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The Dynamic Relationship between Gold and Silver Futures Markets Based onCopula-AR-GJR-GARCH Model

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Abstract

We employed AR (1)-GJR-GARCH (1, 1) and three widely used copula functions to examine the dynamic relationship of gold and silver futures in the TOCOM (Japan) and COMEX (US) markets before and during uptrend.The results show both spillover and contagion effects by one lag on return, as well as significant volatility between the gold and silver futures markets in TOCOM and COMEX before and during uptrend. Furthermore, the responses to bullish and bearish news are asymmetrical for both gold and silver futures in COMEX and TOCOM. Among three copula functions, the Clayton Copula model fit all the return series best both before and during uptrend. The Kendall's tau of the Clayton copula shows low (high) correlation between two commodity futures in two markets; this result is verified by low (high) average return of two the commodities across markets before (during) uptrend. No matter before or during uptrend, the correlation of silver is higher than gold in TOCOM markets, which means that silver returns are higher than gold in both markets during this period.

Keywords: GARCH, Copula function, Spillover effect, Contagion effect, Kendall's tau
JEL Classification Codes: G20, C12, C13

1. Introduction

Since its lowest level at $262 in 2001, to its recent high at $1380 in Oct., 2010, the price of gold have risen more than five times. Meanwhile the silver future price has risen more than six times from $3.5 in 1991 to the recent high at $24.65 in Oct., 2010. The dramatic rise in price of both metals is due to a variety of reasons including, inflation expectations, the economic crisis, international instability, and the increasing demand for gold from emerging markets. Therefore, the gold and silver futures markets attract the attention of many investors. Historically, gold and silver have been treated as close substitutes for one another, both being precious metals that can be used to support currencies, and both having been used as currencies. There is significant evidence that these metals can play a useful role in diversifying risk, and can be an appealing investment in their own title (Shishko, 1997; Money et al.,