to obtain the residual series, and the ADF test is conducted on the residual series. The result shows that the T-value is -10.6761, and the P-value is much less than 0.01. Therefore, the two variables have a co-integration relationship, showing that there are relations between two markets.

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Table 3. ADF test

Type	Var.	ADF	t-value			p-value	Stability
			1%	5%	10%		
First stage	SH	-1.4107	-3.47	-2.88	-2.58	0.5761	No
	NY	-1.3534	-3.47	-2.88	-2.58	0.6039	No
Second stage	SH	-13.2741	-4.01	-3.44	-3.14	0.0000	Yes
	NY	-12.0411	-4.01	-3.44	-3.14	0.000	Yes

5.4. Engle-Granger Test

For further study about the causality of the comovement effect of two markets, I use "Granger Casualty Method" for research. The results (Table 4) show that the original hypothesis, "NY is not the Granger cause of SH", is rejected and the alternative hypothesis, "NY is the Granger cause of SH", is accepted. Also we can accept the null hypothesis, "SH is not the Granger cause of NY". Therefore, the result of the Granger causality hypothesis is that the New York gold market price is the Granger cause of the Shanghai gold market price, and the Shanghai gold market price is not the Granger cause of the New York gold market price. This result proves that when the crisis occurs, the US gold market price reacted before the Chinese gold market, and had a comovement effect on the Chinese gold market, while the Chinese gold market had no significant reverse effect on the American market.

Table 4. Granger Casual Test during financial crisis in 2008

Null hypothesis	F-value	P-value
NY does not Granger Cause SH	280.708	2.E-53***
SH does not Granger Cause NY	0.49986	0.6075

5.5. Stability Test

In order to verify the stability of our result, with the same method, I use data during COVID-19 to test the comovement between Chinese and American gold market. Here I choose data from Jan 1st to July 10th, 2020, which is the period when COVID-19 broke out and gradually diffused. Data includes 125 trade days in total. After passing the effectiveness tests above, the result of Engle-Granger (Table 5) verify that the American gold market has a comovement effect on Chinese gold market for the second time.

Table 5. Granger Casual Test during COVID

Null htpothesis	F-value	P-value
NY does not Granger Cause SH	7.71285	0.0007***
SH does not Granger Cause NY	0.71581	0.4909

6. Conclusion

Nowadays, based on the integration trend of the global economy, Chinese gold market becomes inseparable from the world market. The strong stability and hedging function of gold plays an important role in stabilizing the economy and reducing risks in times of crisis. The results of this paper show that factors, like the stock index, the price of the US dollar, and the price of crude oil, have extremely strong correlation with the price of gold, and can change Chinese gold price a lot. The study of Chinese gold market in the international market shows that the American gold market is more sensitive to the crisis and is always the first to react to the changing situation. The American market also shows a strong comovement effect on the Chinese market, which means that its price fluctuations will greatly affect the Chinese gold price. From a micro point of view, investors can rationally estimate the price of gold through the

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market conditions of stocks, the US dollar, oil, etc., and reduce investment risks. Moreover, due to the relatively lagging reaction of China's gold market, investors can also evaluate the future performance of the Chinese market by observing the international situation and the trend in the U.S. gold market. They can also catch the point when the U.S. market has already reacted to the environment change but China has not, and carry out arbitrage investment. From a macro perspective, the results of Granger causality test also show that for China, the gold market is still in the early stage of development. The trading volume is still small, the market is not sensitive enough, and the market is greatly affected by other markets. This indicates that it is necessary for China to improve laws and regulations, strengthen supervision, and enhance the stability and internationality of the market, to increase the status of the Chinese market in the international market.

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