



## Common factors in international securitized real estate markets

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### ARTICLE INFO

Available online 21 July 2008

#### Keywords:

Securitized real estate markets  
Common factors  
Correlation structure  
Globalization of financial markets  
Canonical correlation analysis  
Macroeconomy

### ABSTRACT

This study investigates the presence of common factors in the securitized real estate markets of the United States (US), United Kingdom (UK), Hong Kong (HK), and Singapore (SG). Using a combination of factor analysis and canonical correlation analysis on 10-year monthly return data for 142 real estate securities in the four markets, more common risk factors among real estate securities within a country than across countries are detected. In addition, there is at least one common securitized real estate market factor that is moderately correlated with the world real estate market, and to a lesser extent, with the world stock market. However, the degree of linkage across the four securitized real estate markets is much weaker than the strong linkages present across the four economies. It further appears that the extent to which correlations are found in international securitized real estate markets might largely be due to the increasing integrated nature of the world real economy, rather than a result of the globalization of financial markets. The results are preliminary, but indicative, and suggest that more studies exploring how common factors, together with the local market portfolio, could help explain the return-generating process of securitized real estate.

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### 1. Introduction

The correlation structure of international stock returns has received considerable attention from portfolio managers and academics as major international stock markets have experienced rapid deregulation and integration in recent years. Whilst some earlier stock market studies (e.g. Granger & Morgenstern, 1970) have indicated that the correlations among the returns of national stock markets are low and consequently their capital markets are less integrated, others such as Agmon (1972) have shown that there exists a significant relationship among his sample of four major stock markets. Similarly, international investors and global managers might also suspect that the returns of some major securitized (public) real estate markets such as the USA, UK, Hong Kong (HK) and Singapore (SG) are closely correlated. This is because real estate is a major capital asset that is comparable to the capitalization of the common stock or bond markets (Newell, Liow, Ooi, & Zhu, 2005).<sup>2</sup> With recent studies, such

as Conover, Friday and Sirmans (2002) and Steinert and Crowe (2001), highlighting the diversification benefits from international real estate in a mixed-asset portfolio, considerable attention has been given to various aspects of securitized real estate performance and their long-run equilibrium relationships and short-term linkages using co-integration and causality methodologies using aggregate real estate security indexes at the country level.

Using monthly data of 142 firms from the four major securitized real estate markets of the US, UK, HK and SG from 1993–2003, this study makes at least two important contributions to the extant literature. The local factors for the individual countries are first estimated; the extent to which these factors are shared by the four countries in the macroeconomic context are investigated. The extent of correlation between any common risk factors and a world wealth portfolio using four world stock and world real estate market proxies is also tested to interpret the nature of the common factor(s). Overall, the results of this study would indicate whether there is presence of at least a world-wide factor in international securitized real estate returns, as well as the effect of country specific risk factors on real estate returns. The approaches and results generated from this study thus complement those of Ling and Naranjio (2002), Hamelink and Hoesli (2004) and Liow, Ooi, and Gong (2005) in international real estate market pricing.

In addition, the results of this study should also prove useful to international property investors and even policy makers who might be interested in understanding how changes in some local and foreign macroeconomic variables could impact securitized real estate returns. For example, a significant relationship between the US economy and the performance of the securitized real estate markets of the UK, HK

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<sup>2</sup> An investment in real estate can be made either directly, by acquiring the physical asset in the private real estate market, or indirectly, by purchasing shares of a company holding real estate in the public real estate market. There are two common types of indirect (or securitized) real estate investment vehicles available to investors. The first type is Real Estate Investment Trusts (REITs) in the US and Australia with its dramatic growth since the beginning 2000s in some Asian countries such as Japan, Singapore, Korea and Hong Kong further enhancing the status and influence of the public (securitized) market. The second type of public real estate investment, popularly known in countries such as the United Kingdom, Hong Kong and Singapore, consists of shares of property companies quoted on a stock market.

and SG might be expected, given the US-centric nature of the global economy. One might also expect the degree of correlation between the different securitized real estate markets to be different, due to the varying extent of integration with the world economy or a result of globalization of financial markets. Although it is beyond the objective of this study to further investigate this issue, the results should provide some preliminary, but indicative, evidence on significant relationships in international securitized real estate markets.

In order to establish a background for this study, Section 2 provides a brief review of relevant literature. This is followed by the research methodology and data in Sections 3 and 4. The empirical results are then reported and discussed in Section 5. Section 6 concludes the study.

## 2. Literature review

The research literature on macroeconomic forces, stock markets and international stock market integration provide a suitable empirical foundation regarding possible relationships in international securitized real estate markets. In addition, the Arbitrage Pricing Theory (APT) of Ross (1976) suggests that there is more than one source of common covariation among asset market returns from the viewpoint of an international investor.

In general, earlier studies examining the relationship between national stock markets reveal that the correlations among the returns of national stock markets are low and that national factors play an important role in the return generating process. These studies use a single risk factor as a proxy for the market portfolio in the Capital Asset Pricing Model (CAPM). For examples, Errunza and Losq (1985) find limited integration for his 9 less developed countries with this approach; Jorion and Schwartz (1986) reject the integration of the US and Canadian capital markets. On the contrary, Cheng (1998) shows that the US and UK economies are closely related. His results also indicate that the returns of UK stocks are significantly positively related to those of the US and that the co-movements between the UK and the US stocks are fairly high. With increasing globalization of financial markets, Huang and Satchell (1999) observe that domestic investors have become more sensitive to the world economic situation, the state of development in the financial markets and the behavior of international investors. Furthermore, globalization in financial markets has possibly resulted in considerable exposure of European and American markets to significant price movements in Asian markets. Recent studies have included Asia-Pacific markets where Hui (2005) investigates the systematic covariation and intertemporal stability of share prices for Asia-Pacific and the US markets using factor analysis. Illueca and Lafuente (2002) evaluate the nature of stock market integration by analyzing the characteristics of factor structure of returns and volatilities. Their factor analytic results suggest that the casual transmission among international stock markets is more intense in terms of volatility. With monthly realized moments for stock market returns, Morana and Beltratti (in press) assess the existence of linkages across the stock markets of the US, the UK, Germany and Japan with monthly realized moments for stock market returns using factor analysis. A single dominant factor was found for the prices and returns of the four stock markets over the period 1973–2004.

In a different vein, the significance of economic fundamentals using the APT on stock market returns has been well documented. Here, the main objective is to identify possible local and global macroeconomic factors that affect local stock markets. Financial economists usually focus upon systematic factors to explain general stock market returns. Their studies have led them to believe that stock prices move accordingly to 'surprises' in macroeconomic factors that explain general stock price movements. In the spirit of APT, many empirical studies employing multi-factor models such as Beenstock and Chan (1988), Clare and Thomas (1994) and Cheng (1995) have attempted the theoretical question of "which economic factors have significant effects on asset prices". However, these asset pricing models do not dictate the number and the identities of these factors,

even if the central theme is that a few pervasive factors are the dominant sources of co-variance among asset returns.

So far, three approaches have been used to empirically investigate possible common factors that might affect common stock returns within individual countries. The first approach gathers a general pool of common factors before they are eventually narrowed down. The disadvantage to this approach is that the nature of the underlying factors driving asset pricing cannot be determined. This approach relies on factor analysis techniques to simultaneously estimate the common factors and factor loadings which might affect security returns (Roll & Ross, 1980). For examples, Titman and Warga (1986) link factors derived from NYSE and AMEX stocks to returns of REITs. The second approach specifies beforehand, common factors which might affect security returns. For example, Chen, Roll and Ross (1986) group US stocks into size sorted portfolios and find that economic factors that are significantly priced in the general stock market include; the changing state of the economy, inflation, yield curve shifts and a measure of the market risk premium. Clare and Thomas (1994), using beta sorted portfolios, find that a number of factors were priced in the UK stock markets; they are: oil prices, two measures of corporate default—"market risk", UK private sector bank lending, the retail price index, the current account balance, and the redemption yield on an index of UK corporate debentures and loans. Beenstock and Chan (1988), however, identify a different set of factors to explain variation in the UK stock returns—interest rates, money supply and two inflation measures.<sup>3</sup> The third empirical approach relies on a combination of factor analysis and canonical correlation in different ways. The main question to be addressed under this line of APT research is "if there are multiple factors affecting security returns, what might they be?" Fogler, John and Tipton (1981), McGowan and Dobson (1993), Christofi, Christofi and Philippatos (1993) and Cheng (1995) apply these techniques and are able to establish a significant statistical and economic relationship between stock market returns and macroeconomic factors. Cheng (1998) employs the factor analytic technique and canonical correlation analysis to examine the international transmission mechanism of the UK and US stock market movements and the relationship between the UK and the US economic indicators. More recent research on the effects of macroeconomic variables on stock market prices and returns include Cheung and Ng (1998), Aylward and Glen (2000), Hondroyannis and Papapetrou (2001), Fifield, Power and Sinclair (2002), Wongbangpo and Sharma (2002) and Erdem, Arslan, Erdem (2005).

With the growth of international investing opportunities in securitized real estate vehicles, such as REITs and public real estate stocks, considerable attention has also been given to the role of real estate stock in an investment environment (Worzala & Sirmans, 2003). Empirically, Garvey, Santry, Stevenson (2001) examine the linkage between real estate stock markets in Australia, Hong Kong, Japan and Singapore using co-integration and Granger causality techniques, while Stevenson (2002) investigates volatility spillover effects in USA REITs and other equity and fixed income sectors. Ling and Naranjo (2002) find evidence of a strong world-wide factor in international securitized real estate returns. Moreover, an orthogonalized country-specific factor is also highly significant. Hence real estate securities may provide international diversification opportunities. Bond, Karolyi and Sanders (2003) also find evidence of a strong global market risk component, measured relative to the MSCI world index. Hamelink and Hoesli (2004) use constrained cross-sectional regressions to disentangle the effects of various factors on international real estate stock returns. They find that country factors are the dominant factor and size has a negative impact on returns. Finally, Liow et al. (2005) uses a combination of co-integration and GARCH

<sup>3</sup> Similar securitized real estate market studies relate mainly to the USA REIT markets. See for examples, McCue and Kling (1994), Ling and Naranjo (1997) and Mei and Hui (2000).

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