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The dependence structure analysis among gold price, stock price index of gold mining companies and Shanghai composite index

Xi Shen, Kanchana Chokethaworn and Chukiat Chaiboonsri

Faculty of Economics, Chiang Mai University, Chiang Mai, Thailand
E-mail: cherryshen109@hotmail.com

ABSTRACT

This paper used different copula-based GARCH models (Copula-GARCH model and Copula-GJR-GARCH model) to analyze the dependence structure among gold price, stock price index of gold mining companies and Shanghai Composite Index in China. The empirical results found that the suitable margins were skew-t distribution, and the GJR-GARCH marginal distribution had better explanatory ability than the GARCH model. Moreover, we found the Clayton copula had the highest explanatory ability of the dependence structure for all series. There existed positive dependence in the rates of return for all series, and the dependence between these markets will be closer with the gradual integration of international financial market.

Keywords: Gold price, Shandong gold stock index, Shanghai composite index; Copula-GARCH; Skewed distribution

JEL Classification: C22, C51, G10

1. Introduction

Since the financial crisis in 2008, the U.S. dollar has accelerated depreciation, but certain products have the ability to resist risks are loved by investors once again, such as gold, oil, etc. China's gold prices have increased a lot from 2003 to 2012 all the way; the investment value of gold has received more and more attention. Under the impetus of the international gold price, the price of gold stocks in the A-share market (Shanghai Stock Exchange) has continued to rise in a downturn situation of the stock market, proving very favorable for investors. Gold mining stocks are a popular way to invest gold. The perceived advantage of investing in gold mining shares is that their value is usually more sensitive to the price of gold than even a gold bar.

In general, the returns of gold-related securities, such as common stock in gold mining companies, are widely considered to be related to the changes in gold prices and, to a much lesser extent than general stock market returns. And gold price has negative correlation with general stock market returns. In China, the dependence among gold price, stock price index of gold mining companies and general stock market will have the same results with the foreign countries or they may not. From the above mentioned issues, this paper will examine to find the dependence measures among gold price, stock price index of gold mining companies and Shanghai composite index.

This paper is organized as follows. Section 2 provides a brief literature review. Section 3 describes the econometrics models used in the paper, namely copula—GARCH model. Section 4 discusses the data presented in the paper and also describes the results of different copula-based GARCH models, and section 5 concludes the paper.

2. Literature review

A number of studies have examined the dependence structure among gold market and stock market, including Blose and Shieh (1995), Sjaastad and Scacciavillani (1996), Tufano (1998), Christie-David et al. (2000), Twite (2002), Faff and Hillier (2004), and Fang et al. (2007). These scholars applied the regression analysis, finding that gold mining company stocks had a greater exposure to the returns of gold price than to the returns of stock market (gold betas were higher than the market betas). But there was little attention given in the investigation of the time series characteristics and possibilities of a long-term co-integrating relationship between these variables. Until Smith (2001) tested for non-stationary in these variables. Smith (2001) studied the short-term and the long-term relationships between four gold price series and six stock price indices in US. Then he found that gold prices and US stock index were just stationary in the first differences, and no co-integration between gold price series and stock market index. And there was clear evidence of a negative short-term Granger causality running from US stock index returns to gold returns, but not the reverse.

In general, scholars have used the autoregressive conditional heteroskedasticity (GARCH) model or the GARCH family models as their model. Eder and Brian (2007) found that asymmetric power GARCH model can fit the data of gold price well, and the dollar had a significant impact on the gold price. Jonathan and Brian (2007) applied

GARCH model to study the volatility of CBOT gold futures and found volatility had great fluctuation in the trading day, and trading volume had insignificantly positive impact to the volatility of gold futures price. Zheng Xiutian (2008) used the GARCH-M model to study the relationships between the return and the risk of gold in Chinese gold market. Estimates showed that the return and risk of gold market was positively related, and expected returns contained a certain risk premium, but the risk premium was not significant. Li Peng and Zhu Xinling (2009) built MVGARCH-BEKK and MVGARCH-DCC model to study the spillovers effect and time-varying correlations between the dollar market and the gold spot market. The BEKK model showed dollar market and gold spot market have two-way spillover effects, and in most periods, the U.S. exchange rate had negative correlation with the gold spot, and variables also had time variability. Zhao Jing (2012) studied the volatility between gold market and stock market in China, and the results showed that the daily series of stock market and gold market didn't follow a normal distribution, which showed Leptokurtosis. They had significant ARCH effects, and the volatility of returns had significant volatility pooling. Stock market was more volatile than the gold market in China.

As far as we know, there are a few studies applying copula-GARCH model to investigate the dependence among China's gold price, stock price index of gold mining companies and Shanghai composite index. Thus, this paper fills in the gap in literature by employing the copula-GARCH model to examine dependence among gold price, stock price index of gold mining companies and Shanghai composite index.

3. Econometrics Models

3.1 The model for the Marginal Distributions

3.1.1 GARCH (1, 1) Model

This paper uses GARCH (1, 1) Model. Bollerslev (1986) uses the ARMA concept and proposes the GARCH model, which is expressed as

$$R_{i,t} = a_i + \varepsilon_{i,t}, \varepsilon_t = h_{i,t} z_{i,t}, z_{i,t} \sim \text{skewed}-t\left(z_{i,t} \middle| \eta_i, \lambda_i\right), \tag{1}$$

$$h_{i,t}^2 = \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1}^2, i = g, s, d \tag{2}$$

where $h_{i,t}^2$ is the conditional variance. Here, $\omega_i > 0, \alpha_i, \beta_i \geq 0, \text{and} \left(\alpha_i + \beta_i\right) < 1$. And we denote the daily closing price of gold Au9999, Shanghai Composite Index and Shandong gold stock index as the variable g, s and d.

The density function of the skewed-t distribution is followed by Hansen (1994) which is defined as:

$$\text{Skewed}-\text{t}\,(z|\eta,\lambda) = \begin{cases} nb\left(1+\dfrac{1}{\eta-2}\left(\dfrac{nz+m}{1-\lambda}\right)^2\right)^{-(\eta+1)/2} & ,z<-\dfrac{m}{n} \\ nb\left(1+\dfrac{1}{\eta-2}\left(\dfrac{nz+m}{1+\lambda}\right)^2\right)^{-(\eta+1)/2} & ,z\geq-\dfrac{m}{n} \end{cases} \tag{3}$$

where $2<\eta<\infty$ and $-1<\lambda<1$ are respectively the kurtosis and the asymmetric coefficients, respectively, and the values of m, n, and b are defined as $m \equiv 4\lambda b\dfrac{\eta-2}{\eta-1}, n^2 \equiv 1+3\lambda^2-m^2,$ and $b \equiv \Gamma\left(\dfrac{\eta+1}{2}\right)/\left(\sqrt{\pi(\eta-2)}\cdot\Gamma\left(\dfrac{\eta}{2}\right)\right)$. In addition, if the asymmetric coefficient λ is equal to zero, then the distribution will become a symmetrical student-t distribution, and if the kurtosis coefficient η is close to ∞, then the distribution will become a standard normal distribution.

3.1.2 GJR-GARCH Model

This paper also utilizes the GJR-GARCH model, which proposed by Glosten et al. (1993), to examine the leverage effect by adding a dummy variable in the conditional variance equation. Thus the GJR-GARCH model can be written as

$$R_{i,t} = a_i + \varepsilon_{i,t}, \varepsilon_t = h_{i,t}z_{i,t}, z_{i,t} \sim \text{skewed}-\text{t}\left(z_{i,t}|\eta_i,\lambda_i\right),$$

$$h_{i,t}^2 = \omega_i + \alpha_i\varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1}^2 + \gamma_i I\left(\varepsilon_{i,t-1}<0\right)\varepsilon_{i,t-1}^2, i = g, s.d \tag{4}$$

where $\omega_i > 0, \alpha_i, \beta_i \geq 0, (\alpha_i+\gamma_i) \geq 0,$ and $\alpha_i + \beta_i + \frac{1}{2}\gamma_i < 1.$ γ_i is the leverage coefficient which applied to negative standardized residuals.

3.2 The Copula Model for Joint Distribution

This paper employs two families of copula model (Copula-GARCH and copula-GJR-GARCH) to describe the dependence structure among gold price, stock price index of gold mining companies and Shanghai composite index. There are two elliptical (Gaussian and Student-t copula) and two Archimedean's copula model (Gumbel and Clayton copula) applying in this paper. The Gaussian copula cannot capture tail dependence and the Student-t can capture tail dependence. The Gumbel copula can be used to form the joint distribution with the upper tail dependence, while the Clayton copula has the lower tail dependence. These copula models and the statistical inference can derive as below.

(1) Following Patton's formula, the bivariate Gaussian copula is given by

$$C_{\text{Gaussian}}(u,v;\rho) = \int_{-\infty}^{\phi^{-1}(u)}\int_{-\infty}^{\phi^{-1}(v)} \frac{1}{2\pi\sqrt{1-\rho^2}}\exp\left(-\frac{x^2-2\rho xy+y^2}{2\left(1-\rho^2\right)}\right)dxdy = \phi_\rho\left(\phi^{-1}(u),\phi^{-1}(v);\rho\right) \tag{5}$$

where u and v are cumulative distribution or empirical cumulative function of standard residuals, which have a uniform distribution in (0, 1). The correlation ρ is Pearson's linear correlation, and ϕ^{-1} is the inverse cumulative distribution of a standard normal distribution.

(2) The bivariate Student-t copula is given by

$$C_{Student-t}(u,v;\rho,\nu)=T\left(t_{\nu}^{-1}(u),t_{\nu}^{-1}(v)\right) \tag{6}$$

where T is the standard univariate Student- t cumulative distribution function with ν being the degree of freedom and correlation ρ .

(3) The bivariate Clayton copula is described as

$$C_{Clayton}(u,v;\theta)=\max\left(u^{-\theta}+v^{-\theta}-1\right)^{-\frac{1}{\theta}} \tag{7}$$

where $\theta\in[0,+\infty)$ is the degree of dependence between u and v, $\theta=0$ implies no dependence and $\theta\to\infty$ represents a full dependence relationship. The Clayton copula can capture the lower tail dependence.

(4) The bivariate Gumbel copula is given by

$$C_{Gumbel}(u,v;\theta)=\exp\left(-\left((-\log u)^{\theta}+(-\log v)^{\theta}\right)^{\frac{1}{\theta}}\right) \tag{8}$$

where θ is the degree of dependence between u and v, and within $[1,+\infty)$. $\theta=1$, shows no dependence and if θ increases to infinity which represents a fully dependence relationship between u and v. The Gumbel copula can capture the upper tail dependence.

3.3 Estimation and Calibration of the Copula

This paper uses IFM method to estimate the parameters of copula-based GARCH mode. In the first stage, estimating the parameters Θ_u and Θ_v of the marginal distributions using the maximum likelihood method, respectively:

$$\hat{\Theta}_u=\arg\max l^u(\Theta_u)=\sum_{t=1}^{T}\log\left(f_{u,t}\left(r_{u,t},\Theta_u\right)\right) \tag{9}$$

$$\hat{\Theta}_v=\arg\max l^v(\Theta_v)=\sum_{t=1}^{T}\log\left(f_{v,t}\left(r_{v,t},\Theta_v\right)\right) \tag{10}$$

In the second stage, estimating the copula parameters Θ_c , given the estimations performed in the first step:

$$\hat{\Theta}_c=\arg\max l^c(\Theta_c)=\sum_{t=1}^{T}\log\left(c\left(F_{u,t}\left(r_{u,t},\hat{\Theta}_u\right),F_{v,t}\left(r_{v,t},\hat{\Theta}_v\right),\Theta_c\right)\right) \tag{11}$$

4. Empirical Result

4. 1 Data and descriptive statistics

This paper is mainly based on the daily closing price of Shanghai composite index, gold Au9999 and gold mining industry stock named Shandong gold stock, which covers about 3 years' daily data, from January 4th,2011-October 29th,2013. The market capitalization and liquidity of Shenzhen Stock Exchange is relatively low in contrast with Shanghai Stock Exchange, therefore this paper uses Shanghai composite index as the mirror of stock market in China. In addition, gold Au9999 was the first gold trading product in China. The reason for selecting Shandong Gold as representatives is that this company mines gold as their main business, and mining gold has a higher proportion in their business. Shanghai composite index data, the gold Au9999 price data and Shandong gold stock index are from the EcoWin. To eliminate spurious correlation generated by holidays, this paper eliminates those observations when a holiday occurred, and the total numbers of the data was 1,812. p_t is the daily closing price, and the rate of return $R_t = 100(\ln p_t - \ln p_{t-1})$. As following, this paper uses Gold to represent gold product Au9999, SD stands for Shandong gold stock index and SH stands for Shanghai composite index.

The descriptive statistics reports in Table 1, which shows that all series have asymmetric and fat tail behavior relative to the negative skewness and high value of kurtosis. Moreover, the Jarque-Bera test is strongly rejected the normality of the unconditional distribution for all the series. In addition, Figure 1 also shows that the rates of return for all series were not normally distributed. Hence, this paper chooses the skewed-t distribution.

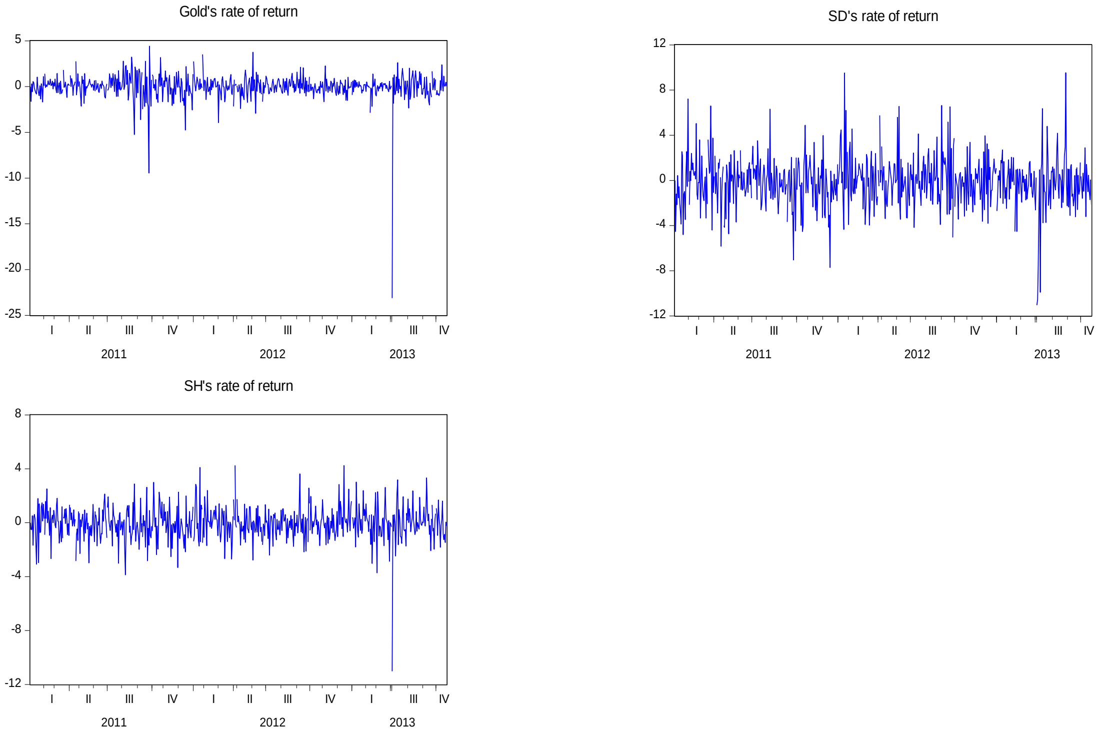

Figure1. Rate of return for Gold, SD and SH

TABLE 1. Data description and statistics

	rate of return for Gold	rate of return for SD	rate of return for SH
Mean	-0.0223	-0.1531	-0.0483
Median	0.0195	-0.0674	0.0031
Maximum	4.4220	9.5389	4.2549
Minimum	-23.1155	-11.0457	-11.0222
Std. Dev.	1.4522	2.2795	1.2439
Skewness	-7.1311	-0.0655	-0.9679
Kurtosis	110.5319	6.2406	13.2584
Jarque-Bera	296614.5	265.1679	2747.273
Probability	0.0000	0.0000	0.0000
Sum	-13.5374	-92.6722	-29.2659
Sum Sq. Dev.	1273.817	3138.697	934.6737
Observations	604	604	604

Source: computation.

TABLE 2. ADF test for the rate of return of gold, SD and SH

Exogenous: Constant, Linear Trend	t-Statistic	Prob.
Null Hypothesis: Gold has a unit root		
Augmented Dickey-Fuller test statistic	-26.4006***	0.0000
Null Hypothesis: SD has a unit root		
Augmented Dickey-Fuller test statistic	-24.3336***	0.0000
Null Hypothesis: SH has a unit root		
Augmented Dickey-Fuller test statistic	-25.12935 ***	0.0000

Note: The symbol ***denotes the rejection of the null hypothesis at the 0.001significance levels.
Source: computation.

TABLE 3. PP test for rate of return of gold, SD and SH

Exogenous: Constant, Linear Trend	Adj. t-Statistic	Prob.
Null Hypothesis: Gold has a unit root		
Phillips-Perron test statistic	-26.4006***	0.0000
Null Hypothesis: SD has a unit root		
Phillips-Perron test statistic	-24.4530***	0.0000
Null Hypothesis: SH has a unit root		
Phillips-Perron test statistic	-25.1336 ***	0.0000

Note: The symbol ***denotes the rejection of the null hypothesis at the 0.001significance levels.
Source: computation.

The data should be stationary for modeling GARCH model, so this paper applies the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test to test unit roots. Table 2 and Table 3 show the results of unit roots tests, confirming that all series are stationary.

4.2 Empirical results

4.2.1 Results for the marginal models

For the marginal distribution, the suitable distribution is ARMA (0, 1)-GARCH (1, 1) with the skewed t-distribution and ARMA (0, 1)-GJR-GARCH (1, 1) with the skewed

TABLE 4. Estimation results of the GARCH model and GJR-GARCH model

	GARCH(1,1) Skew t		GJR-GARCH(1,1) Skew t	
	Estimate	Std.error	Estimate	Std.error
Panel A: Estimation results for the SD's rate of return				
ma1	-0.0597	0.0405	-0.0653	0.039
ω	0.9179*	0.4341	1.3693	0.8425
α	0.0863*	0.0414	0.012	0.057
β	0.7419***	0.1017	0.6425**	0.1718
γ			0.1766	0.1369
λ	0.9771***	0.0539	0.9822***	0.0543
η	4.3834***	0.8605	4.575***	0.9335
Log likelihood	-1307.324		-1305.347	
Panel B: Estimation results for the SH's rate of return				
ma1	0.0162	0.0329	-0.0073	0.0354
ω	0.0013	0.0171	0.1279	0.1039
α	0.0000	0.0009	0.0000	0.0012
β	0.9989***	0.0115	0.9069***	0.072
γ			0.0191	0.0233
λ	0.9932***	0.0505	0.9877***	0.0505
η	4.2447***	0.6581	4.1296***	0.7653
Log likelihood	-941.6965		-940.8743	
Panel C: Estimation results for the Gold's rate of return				
ma1	-0.1195***	0.0348	-0.1147**	0.0353
ω	0.0472*	0.0239	0.0122	0.0125
α	0.0674	0.0346	0.0772***	0.0223
β	0.9134***	0.0342	0.9547***	0.0172
γ			-0.0686**	0.0215
λ	0.9201***	0.0516	0.9323***	0.0548
η	2.9099***	0.4197	3.2102***	0.4053
Log likelihood	-838.252		-831.1322	

Note: The symbol ***, ** and * denote the rejection of the null hypothesis at the 0.001, 0.01 and 0.05 significance levels.
Source: computation.

t-distribution, because the corresponding residuals satisfy the i.i.d assumption. From Table 4, for the distribution of all series, λ is statistically significant and less than 1, which means that the skewed-t distribution is suitable for this data set. The ARCH coefficient α is significant in Shandong gold stock with GARCH model and gold price with GJR-GARCH model. All autoregressive coefficients β are highly significant, implying that all series have long-run persistence. The leverage coefficient γ in GJR-GARCH model shows that there is leverage effect for all series. Form the value of log-likelihood, the GJR-GARCH marginal distribution has better explanatory ability than GARCH marginal distribution.

For the construction of the copula model, the goodness-of-fit test of the marginal models is crucial. If the marginal distribution models are mis-specified, the copula will be mis-specified, so the probability transformation $\hat{u}_t$ and $\hat{v}_t$ must be i.i.d uniform (0, 1). This paper uses the Box-Ljung test to examine the autocorrelation, for all variables for k=1, 2, 3, 4, $(\hat{u}_t - \bar{u})^k$ and $(\hat{v}_t - \bar{v})^k$ were regressed on 10 lags. In addition, the Kolmogorow-Smirnov test is used to test whether marginal distribution has a uniform distribution or not.

TABLE 5. Test of the marginal distribution models

GARCH	Gold		SD		SH	
	X-squared	P-value	X-squared	P-value	X-squared	P-value
Box-Ljung test of margins for autocorrelation						
First moment	8.4652	0.5835	9.1697	0.5161	11.6477	0.3093
Second moment	14.581	0.1481	5.5781	0.8494	10.6369	0.3865
Third moment	14.5288	0.1502	13.2135	0.212	6.2387	0.7948
Fourth moment	18.232	0.0511	4.2522	0.9353	7.1696	0.7093
KS test for uniform distribution						
	Statistic	P-value	Statistic	P-value	Statistic	P-value
	0.041	1	0.041	1	0.041	1
GJR-GARCH	Gold		SD		SH	
	X-squared	P-value	X-squared	P-value	X-squared	P-value
Box-Ljung test of margins for autocorrelation						
First moment	9.4408	0.4908	9.075	0.525	12.2775	0.2669
Second moment	7.6463	0.6633	7.2508	0.702	12.5109	0.2523
Third moment	15.4546	0.1163	13.5536	0.194	6.5782	0.7646
Fourth moment	13.0229	0.2224	6.3896	0.782	8.7725	0.5538
KS test for uniform distribution						
	Statistic	P-value	Statistic	P-value	Statistic	P-value
	0.041	1	0.041	1	0.041	1

Source: computation.

Table 5 reports the results of these two tests for the two marginal distribution models. Both the GARCH model and GJR-GARCH model have passed the LB and K-S test at 0.05 levels.

4.2.2 Estimating parameters of the copula model

Table 6 shows that the estimation for four copula functions based on GARCH and GJR-GARCH model. From the values of AIC and BIC, both in the copula-GARCH model and the copula-GJR-GARCH model, the Clayton copula is the best model to explain the dependence structure for all series, implying that they have low tail dependence;

TABLE 6: The results for Copula-GARCH and Copula-GJR-GARCH model

	Copula-GARCH			Copula-GJR-GARCH		
	Gold-SD	Gold-SH	SD-SH	Gold-SD	Gold-SH	SD-SH
Panel A: Estimation of Gaussian copula						
ρ	0.5829	0.1201	0.5426	0.5804	0.1239	0.5354
	(0.0232)	(0.0398)	(0.0252)	(0.0233)	(0.0398)	(0.0256)
Ln(L)	6.8400	6.4204	6.7867	6.8357	6.4216	6.7689
AIC	-11.6800	-10.8408	-11.5734	-11.6714	-10.8432	-11.5378
BIC	-7.2764	-6.4372	-7.1699	-7.2678	-6.4397	-7.1343
Panel B: Estimation of Student-t copula						
ρ	0.5835	0.1375	0.5606	0.5814	0.1442	0.5543
	(0.0242)	(0.0437)	(0.0288)	(0.0244)	(0.0438)	(0.0289)
ν	25.4947	7.0166	5.8146	24.1566	6.4657	6.1313
	(27.8860)	(2.2850)	(1.5188)	(25.2066)	(1.9690)	(1.6611)
Ln(L)	6.8686	6.4713	6.9206	6.8670	6.4813	6.8969
AIC	-9.7372	-8.9426	-9.8412	-9.7340	-8.9626	-9.7938
BIC	-0.9301	-0.1355	-1.0342	-0.9270	-0.1554	-0.9866
Panel C: Estimation of Clayton copula						
θ	0.9564	0.1975	0.8872	0.9570	0.2006	0.8521
	(0.0779)	(0.0536)	(0.0771)	(0.0781)	(0.0539)	(0.0759)
Ln(L)	7.1131	6.4707	6.9847	7.1295	6.4729	6.9493
AIC	-12.2262	-10.9414	-11.9694	-12.2590	-10.9458	-11.8986
BIC	-7.8227	-6.5379	-7.5658	-7.8554	-6.5423	-7.4951
Panel D: Estimation of Gumbel copula						
θ	1.5571	1.0649	1.5402	1.5544	1.0737	1.5301
	(0.0497)	(0.0309)	(0.0495)	(0.0496)	(0.0311)	(0.0491)
Ln(L)	6.7672	6.4129	6.8018	6.7576	6.4160	6.8012
AIC	-11.5344	-10.8258	-11.6036	-11.5152	-10.8320	-11.6024
BIC	-7.1309	-6.4223	-7.2001	-7.11181	-6.4285	-7.1989

Note: This table reports the ML estimates of two types of copula-GARCH models and the standard errors in the brackets.
Source: computation.

while the Student-t copula has the worst performance. Between the Gold and SD, the degree of freedom of the Student-t copula is very large, so the Student-t copula will converge to the normal copula.

For all series, the parameters are positive. Comparing Gold and SD, SD and SH, the dependence parameter of Gold and SH is much smaller in all copula functions, implying that the return of gold Au9999 and the return of Shanghai composite index have much higher dependence with Shandong gold stock's return, but the return of gold Au9999 and the return of Shanghai composite index have a smaller dependence. Moreover, the return of Shandong gold stock is widely considered to be more related to the changes in the return of gold prices (gold Au9999) than the return of general stock market (Shanghai composite index), which is same with the general idea.

5. Conclusions

This paper proposes two classes of copula-GARCH models (copula-GARCH model and copula-GJR-GARCH model) to analyze the dependence among the returns of gold Au9999, Shandong gold stock index and Shanghai composite index in China. The empirical results show that the model with the GJR-GARCH-skew-t distribution has better explanatory ability than the GARCH distribution. Moreover, we uses different copula functions, including the Gaussian, Student-t, Clayton and Gumbel copula to analyze the joint distribution of gold price (gold Au9999), Shandong gold stock index and Shanghai composite index returns. We find that the Clayton copula has the highest explanatory ability of the dependence structure than other copula functions, while the Student-t copula has the worst performance. The parameters of all copula functions are positive. The return of gold Au9999 and the return of Shanghai composite index have much higher dependence with Shandong gold stock's return, but the return of gold Au9999 and the return of Shanghai composite index have a smaller correlation. Moreover, Shandong gold stock's return is widely considered to be more related to the changes in the return of gold price (gold Au9999) than the return of general stock market (Shanghai composite index), which is same with the general idea.

The distinction is helpful for both portfolio managers with gold and gold mining companies' stock in their portfolios and for the designers of policy, giving that gold mining companies' stock has high correlation with gold price and stock market index. When the gold price rises, gold mining stocks can use to be an investment choice.

This paper has a contrary conclusion is that the return of gold price has positive correlation with the return of the general stock market, which is different with many literatures (gold price has negative correlation with general stock market returns). The reason is that China is a relatively independent economy, the transfer of funds is received relatively strict supervision by the government, and there is a limited amount of financial products that can be invested in the market. Gold market is staying in the initial development stage, the function of gold for a hedge or safe haven is not very obvious in China. Therefore, China's government should continually develop the gold market.

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