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Price and volatility dynamics between securitized real estate spot and futures markets

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ABSTRACT

This study is among the first to examine the price, volatility and covariance dynamics between securitized real estate spot and futures markets. It provides a distinctive and yet complementary perspective on the predictability of real estate spot return and spot volatility based on the information from the spot market alone. The results show that for the EPRA/NAREIT Europe index, the spot market tends to lead its futures market in the long run during the sample period, which can be attributed to a rather illiquid real estate futures market in sharp contrast with a voluminous spot market. Furthermore, we find the V-shaped asymmetric effect of the basis on the futures market volatility, which represents the primary channel of strong volatility transmission between securitized real estate spot and futures markets during the whole sample and the post-crisis period. This sheds light on the hedging effectiveness for the REIT index.

1. Introduction

The important role of futures market in the price discovery process has received considerable attention in the literature. In a static sense, the price discovery implies the existence of equilibrium prices, while in a dynamic sense, the price discovery process describes how price information is produced and transmitted across related markets. The notion of cointegration and related error correction models has been widely used to incorporate the nonstationarity of asset prices while investigating the price discovery in futures markets (e.g., Brenner and Kroner, 1995; Kavussano et al., 2008; Uhrig-Homburg and Wagner, 2009; Yang et al., 2001). In addition to such price information transmission, another important issue is the volatility transmission between futures markets and underlying spot markets. Ross (1989) points out that price volatility is directly related to the rate of information flow. Hence, proponents of futures trading might expect more pronounced volatility spillover from futures to spot markets as evidence for more informationally efficient futures markets. By contrast, opponents of futures trading could interpret this spillover as evidence that speculative futures trading unduly influences underlying spot prices and causes excessive spot market volatility (e.g., Zhong et al., 2004).

This study explores the price discovery process and information transmission channels in the real estate market through a comprehensive analysis of the price, volatility and covariance dynamics between securitized real estate spot and futures markets. The study contributes to the literature in the following aspects. First, to the best of our knowledge, this study is among the first to examine the dynamic relationships between securitized real estate spot and futures markets. Although real estate is a major capital asset in the world, with the size of the capitalization larger than that of either the common stock or bond markets, real estate futures have a relatively short history.[2] For example, S&P/Case-Shiller home price index futures contracts were introduced in May 2006 and IPD UK property index futures were introduced in February 2009. These futures are all related to housing price indices and only monthly spot market data are available. In addition, these futures

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[2] For comprehensive reviews of real estate derivatives, see Fabozzi et al. (2010).

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exhibit little daily price variations, implying their low liquidity. In this study, we focus on a major securitized real estate futures based on the EPRA/NAREIT Europe Index ("EPRA" hereafter). Compared to the housing price index futures, the securitized real estate index futures market is relatively more liquid and volatile, and importantly, daily underlying spot market data are readily available.[3] 6Hence, this allows us to directly examine price discovery and volatility transmission between real estate spot and futures market, which remains largely unexplored in the literature. A related work is done by Wong et al. (2007), which focuses on the return and volatility transmission between the over-the-counter real estate forward (pre-sale) market and the spot market in Hong Kong. Finally, an examination of price and volatility dynamics between real estate spot and futures markets provides a distinctive and yet complementary perspective on the predictability of real estate spot return and spot volatility based on the information from the spot market alone.

Second, we apply a relatively new bivariate asymmetric ECM-GARCH-BEKK model (Yang et al., 2012) to simultaneously incorporate both the volatility spillover between real estate spot and futures markets and the asymmetric basis effects on returns, volatilities and covariances. As discussed in Yang et al. (2012), the model is motivated by the theoretical argument of Kogan et al. (2009) that the asymmetric basis effect on futures volatility is positive (negative) when the basis is positive (negative). It also extends the GARCH-X model specification which allows for investigating the asymmetric basis effect (e.g., Kavussano et al., 2008). The model sheds light on the hedging effectiveness for the REIT index, as discussed in Liang et al. (1998). Noteworthy, we find that such asymmetric basis effect represents the only channel of volatility transmission between securitized real estate spot and futures markets during both the whole sample and the post-crisis period, suggesting the potential model misspecification in previous studies.

Third, we utilize a recursive cointegration technique developed by Hansen and Johansen (1999) to examine the time-varying price discovery performance, which is particularly revealing for nascent real estate futures markets. There are at least two empirical issues in modeling the price discovery process of the futures market in the literature. The first issue is the ambiguity about the length of time an emerging futures market would take to function well in its price discovery process, where Uhrig-Homburg and Wagner (2009) show that it could span from a few months to several years.[4] The second issue is existence of a potential structural break in the sample period due to the recent 2007–2008 global financial crisis. The recursive cointegration analysis allows us to address two issues directly.

The rest of this paper is organized as follows. Section 2 describes the data and Section 3 discusses the empirical methodology. Section 4 presents empirical findings, and finally, Section 5 concludes.

2. Data descriptions

The EPRA/NAREIT Global Real Estate indices are jointly developed and published by the European Real Estate Association (EPRA) and National Association of Real Estate Investment Trusts (NAREIT). These indices are constructed on a consistent basis across countries from the share prices of companies with greater than $US200 million listed capitalization that derive at least 60% of their income from property investment related activities. The aim of these new indices is to reflect property investment which is primarily for the purposes of obtaining income, while companies engaged in construction and similar activities are excluded. The EPRA/NAREIT Global Real Estate Indices represent general trends in all eligible real estate stocks worldwide and act as a benchmark for reference in the financial markets.

The EPRA index developed by the EPRA/NAREIT is considered a benchmark for European real estate listed investments. It combines the benefits of a good proxy for real estate with the advantage of equity markets liquidity. The EPRA index includes around 100 stocks of real estate companies from 15 European countries. On October 1st 2007, the EPRA index futures was introduced, with quarterly maturities (March, June, September, and December) and the expiration day is the third Friday of the expiry month. The futures contracts are traded on the Paris derivatives market via LIFFE CONNECT, with liquidity supported by market makers to provide continuous on-screen prices.

From Bloomberg, we collect daily futures prices and their underlying price indexes, which are (almost) synchronously traded in Europe.[5] The sample period is from October 1st, 2007, to March 31st, 2011. Given their liquidity, the continuous nearby futures price series are constructed as follows. First, the nearby futures contract, which is a contract with the nearest active trading delivery month to the day of trading, is specified. Prices for the nearby futures contract are used until the contract reaches 10 days (excluding weekends) prior to the expiration date. Subsequently, prices for the next nearby contract are used. The returns of each price series are computed as the changes in the natural logarithms of prices. Given each pair of futures and spot price series, the daily basis series is calculated as the difference between these two series.

To incorporate the impact of the recent financial crisis, we divide the sample into two sub-samples: the crisis period and the post-crisis period. The potential structural break point is set at June 30, 2009, which was the ending date of US latest recession announced by National Bureau of Economic Research (NBER). Although such division of subperiods appears to be somewhat ad hoc, the extremely high synchronicity of international stock movements between the US and the Europe during this particular sample period tends to suggest that such division is reasonable. Not only the US market but also all major European stock markets recovered gradually from the crash since June 30, 2009.[6]

The summary statistics of the spot and futures returns and their bases are presented in Table 1. In the whole sample, spot and futures returns are negative, which can be attributed to the

[3] Although daily trading volume information for the S&P/Case-Shiller home price index futures is mostly missing from Bloomberg, a few numbers available show that they are typically less than 10 contracts per day. By contrast, the EPRA futures trading volumes are often more than 100 or even 1000 contracts per day, with the average of 236 contracts per day during the sample period (with the days of missing data skipped). There is another futures based on the EPRA/NAREIT Euro Zone Index ("EPEU" hereafter), which was introduced to the market on the same day as the EPRA futures. But the EPEU futures trading volume is on average 98 contracts per day during the sample period (with the days of missing data skipped). The EPEU spot market trading volume is about 22% of that for the EPRA index during the sample period. Obviously, the EPEU spot and futures markets are much less liquid than the EPRA spot and futures markets. The preliminary analysis shows that the main result still generally holds for the EPEU case, although there is also evidence for a highly instable relationship between the EPEU spot and futures markets.

[4] In some cases where a futures market is so illiquid that it is much less actively traded than the underlying spot market, the price discovery function of such a futures market might not ever be established, as the spot market tends to lead the futures market. Nevertheless, it is an open question to empirically determine how illiquid a futures market should be so that it might not perform the price discovery function.

[5] As the underlying price index is not directly tradable but rather compiled at the end of each trading day, there might be to some degree the non-synchronous trading problem. This is due to the possibility that some component real estate stocks of the index might not have any trade during a trading day and thus the stale price would be used to construct the index. Nevertheless, as the index only includes large real estate stocks that can be expected to have generally rather active trading, such non-synchronous trading problem might not be a serious issue. Of course, it deserves further investigation when the data of higher frequency are available.

[6] Note that the choice of June 30, 2009 as the structural break date is also generally in line with Figs. 1 and 2 (to be discussed below), where a stable long-run cointegration relationship emerges only after March 2009. Obviously, the determination of potential structural break in the cointegration relationship should be most relevant and important when modeling multiple nonstationary time series, which applies in this study.