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Does REIT index hedge inflation risk? New evidence from the tail quantile dependences of the Markov-switching GRG copula

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ABSTRACT

This paper explores tail quantile dependences between the inflation rate and the real estate investment trust (REIT) return by utilizing the Markov-switching GRG copula. Empirical results show that the dependence between inflation rate and REIT return is mixed, implying that the inflation-hedging ability of REIT index is not fixed. The REIT index is not a hedge against inflation risk during the period of negative dependence; on the contrary, the REIT index has a partially inflation hedging ability during the period of positive dependence. Furthermore, the intensity for the dependence in non-extreme cases is different from that in very extreme cases.

1. Introduction

The central bank attaches a great deal of importance to price stability due to the crucial role of price level in affecting economic activities, banking and financial environments and investment decisions. It is well known that a surge in price level will lead to weakness in economic activity and cause deterioration in the banking and financial markets. The real value of holding money is seriously reduced when the price level rises considerably. To keep portfolio gains at a reasonable level without erosion by inflation, investors will attempt to increase the portfolio positions of inflation-hedging assets and reduce the portfolio weight of money component. However, before implementing a profitable portfolio strategy, the financial assets which will keep real value against inflation risk must be found. Although REIT (real estate investment trust) index is the financial asset often mentioned in the existing literature, its capability for hedging inflation risk is ambiguous. The purpose of this paper is to investigate the positive and negative dependences between inflation rate and REIT return at different quantiles, including very extreme, extreme and normal circumstances, to explore whether the magnitude of quantile dependence measures shows distinct patterns.

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The theoretical literature reveals that the relationship between aggregate price levels and financial asset prices has been investigated for many decades. Previous literature provides explanations for positive and negative linkages.[1] Recently, Hardin, Jiang, and Wu (2012) have developed a theoretical framework which provides a reasonable explanation for the ambiguous findings. They argue that inflation illusion and hedging effect are the two predominant factors in determining the relationship between REIT return and inflation rate. The hedging effect suggests that the REIT return needs to be increased to compensate investors for the loss of real purchasing power when the inflation rate increases. This effect reveals a positive inflation-return relationship. The negative relationship can be attributed to the inflation illusion, which is related to an incorrect perception of the true price level. The relationship between inflation rate and REIT return heavily depends on the relative intensity of the above two opposite effects. If the hedging effect surpasses the inflation illusion, then the inflation-REIT return relationship is positive; otherwise, the relationship is negative.

Many empirical studies have explored whether financial assets can preserve their real revenue when price levels rise. Unfortunately, these studies have not been conclusive. Most empirical studies investigated the inflation-hedging effect by utilizing a linear regression model and/or the impulse response functions of a vector autoregression (VAR) model. The fixed-coefficient framework and the symmetric relationship are the two main limitations of the above two approaches. Moerman and van Dijk (2010) empirically studied the impact of inflation risk on excess returns of stocks for the G5 countries. They determined that the response of stock return to inflation risk is time-varying and the inflation premiums show positive and/or negative patterns. Hess and Lee (1999) showed that no invariant relationship between US inflation rate and stock return is evident. Therefore, the non-fixed-effect framework needs to be considered when determining the inflation-return relationship.

The level of inflation rate provides distinct messages. Consequently, it affects the performance of financial assets in hedging against inflation risk. For example, Hoesli, Macgregor, Matysiak, and Nanthakumaran (1997) investigated whether UK real estate could serve as an inflation-hedging instrument. They confirmed that UK real estate provides little hedging ability when the inflation rate is low, and the hedging ability disappears when the inflation rate is high. Barnes, Boyd, and Smith (1999) examined the inflation-stock return relationship for 25 countries and testified that the countries with high inflation show positive relationships while there are no clear relationships for countries with low and medium inflation. In addition, the response of asset return to a positive inflation shock is not the same as that for a negative inflation shock. Lee (2010) observed that stock returns respond negatively to positive inflation but positively to negative inflation. Hong and Lee (2013) found similar results for REIT markets. On the other hand, Knif, Kolari, and Pynnonen (2008) found that the effects of positive and negative inflation rates relate to economic conditions. Simpson, Ramchander, and Webb (2007) corroborated that monetary policy stances determine magnitude of positive and negative inflation rates. Hence, discordant evidence can arise from ignorance of asymmetric effects.

In order to take the insufficiency of fixed-coefficient and symmetric frameworks into account, this paper develops a Markov-switching GRG copula, which combines the regime-switching structure and the mixture distribution of a Gumbel copula and a 90 degree counterclockwise rotated Gumbel copula, to analyze the mixture of positive and negative inflation-return relationships.[2] In contrast to the above mentioned regression frameworks which mainly focus on lead-lag behaviors, the nature of Markov-switching GRG copula measures instantaneous correlations not only in the very extreme tail but also in each quantile.[3] Moreover, a two-state Markov chain process with fixed transition probabilities is imposed to allow non-constancy in the parameters of GRG copula to occur.

As introduced by Zhang (2008), the upper-upper tail dependence coefficient evaluates the positive dependence between two variables moving in the same direction and the lower-upper tail dependence measure analyzes the negative dependence of two variables moving in opposite directions. Because of the mixture of upper-upper tail dependence and lower-upper tail dependence provided by the Markov-switching GRG copula, the Markov-switching GRG copula can capture the positive relationship and negative relationship. Moreover, this paper allows the Markov-switching GRG copula to behave asymmetrically in the tail dependences. In summary, allowing the relationship between two variables to have asymmetric positive co-movements in some periods and negative co-movements in others is one of the main advantages of the Markov-switching GRG copula.

Another compelling reason for Markov-switching tail dependence parameters is that they can investigate whether the magnitude of inflation-return relationship is state-varying in different quantiles. We can analyze whether or not the dependence for any given quantile differs between states in this specification. In doing so, not only the dependence between infla-

[1] For example, the Fisher equation supports the positive relationship (Fisher, 1930). The negative relationship is supported by the proxy hypothesis of Fama (1981), the inflation illusion hypothesis of Modigliani and Cohn (1979), the tax-system hypothesis of Feldstein (1980) and the inflation variability hypothesis of Hendershott (1981). See Alagidede and Panagiotidis (2010) and Hong and Lee (2013) for a review of a large body of the theoretical literature.

[2] The Markov-switching copula model has been utilized by Chollete, Heinen, and Valdesogo (2009), Garcia and Tsafack (2011) and Silva Filho, Ziegelmann, and Dueker (2012) to discuss the dependence between international assets. Chollete et al. (2009) and Garcia and Tsafack (2011) suppose that there are two different regimes: one regime is symmetric and the other is asymmetric. The symmetric regime is captured by the normal copula in both papers. The asymmetric regime is characterized by a canonical vine copula composed of symmetric and asymmetric copulas in Chollete et al. (2009) and by a mixture copula, which is made of survival Gumbel copulas, in Garcia and Tsafack (2011). Silva Filho et al. (2012) use a Markov-switching symmetrized Joe-Clayton (SJC) copula to measure the dependence between international stock markets.

[3] Although Hondroyiannis and Papapetrou (2006) adopted the Markov-switching VAR model to analyze the relationship between inflation and stock return, their specification encountered two difficulties. One is related to ignorance of the nonlinear correlation. The other is that their model cannot discuss the relative effects of large and small inflation rates on stock returns.