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# Do commodities effectively hedge real estate risk? A multi-scale asymmetric DCC approach

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ABSTRACT

We examine the hedging performance of commodities futures for US real estate portfolios in a multi-scale setting. Dynamic asymmetric conditional correlations and thereafter optimal hedge ratios of real estate stock returns with commodities index, gold, oil and bond returns are estimated to examine hedge effectiveness under heterogeneous market expectations. Rolling window based out-of-sample one-step-ahead forecasts show that commodities index (gold) provide the best hedge to US real estate stocks for short-term (long-term) investments. The results are robust to the choice of model refits and rolling window sizes and provide useful implications for alternate markets' investors.

## 1. Introduction

Real estate markets around the world, and particularly in the U.S and Europe, experienced rapid globalization and internationalization due to the development of real estate securities instruments. These markets have had immediate success and have extended the range of investment and risk management strategies available to investors (Hobbs et al., 2007; Bardhan and Kroll, 2007; Eichholtz and Nils, 2007; Zhou, 2016). Real estate stocks are viewed as a combination of consumption and leveraged investment (Shiller, 1993; Goodman and Fabozzi, 2005), for which optimists use debt leverage to enhance the return on their risky housing investment, and, in hostile periods, when returns are low, they risk their consumption in futures, similar to the commodities markets, where the underlying assets are the consumption assets. However, pessimists, who avoid risky housing investments, opt for smoother consumption plans to always consume (Wang and Zhang, 2014). Hence, the risk drivers in the real estate markets, e.g., default clustering and timing, recovery rates and prepayment, effect the financial stability of institutions and companies (Fabozzi et al., 2010), and hedging the potential risk associated with a real estate investment is not an easy task due to the lack of availability of hedging instruments in this market (Chiang et al., 2015).

Fluctuations in property prices were triggered by the massive declines in house prices after the collapse of the housing bubble since the beginning of 2007, leading to mortgage delinquencies and a devaluation of housing related securities (Reinhart and Rogoff, 2008). These consequences were not restricted to the real estate market and were also transmitted to other financial markets throughout the world and became the subprime mortgage crisis (Guidolin and Timmermann, 2007; Hinkelmann and Swidler, 2008). The issues of co-integration between global markets and real-estate markets have both practical and theoretical importance for investors, e.g., the understanding of global systematic risk can play an important role in pricing real estate securities. Increasing international collaboration between financial regulators can significantly decrease the contagion risk. If the contagion risk is addressed, the domestic real estate markets may be able to be more resilient to global shocks (Hatemi-J et al., 2014). The subprime mortgage crisis, coincided with the U.S. recession (2007–09), had posed a greater risk to financial stability around the world (Bekiros et al., 2015; Choi, 2013). Strong linkages were witnessed among different assets and real estate market securities during the global finance crisis (Moscone et al., 2014).

On the other hand hedging stock prices through commodities got considerable attention in the literature for the past couple of decades. It

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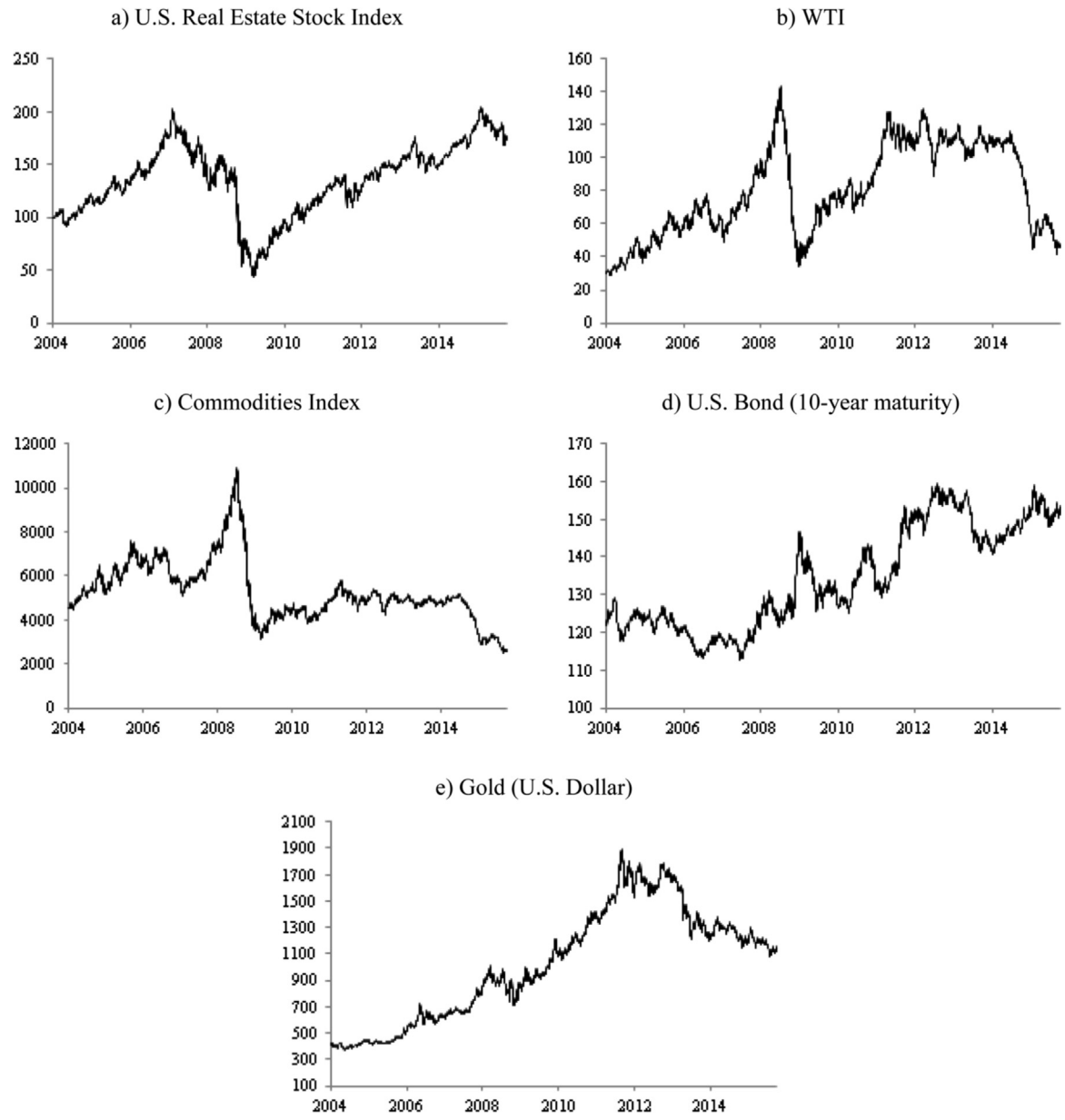


**Fig. 1.** Time trend of series over sample period.

is worth arguing that the correlation between assets is the primary factor when deciding which hedging instruments will provide the best and most effective hedge (Berger and Uddin, 2016). Commodities are emerging as an alternative asset class (Daskalaki and Skiadopoulos, 2011), and futures on commodities have more diversification effects on conventional portfolios because of their low correlation with stock and benchmark bonds indices (Bekiros et al., 2016; Füss et al., 2010). These features encourage investors to choose commodities as a financial protector in times of market stress (Silvennoinen and Thorp, 2013). However, studies have found that the usefulness of gold as an investment asset is far greater than its traditional use, e.g., jewelry and ornaments (Capie et al., 2005; Baur and Lucey, 2010).

Assessing the time-varying relation between commodities, benchmark bonds and stock indices is an important debate since most previous studies have employed the GARCH (generalized autoregressive conditional heteroskedasticity), VARMA-GARCH (Ling and McAleer, 2003) and dynamic conditional correlation (Engle, 2002) to model the volatility and conditional correlations between assets. Thus, we utilize the multivariate asymmetric dynamic conditional correlation – generalized auto-regressive conditional heteroskedasticity (ADCC-GARCH) model proposed by Cappiello et al. (2006) to construct one-step-ahead conditional correlations and, thereafter, optimal hedge ratios of U.S. real estate stock returns with oil, commodity, gold and bonds returns.

It is well known that the real estate stock markets, commodities and bond markets are complex systems comprising a multitude of heterogeneous agents. These agents operate over different time horizons (from minutes to years) and, therefore, collectively determine the aggregate market behavior (Andreasson et al., 2016). The expectations, trading strategies, risk profiles and informational sets of these market participants also differ. Accordingly, it is reasonable to assume that co-movement and thereafter the hedge effectiveness of different assets vary across time scales associated with different investment horizons