Research Project: Switching Volatility and Dynamic Interdependence in International Securitized Real Estate Markets

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This research aims to investigate the interdependence between major securitized real estate markets (Table 1) and assess a more efficient investment strategy on international portfolio diversification from a regime-switching volatility perspective. Previous researches have acknowledged the importance of securitized real estate as a potential alternative investment asset to obtain diversification benefits in a mixed-asset portfolio. As markets are subject to different shocks at different times, international diversification strategy may help investors reduce risks that come from idiosyncratic shocks. However, financial market returns have exhibited significant volatility clustering due to shocks originated from the financial crises. The trend of globalization and economic integration has also reduced the benefits of international diversification. With the emergence of a global real estate securities market since the 90's, it has become important for investor to understand better the time-varying correlation between major international real estate securities markets and their co-movement with the global stock market. In this study, we attempt to employ both univariate and bivariate version of Hamilton's regime switching models (Hamilton, 1989; Hamilton and Susmel, 1994; Edwards and Susmel, 2001) and a Switching Regime Beta Model developed by Billio and Pelizzon (2003), to assess volatility regime switching and regime interdependence of real estate stocks and financial and macroeconomic factors, as well as establish a more pragmatic efficient real estate securities portfolio model that is both time- and state-varying. Four major findings emerge from this research:

(a) We find that global developed public property markets can be adequately characterized by a SWARCH model. In particular, most of the persistence in real estate stock price volatility can be attributed to the persistence of low, medium and high-volatility regimes in international developed public property markets (see Figure 1 for Singapore securitized real estate market). Moreover, there is a significant volatility increase during the crises periods for all markets examined. However, the identified high volatility regime appears short-lived. Moreover, the dynamic linkages among the markets are positively dependent on volatility regime. The responses of public real estate market returns to the selected macroeconomic conditional risk variables are asymmetric in the regime switching context. Our results imply risk-reduction via international diversification in public property markets may only hold true in low volatility period. Consequently portfolio managers need to understand and implement volatility state-dependent optimal asset allocation in order to better advise their clients.

(b) As international markets are more closely correlated during volatile periods, we detect maximum cross-market correlation and minimum benefit of risk reduction always happened in the joint high volatility regime shared by the individual and world markets. However, by incorporating the volatility regime-switching and state-varying correlation into the construction of international portfolios, investors are able to derive a more efficient portfolio with minimum risk or higher return within a given risk.

(c) Following from the success of univariate SWARCH modelling, our bivariate SWARCH model indicates that high volatility episodes are generally short-lived and that there is some evidence of volatility co-movements /synchronization across markets especially when the two markets comes from the same continents. In particular, we observe high volatility synchronization between the HK and SG, as well as between the HK and FR pairs. Moreover, there is adequate evidence of simultaneous regime-switching behaviour in all real estate markets (Figure 2: Hong Kong and Singapore). Finally, the state-dependent correlation behaviours are observed for 24 pairs (87.5%) of market combinations. These results imply that the multivariate MS-VAR variance-covariance models can be beneficial to detect cross-market contagion.

(d) Given the context of economic globalization and frequent occurrence of financial crises over the past two decades, our results from both the univariate and multivariate switching regime beta models indicate that the public property markets examined have responded significantly to the global financial crisis (GFC) with a significant increase in the volatility parameter compared to normal period. Moreover, the linkages of the public property markets with the two world market indices have been altered by the financial crisis, and are significantly enhanced in the post-crisis period for the European region. In contrast, the three major Asian public property markets display reduced risk spillover effect in high volatility state from the world market in recent years. Our findings offer important and different implications for investors in their pursuit for portfolio diversification and policymakers in contagion management in the Asian and European public property markets. (Figure 3)

To our knowledge, this is probably one of very few real estate research studies that adopt this volatility switching idea in capturing the volatility persistence and regime switching characteristics of real estate securitized market returns. As a result of this endogenous determination of volatility regimes, we can assess the degree of market

interdependence and linkages under the different volatility states (e.g. high, medium and low) Therefore, this study can contribute to the literature on the issue of dynamic market linkages in international developed real estate securities markets from a structural break and non-linear perspective. Finally, portfolio managers are able to implement state-dependent optimal real estate securities allocation in order to better advise their clients.

References

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Table 1 Descriptive statistics of weekly stock market returns for 9 real estate securities markets: January 1990 – January 2012

	AU	FR	GER	HK	ITA	JP	SG	UK	US
Mean (%)	0.017	0.090	-0.009	0.138	-0.065	-0.071	-0.003	-0.033	0.114
S.D (%)	2.043	2.128	2.848	3.893	3.394	3.768	3.983	2.609	2.423
Kurtosis	19.588	7.988	8.419	7.127	8.760	4.542	11.300	10.501	11.455
Skewness	-1.513	-0.683	-0.713	-0.388	-0.677	0.033	-0.505	-0.823	-1.012
Min (%)	-20.263	-12.957	-17.530	-26.565	-23.390	-17.861	-36.414	-20.293	-17.040
Max (%)	14.730	9.790	14.980	19.125	13.852	19.751	20.519	13.526	12.089
rho(1)	0.027	0.203[1]	0.273[1]	0.235[1]	0.248	0.175[1]	0.200[1]	0.226	0.217[1]
JB test	13622[1]	1282[1]	1504[1]	845[1]	1678[1]	114[1]	3350[1]	2825[1]	3621[1]
ARCH(5)	131.5[1]	147.3[1]	221.1[1]	62.9[1]	105.5[1]	43.2[1]	93.7[1]	217.7[1]	353.9[1]

*Legend: Australia (AU), France (FR), Germany (GER). Hong Kong (HK), Japan (JP), Singapore (SG), United Kingdom (UK), United States (US). Rho (1) is the first-order autocorrelation. *, - indicates statistical significance at the 1% level*

Figure 1. Three volatility regimes-Singapore securitized real estate markets

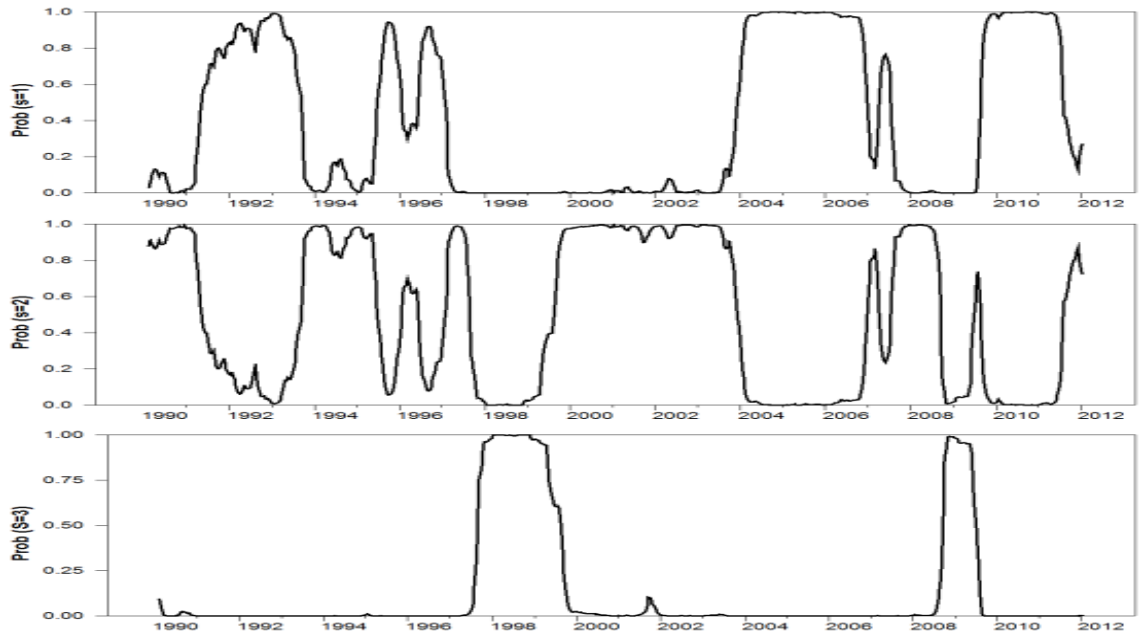

Figure 2 **Bivariate SWARCH Smoothed Probability Plots (HK and SG)**

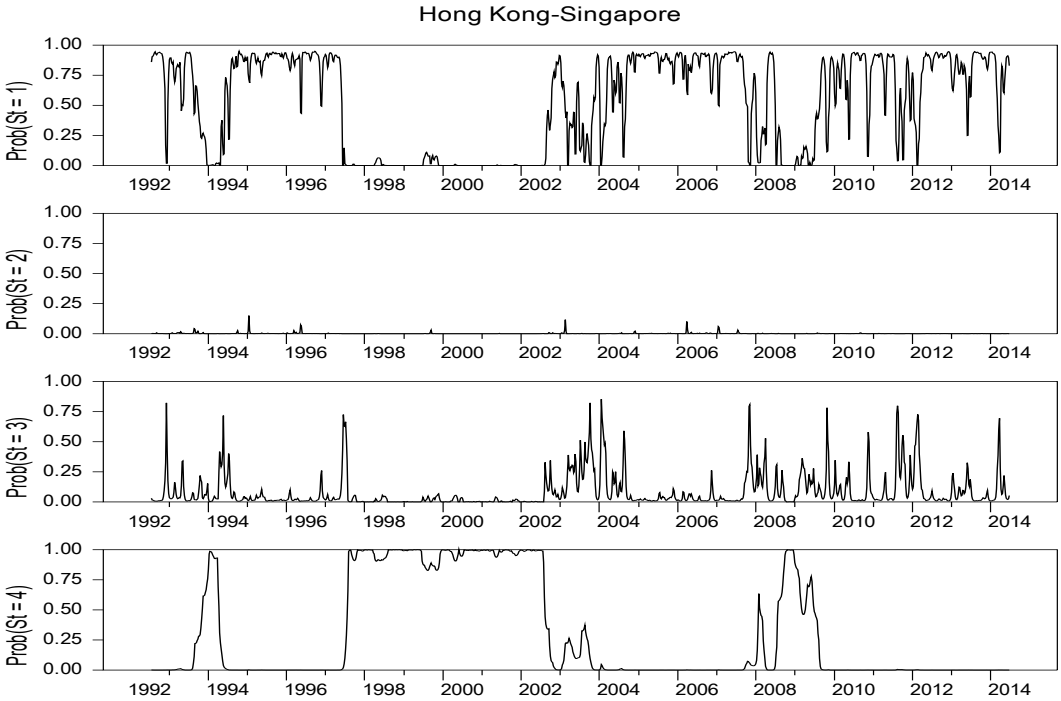

Figure 3 **Smoothed Probabilities of low volatility regime from multivariate switching regime beta model**