THE DYNAMIC OF RETURNS AND VOLATILITY OF MALAYSIAN LISTED PROPERTY COMPANIES IN ASIAN PROPERTY MARKET

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ABSTRACT. This paper examines the dynamics of return and dynamic volatility across the Malaysian and pan-Asian countries' listed property companies market over the period January 1998 to August 2012. Listed property companies' portfolios have the potential to offer high returns and low risks for long-term investments for individuals as well as institutional investors. As such, it is important to assess the return and volatility level of the Malaysian listed property companies market in the dynamic region of pan-Asian countries. This paper uses ARCH and GARCH models to empirically examine the dynamic volatility of listed property companies in 12 pan-Asian countries. The findings revealed that for the past 14-years Malaysia experienced moderately high volatility levels in term of investment in listed property companies. This study will contribute significantly to the empirical literature on the volatility dynamics of the Malaysian property market in international real estate portfolios. In particular, the findings from the study will be useful for international investors to better understand the potential portfolio implications of investing in the Malaysian real estate market.

KEYWORDS: Dynamic; Listed property companies; Malaysia; Returns; Volatility

1. INTRODUCTION

The performance of the real estate securities market is a widely researched topic in property literature. Numerous studies have analysed the historical performance of direct and indirect property companies as well as Real Estate Investment Trusts (REITs). Previous research has shown that securitised property has outperformed other common stocks on a risk-adjusted basis. Listed property companies have become a more significant investment vehicle in recent years. Other real estate investment areas, such as REITs and commercial property have also became major global investible asset classes. Besides equities, real estate is one of the largest asset investment classes available to investors that are able to provide consistent benefits and cash flow.

Traditionally, the stock and property market are highly correlated, from which either one of the following two things arise: wealth effect (from stock market to property market) and credit price (from property market to stock market) (Hui, Yu 2010). These scholars were also of the view that the wealth effect is usually observed, as the stock market leads the property market. Moreover, from the perspective of risk diversification, high correlations between these two markets reduce the possible benefits obtained through portfolio diversification, irrespective of which of the two effects arise.

Previous literature has shown that property prices have a significant impact on the country's macroeconomic and financial stability. As such, any structural breaks could lead to a change in the relationship between the stock and property market. Bond *et al.* (2006) examined the extent of contagion across the real estate markets during the Asian Financial Crisis (AFC) and found the existence of contagion among these markets. This aspect plays an important role in widening the focus of a performance analysis of listed property companies in Malaysia within mixed-asset portfolios, as well as pan-Asian countries. In doing such an analysis ensures that the findings are relevant

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in the property context. According to Kroencke and Schindler (2010), a financial crisis and its contagion effects almost all asset markets as well as national financial markets. This clearly illustrates that returns are not normally distributed and correlations are time varying and increase strongly during downward moving market phases when diversification is most needed by investors.

Wilson *et al.* (2007) concentrated on measuring the spillover effect across Asian property stocks. Four Asian countries, Hong Kong, Japan, Malaysia and Singapore were selected as case studies. The purpose of the research was to understand the degree of commonality and the spillover effect on behaviour across property markets. The findings revealed that the developing crisis was being captured in the price dynamics of the securitised real estate sector earlier than reported in previous empirical studies of the general stock. The results highlighted that contagion across Asian markets started to occur in October 1997. The AFC triggered some research to further explore the impact of the crisis on the real estate market. In particular, risk analysis to minimise the impact of the crisis on the stock market, especially the real estate finance market, was undertaken. For example Mei and Hui (2004) examined conditional premium risks of Asian real estate stocks. This paper also highlighted the issue of contagion of Asian real estate markets. In their findings, the authors found strong evidence of time-varying risk premiums, suggesting property development based on constant discount rates missed specifying the cost of capital. In addition, the use of multi-country models suggested that conditional excess returns of many economies in crisis appeared to move quite closely with each other.

Several scholars have dedicated their studies to volatility research in Asian real estate stock markets. For instance, Liow *et al.* (2011) explored the volatility convergence in Asia-Pacific securitised real estate markets. The paper investigated whether a group of Asia-Pacific securitised real estate markets have displayed a similar common time-varying volatility over the period 2005 to 2009. This was the first paper to investigate common volatility in real estate and volatility spillover. The findings revealed the presence of Autoregressive Conditional Heteroscedasticity (ARCH) effects in almost all the real estate securities series, indicating that Asian real estate time-varying volatilities need to be incorporated into searching for volatility convergence. In addition, the analysis indicated the presence of at least one common time-varying

variance component and thus partial volatility convergence among the eight Asian-Pacific real estate securities markets (including Australia).

Pham (2012) extended the analysis to investigate the dynamics of returns and volatility in the emerging and developed Asian REITs market. The purpose of the study was to examine the dynamic transmission of REITs returns and volatility between seven Asian REIT markets: Japan, Singapore, Hong Kong, Malaysia, Taiwan, Thailand and South Korea over the period June 2006 to May 2011. The results indicate that emerging markets offer lower returns to investors, but in lower risk. The emerging REIT index outperformed the developed REIT index on a risk-adjusted basis. In addition, investors can use available information from Singapore and Japan to predict movements of REIT returns in other Asian markets. The study also revealed that Hong Kong, Singapore and South Korea were the main volatility emitters in the region, while Japan and Taiwan were volatility receivers and Malaysia and Thailand acted as intermediary markets.

The significance of globally listed property companies has been widely discussed over the past decade. Prior discussion has considered various aspects of analysis to assess the performance of listed property companies whether in the form of statistical analysis, surveys, academic or industrial literature. Strong growth and outstanding risk-adjusted performance of the securitised real estate market has recently made international investors increasingly interested in real estate allocations in their portfolio. The level of securitised property at the global level is approximately 19% (Australia), 26% (Hong Kong), 14% (Singapore), 7% (UK) and 14% (United States) (EPRA 2012). Asian countries have shown a significant contribution to global property securities. Consequently, the significance and performance of the Asian securitised real estate sector justifies the attention of global investors.

A total of USD 452 billion has been recorded as global property transactions in 2011 compared to USD 350 billion in the previous year (RCA 2012). This indicates global property transactions are in a recovery phase after the impact of the GFC in 2008–2009 and the Eurozone crisis in 2010. Total transactions in 2011 were relatively low, compared to transactions recorded before the GFC, USD 921 billion in 2007 (RCA 2012).

There are extensive studies devoted to the Asian property markets, such as Liow and Adair (2009), Liow (2005, 2008, 2009), Jin *et al.* (2007), Liow and Sim (2006), Ooi *et al.* (2006), Wilson

et al. (2007), Gerlach *et al.* (2006), Addae-Dapaah and Loh (2005), Ooi and Liow (2004), Mei and Hui (2004), Newell *et al.* (2009a, 2009b), Newell and Razali (2009), Nguyen (2011, 2012) and Tsai *et al.* (2010). Some authors, such as Ling and Naranjo (2002), observe cross-country analysis on commercial real estate returns.

There are only a few studies that have concentrated on listed property companies' performance in Malaysia. For example, Ting and Tan (2008), showed an interest in the Malaysian property market, although only for residential properties. Ting (2002) explored the comparative performance analysis on listed property companies in Malaysia, however the study was limited to shares and direct residential property. Although Lee and Ting (2009) demonstrated the diversification benefits and return enhancement of Malaysian REITs in a mixed-asset portfolio, no similar evidence was found for property companies. The results show that property shares have neither diversification potential nor return enhancement in a mixed-asset portfolio in both mean variance and downside risk optimisations.

Many researches focus on the Malaysia property market and only pay attention to the REITs. Given the importance of assessing the property market performance in Malaysia, Md. Saad *et al.* (2010) attempted to analyse the performance of unit trust companies in Malaysia, while Newell and Osmadi (2010a, 2010b) and Osmadi (2007) examined REITs and the Islamic REITs development in Malaysia. Earlier, Newell and Acheampong (2002) examined the performance of listed property trusts over the period 1991 to 2000. Recently, Nawawi *et al.* (2010) examined the relationship between Asian REITs and the Malaysian REITs market. Sing *et al.* (2002) studied the Malaysian REITs (M-REITs) focus from the real estate market point of view. Recent research by Ting and Wai (2011) looked at the effects of property portfolio characteristics on M-REITs risk. Ibrahim *et al.* (2009) explored the potential of Shariah investments in Asia, focusing on property portfolios and property trusts.

A summary of the most relevant past research regarding the performance of securitised property markets, including direct property and mixed-asset classes, is shown in Table 1. In general, the literature has shown that assessing the various property types and examining their roles in mixed-asset classes are important and explains much of the variability on portfolio returns, risks and volatility measures. It was also observed that the performance of property portfolios is by no means

consistent and depends on the quality of data, statistical procedures and time frames. In addition, the systematic analysis of the results of the property returns by researchers enables investors across the globe to better evaluate the performance of international property portfolios. In summary, previous studies have confirmed that the analysis of property performances using various techniques, specifically risk-adjusted and correlated to identify the potential of diversification and the volatility spillovers model is a reasonable tool to analyse property performance in mixed-asset portfolios.

In summary, research in relation to the property market in Malaysia has been increasing in recent times, however, compared to other countries it is still limited and there are still a lot of opportunities to research the Malaysian property market. There is no research evident on the performance and significance of Malaysian property securities market in a mixed-asset portfolio. This has created several research gaps and has motivated the undertaking of this research.

The first research gap is that most studies that had concentrated on Asian property performance only put Malaysia as a case study comparison. For example, research undertaken by Newell *et al.* (2004, 2005, 2007, 2009a, 2009b), Chau *et al.* (2001, 2003), Newell and Chau (1996) and Schwann and Chau (2003) studied the performance of the real estate sector in Malaysia from different case studies. These researchers extensively studied the performance of China and Hong Kong's property portfolios compared with the performance of Malaysia and other Asian countries to show the level of performance for each country. Other countries have also been the subject of case studies, such as Singapore, India, Thailand and Vietnam. As such, these studies indicate that Malaysia has only been used as a case study comparison without having been the subject of an in-depth analysis from the local point of view. For this reason, it is very significant to use Malaysia as the main case study in order for property stakeholders in Malaysia to be well informed in relation to the performance of the real estate sector, particularly listed property companies. The emergence of big property companies such as SP Setia, Sime Darby and Sunway have created property investment opportunities not only for Malaysia, but also globally.

The second research gap is the apparent lack of studies that have used econometric analysis such as Granger causality tests and ARCH and Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models, especially to examine

Table 1. Summary of related literature of property market performance

No.	Region	Author(s)	Summary
1.	Asia	Liow and Adair (2009)	Examined the role of Asian real estate companies with regard to their value-added performance and portfolio diversification benefits in Asian mixed-asset portfolios.
		Liow (2008)	Investigated empirically the changes in long-term relationships and short-term linkages among the US, UK and 8 Asian real estate securities by using a combination of Johansen linear co-integration, Bierens nonlinear co-integration, Granger causality, variance decomposition and volatility spill-over methodology.
		Liow (2008)	Analysed international securitised real estate markets including most Asian countries to confirm prior stock market evidence regarding the presence (or absence) of long memory volatilities for 40 weekly real estate indices by using 5 econometric tests.
		Liow and Sim (2006)	Examined the risk and return of Asian real estate stocks from an American investor's point of view.
		Liow *et al.* (2005)	Analysed the relationship between expected risk premia on property stocks and some major macroeconomic risk factors as reflected in the general business and financial conditions for stock markets in Hong Kong, Singapore, Japan and UK.
		Addae-Dapaah and Loh (2005)	Examined the performance of Asian emerging real estate markets against those of developed markets including European countries with due cognizance of currency risk.
		Gerlach *et al.* (2006)	Studied the influence of the 1997 AFC on capital flows within the property market and the associated long-term implications of it.
		Ooi *et al.* (2006)	Examined REITs markets in Japan, South Korea, Malaysia, Singapore, Taiwan and Hong Kong.
		Wilson *et al.* (2007)	Used a structural time series approach to isolate stochastic trends and cyclical components across a system of securitised Asian property markets.
		Mei and Hui (2004)	Examined the time variation of expected returns on Asian property stocks using a multi factor latent variable model.
		Newell *et al.* (2009a)	Assessed the significance, risk-adjusted performance and portfolio diversification benefits of the listed property securities markets in the Asian international financial centres (IFCs) contrasting the performance to 6 major non-IFC markets in Asia.
		Newell and Razali (2009)	Assessed the impact of the GFC on commercial property investments in Asia.
		Nguyen (2011)	Study of the performance analysis of the listed property companies for 13 Asian countries according to the level of market maturity as developed, emerging and lesser emerging.
		Lin and Lin (2011)	Examined source of growth patterns in asset prices by analysing the integration relationship between stock market and real estate in 6 Asian countries.
		Tsai *et al.* (2010)	Examined some important characters of REITs in 6 Asia-Pacific areas including Australia, Japan, Singapore, Taiwan, Korea and Hong Kong. The results show that volatility behaviours of REITs have Generalized Autoregressive Conditional Heteroscedastic (GARCH) effects; in addition, REITs and stocks have a long-term relationship in all markets.
		Ling and Naranjo (2002)	The paper tested whether commercial real estate markets (both exchange-traded and non-exchange-traded) are integrated with stock markets using multifactor asset pricing models.
		Newell *et al.* (2005)	The research used an information transparency index with 180 property companies in 10 Asian countries and were assessed over 1997 to 2003 for their levels of information transparency.
		Ooi and Liow (2004)	Examined the performance of real estate stock listed in 7 developing markets in East Asia using panel regression to identify determinants of risk-adjusted returns of real estate securities markets.
		Nawawi *et al.* (2010)	Investigates the co-movement of the REITs and stock market in Asia. The results indicated that these two markets are stationary and co-integrated.
		Liow and Chen (2011)	Assessed whether a group of 8 Asia-Pacific securitized real estate markets display similar volatility trends over the past 15 years using an econometric model.
		Liow (2012)	Examined time varying co-movements across 8 Asian real estate securities markets and their local stock markets, a regional Asian stock market proxy and a global stock market proxy.
		Jin *et al.* (2007)	Mixed-asset portfolios were constructed over the period 1998 to 2005 from 6 countries in Asia including Australia and New Zealand. The results have shown mixed asset portfolios in emerging countries outperformed developed countries.
		Schindler (2009)	Analysed long and short-term co-movements between Asia-Pacific real estate markets and the real estate markets in the UK and the US based on bivariate testing for co-integration and correlation analysis.
		Pham (2012)	Examined the dynamics of return and volatility spill-overs across the REIT markets of Asian REITs markets.

the performance of listed property companies. Although Liow (2012) used the GARCH model, the analysis only focused on co-movements and correlations in the Asian securitised real estate and stock markets. Again, Liow (2012) only used Malaysia as a comparison case study. Moreover, only Liow has used the GARCH model as an analysis technique. Consequently, it is believed that this study will be the first study to assess the volatility performance of listed property companies by using several econometric techniques. However, there is no evidence that the statistical analysis techniques of Granger causality, ARCH and GARCH, have been used to study the performance of listed property companies. Most of the studies employing these techniques only touch on the general stock market and other macroeconomic issues.

The third research gap is very limited literature on the performance of listed property companies over the past decade. This results from the limited study on the real estate sector in Malaysia itself. As mentioned previously, Malaysia has only been used as a comparison case study in major case studies, therefore minimal knowledge exists in relation to the background of property investment in Malaysia. Research into property investment in Malaysia was only initiated by Ting (2002) on the performance of property shares. Ting and Tan (2008) again constructed diversified mixed-asset portfolios by incorporating residential properties. The only extensive study undertaken has been done by Lee and Ting (2009), although the study focused on Malaysian REITs in a mixed-asset portfolio. Moreover, research regarding the performance of listed property companies in Malaysia has only been done by Ting and Tan (2008), Lee and Ting (2009), Ting (2002) and Abdullah and Wan Zahari (2011). This obviously shows that it is vital to enrich the background knowledge for listed property companies' investment in Malaysia.

The fourth research gap is the lack of primary case studies in relation to Malaysian listed property companies within mixed-asset portfolios. Moreover, comparative performances also extend to pan-Asian companies. It is believed that this research is the first study to investigate the return and volatility dynamic of listed property companies within mixed-asset portfolios, as well as property portfolios in pan-Asian countries. Most importantly, the analyses have been made from the perspective of local investors. Previous research undertaken discusses the analysis from the point of view of the authors' country of origin,

as well as other developed countries such as the USA, the UK, Europe and Australia.

With all these research gaps, it is very important to study the performance of listed property companies within mixed-asset portfolios. For this research, the point of analyses will be from the perspective of local investors. The analyses will also extend to pan-Asian countries to assess the dynamic of Malaysian listed property companies in this region. This research will contribute significantly to the property investment area in Malaysia.

2. METHODOLOGY

This paper will analyse the performance of property securities markets, for listed property companies in Malaysia, from 1998 to 2012. Risk-adjusted performance analysis will be used to assess the added value of Malaysian listed property companies in pan-Asian portfolios. Portfolio diversification benefits of Malaysian listed property companies will also be assessed. For the various indirect properties and associated financial series for Malaysia, risk-adjusted returns will be assessed from 1998 to 2012. This period has been chosen because of the two financial crises which occurred during this period. It is interesting to study the impact of these financial crises (the AFC and the Global financial crisis) to Malaysian listed property companies, as well as other pan-Asian countries. Performance analysis will use local currencies, as international investors typically implement their own currency hedging strategies to control currency risk. Regional and mixed-asset portfolio diversification benefits will be assessed using correlation analysis.

The performance of the Malaysian listed property companies, as well as other asset classes, will be evaluated by applying risk-adjusted performance analysis using the Sharpe Index. Sharpe Index analysis will determine a standard measure of risk-adjusted returns by calculating the risk-adjusted excess returns.

In addition, several advanced statistical models will also be used in this research to further explore the significance and performance of the listed property companies in Malaysia. The Granger causality tests will be used to determine the different lags between the direct and indirect property markets. GARCH models will be used in this research to determine time-varying conditional variances and covariance. This method will measure precedence and information content but does not by itself indicate causality in the more common use of the

term. Granger causality testing in this research is calculated by using the software "Eviews". Eviews runs bivariate regression in the form of:

$$Y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots \alpha_1 y_{t-1} + \beta_1 X_{t-1} + \ldots \beta_{1x-1} + \varepsilon_t \quad (1)$$

$$xt = \alpha_0 + \alpha_1 x_{t-1} + \alpha_1 x_{t-1} + \beta_1 y_{t-1} + \ldots \beta y_{-1} + \mu_t \quad (2)$$

for all possible pairs of (x, y) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \ldots \beta_1 = 0 \quad (3)$$

In addition, ARCH modelling is used to find apparent changes in the volatility of the property securities market, as well as property companies in Malaysia. ARCH is a financial model that is able to capture clustering and predict volatility. The ARCH model allows the conditional variance of a time series to change over time as a function of past squared errors by imposing an autoregressive structure on conditional variance and allowing volatility shocks to persist over time, hence expected equilibrium returns (excess returns) also vary over time (Liow *et al.* 2006). In other words, the ARCH model is often used to assess the expected return on an asset related to the expected asset risk. The estimated coefficient on the expected risk is a measure of the risk-return trade-off. The ARCH model is calculated by using the following formula:

$$y_t = x_{t\gamma} + \sigma_t^2 + \varepsilon_t, \quad (4)$$

where: σ_t^2 – one-period ahead forecast variance based on past information; x – predetermined variables; ε_t – error.

According to Bollerslev (2001) GARCH, as opposed to higher order models, is parsimonious and allows for long memory in the volatility process and fits most economic time series. The ultimate analysis of volatility co-movement has to be done using a systematic approach, for example analysing the volatility of the Malaysian property stock market and comparing it with other pan-Asian countries as a whole. A multivariate GARCH model helps to capture the dynamic relationship between Malaysia and 11 other pan-Asian countries. Modelling the volatility of the 12 countries' property listed companies markets simultaneously has several advantages over the univariate approach that has been used so far. A multivariate approach eliminates the two-step procedure, thereby avoiding problems associated with estimated regressors

(Koutmos, Booth 1995). In addition, it improves the efficiency and the power of the test for cross-market, co-movement and spillovers. It is also consistent with the notion that volatility spillovers are manifestations of the impact of global shocks on any given market.

The GARCH model is estimated by computing the conditional leg-likelihood function:

$$L(\Theta) = (T/2)\ln(2\pi) - \tfrac{1}{2}\Sigma^T_{T-1}[\ln(\sigma_t) + \varepsilon_t \sigma_t \varepsilon_t]^{-1}, \quad (5)$$

where: Θ – the parameter vector to be estimated; T – number of observations; o_t – time-varying conditional variance-covariance matrix.

This paper details the study focused on Malaysian property companies and 11 other Asian countries. It considers 11 national securitised real estate markets, namely Malaysia (MY), Singapore (SG), Indonesia (IN), Thailand (TH), Japan (JP), the Philippines (PH), Vietnam (VN), China (CN), Hong Kong (HK), Taiwan (TW) and South Korea (SK). The choice of these countries, together with the Malaysian securitised property market, will give a full range of Asian real estate markets, a much more thorough analysis compared to past research. In addition, these Asian markets are generally aggressive with higher systematic and idiosyncratic risks (Liow, Sim 2006). Further, all returns will be generated using local currencies to avoid currency hedging.

3. RESULTS AND DISCUSSIONS

3.1. Risk-adjusted returns

In terms of the Sharpe index analysis within mixed-asset portfolios, listed property companies were in bottom place with a risk-adjusted score of 0.03 compared to other portfolios in Malaysia. Bonds were the best portfolio performer in terms of a risk-adjusted point of view (1.69). This was followed by plantation and industrial asset classes (risk-adjusted: 0.40 and 0.35 respectively). The results indicate that over the period January 1998 to August 2012, listed property companies were the poorest performing asset classes. Furthermore, a study by Newell *et al.* (2009a) revealed Malaysian property companies' Sharpe index had a negative ratio (–0.74) for the study period Q4 1998 to Q1 2007. Similar results were also found in a study by Nguyen (2011) and Liow and Adair (2009) which resulted in a Sharpe index of –0.0046 over the period January 1999 to December 2009 and –0.154 over the period 1996 to 2005. These results concur with the results

from this study that showed a poor performance in terms of the Sharpe index performance compared to other asset classes. Full results of the analysis are tabulated in Table 2.

Table 3 presents the risk-adjusted performance analysis for property companies for Malaysia and others pan-Asian countries for over the period January 1998 to August 2012. Over this period, listed property companies in Malaysia ranked among the bottom for all pan-Asian countries (ranked at number 7). Malaysia, together with Singapore, Japan, Thailand and Taiwan, ranked at the bottom of the index based on the Sharpe index performance. In terms of annual returns, Malaysia was able to show positive growth along with all pan-Asian countries. This indicates that although the GFC hit most of the pan-Asian countries, listed property companies were able to show sustainable growth. Over the whole period of the study, Malaysia also showed low average annual returns compared to other pan-Asian countries. In addition, risk for listed property companies in Malaysia was among the highest. Overall, in terms of average annual returns, South Korea, Vietnam, Hong Kong, the Philippines and China managed double-digit percentage performance levels which ranked them in top place in terms of the Sharpe index performance.

In contrast, India, Taiwan and Thailand were ranked at the bottom in terms of average annual returns. This result is similar to the finding by Newell et al. (2009a) which put Malaysian property companies among the lowest performing in the pan-Asian countries over the period Q4 1998 to Q1 2007. However, a more recent study by Newell et al. (2009a) revealed Malaysia as ranked at number four among pan-Asian countries, including the UK and the USA. In addition, research done by Liow and Adair (2009) showed Malaysia out-performed several mature markets, such as Singapore and Japan for listed property companies' performance over the period 1996 to 2005. Another study by Nguyen (2011) revealed almost similar findings with several countries' risk-adjusted performance, except for Malaysia, South Korea and Singapore.

Overall, Malaysian listed property companies have shown poor performance over the period January 1998 to August 2012, in the context of pan-Asian countries. Although listed property companies performed poorly on the Sharpe index, Malaysia is still able to offer competitive average risk levels based on its performance over the last 14 years. As such, over this period, it can be concluded that Malaysia performed poorly for the whole period of the study. It is very clear for the listed property companies portfolio that Malaysia

Table 2. Mixed-asset portfolio risk-adjusted analysis: January 1998 to August 2012

	Shares	Property companies	Bonds	Plantation	Finance	Industrial	Cash
Average annual return	7.92%	1.39%	8.73%	10.72%	10.77%	7.74%	0.67%
Average risk	26.34%	33.17%	5.02%	26.39%	36.22%	21.12%	4.40%
Risk/return ratio	3.32	23.82	0.58	2.46	3.36	2.73	6.56
Risk adjusted	0.29	0.03	1.69	0.40	0.29	0.35	
Rank	4	6	1	2	4	3	

Table 3. Pan-Asian portfolio risk-adjusted performance analysis: January 1998 – August 2012

	Average return (%)	Average risk (%)	Sharpe index (%)	Index rank
Malaysia	7.92	26.34	0.29	4
Listed property companies				
China	11.23	41.42	0.28	5
Hong Kong	16.30	37.14	0.33	2
Indonesia	6.12	41.92	0.10	6
Japan	2.20	52.37	−0.03	9
South Korea	17.02	36.28	0.34	1
The Philippines	15.22	39.45	0.31	4
Singapore	3.09	23.12	0.02	8
Taiwan	2.81	31.94	−0.09	11
Thailand	4.09	22.43	−0.08	10
India	0.21	14.29	−0.27	12
Vietnam	16.24	38.43	0.30	3
Malaysia	1.39	33.17	0.03	7

*Data for Vietnam is beginning from 2007.

needs to step up in order to compete with mature and advanced markets, as property offers better investment in term of profits compared to the other asset management types.

3.2. Potential of diversification

Table 4 presents the correlation matrix for Malaysia's listed property companies over the period January 1998 to August 2012. The average correlation for the Malaysian listed property companies with the various pan-Asian listed property companies was $r = 0.49$, consistent with that seen among the various other pan-Asian listed property companies (average correlation of 0.50). This reinforces the diversification benefits of Malaysia's listed property companies in a pan-Asian securities property fund. Over this period, Malaysia has shown a low correlation with other countries, such as Hong Kong ($r = -0.14$), Taiwan ($r = -0.17$), South Korea ($r = 0.03$) and Singapore ($r = 0.08$). This indicates Malaysia has diversification potential in terms of listed property companies' investment portfolios with these countries. Overall, Malaysia has shown diversification potential among all other pan-Asian countries.

The correlation for all countries ranged between $r = -0.23$ (Hong Kong and Indonesia) to $r = 0.57$ (Singapore and China). Thus, it indicates most of the pan-Asian countries showed diversification potential for listed property companies' portfolios over the period January 1998 to August 2012. For instance, the correlation range of Japanese listed property companies with other pan-Asian countries is between $r = -0.17$ to $r = 0.15$, Hong Kong is between $r = -0.24$ to $r = 0.38$, Indonesia is between $r = -0.70$ to $r = 0.44$ and South Korea is between $r = -0.17$ to $r = 0.15$. These ranges were low, thus indicating some diversification potential for the relationship of these countries.

Overall, the analyses have shown Malaysia offered diversification benefits for investment in the context of pan-Asian countries over this period. Over this period most pan-Asian countries have also shown diversification potential among each other in terms of listed property companies' investment portfolios. However, analysis done by Newell *et al.* (2009a) revealed property companies

have shown less diversification potential with major Asian countries over the period Q4 1998 to Q1 2007. In contrast, a study conducted by Liow *et al.* (2009) for the period January 1996 to December 2006 showed Malaysia having diversification potential with all countries case studied, including Australia, the UK, the USA and New Zealand. Nevertheless, both studies were conducted prior to the GFC, as such the results would be significantly different if the GFC was taken into account in the analysis. The analysis has shown that Malaysia was able to offer diversification benefits in terms of investment in listed property companies based on the past performance over the last 14 years. It has proven that although the results in terms of the Sharpe index performance are not really good, Malaysia's listed property companies' portfolios are able to offer some diversification benefits for investors.

3.3. VAR Granger causality

The Granger causality test will isolate the leading and lagging relationships existing in the pan-Asian listed property companies' market volatilities. This will allow the calculation method to operate with a minimum of two endogenous variables and avoid limitations. The formula for the Granger causality test has been provided in the previous section. The Granger causality test will explain that the variable *Y* can be improved by lagged values of another variable *X*. The procedure requires the selection of the appropriate deterministic components for the VAR systems. Causality that occurs contemporaneously between two variables indicates that the two series are correlated. The analysis will treat unidirectional causality as a more definitive sign of a leading or lagging relationship than bidirectional causality.

Table 5 summarises the Granger causality test results for listed property companies in pan-Asian countries over the period January 1998 to August 2012. The test examines the relationships between Malaysian and other pan-Asian countries volatilities using bivariate Granger causality tests. The *F*-statistics and *p*-values is aim to tests the joint significance of lagged values of the leading country in determining lagging country which granger

Table 4. Malaysia's listed property companies correlation matrix: January 1998-August 2012

	JP	SG	HK	TH	CN	ID	TW	SK	IN	VT
MY	0.15	0.08	−0.14	0.44	0.28	0.13	−0.17	0.03	0.32	0.02

Note: MY = Malaysia, SG = Singapore, HK = Hong Kong, CN = China, SK = South Korea, TW = Taiwan, IN = Indonesia, TH = Thailand, ID = India, VT = Vietnam, JP = Japan, PH = The Philippines.

Table 5. Summary of pan-Asian countries' Granger causality test results

Countries	Causality (overall)	Causality (uni-directional)	Causality (bi-directional)
Malaysia	India	South Korea	Japan
	Vietnam	Thailand	India
	South Korea	Vietnam	
	Thailand	Hong Kong	
	Japan		
	Hong Kong		
Singapore	Hong Kong	Taiwan	Thailand
	China	Hong Kong	India
	South Korea	China	Vietnam
	Indonesia	South Korea	
	Thailand	Indonesia	
	India	Japan	
	Vietnam		
	Japan		
	Taiwan		
Hong Kong	South Korea	Vietnam	South Korea
	India	Singapore	India
	Vietnam	Malaysia	
	Malaysia	China	
	China	Taiwan	
	Taiwan	Indonesia	
	Indonesia	Singapore	
	Singapore		
China	Indonesia	Indonesia	
	Japan	Japan	
	South Korea	South Korea	
	Taiwan	Taiwan	
	India	India	
	Hong Kong	Hong Kong	
South Korea	Malaysia	Malaysia	Taiwan
	Hong Kong	Hong Kong	
	China	China	
	Taiwan	Thailand	
	Thailand	Vietnam	
	Vietnam	Japan	
	Japan	Singapore	
	Singapore	South Korea	
	South Korea	Indonesia	
	Indonesia		
Taiwan	Singapore	Singapore	India
	China	China	Vietnam
	South Korea	Indonesia	South Korea
	Indonesia	Thailand	The Philippines
	Thailand	Japan	
	India	Hong Kong	
	Vietnam		
	Japan		
	The Philippines		
	Hong Kong		
Indonesia	China	Malaysia	China
	India	Singapore	India
	Malaysia	Taiwan	
	Singapore	Vietnam	
	Taiwan	Japan	
	Vietnam	The Philippines	
	Japan	Hong Kong	
	The Philippines		
	Hong Kong		

Countries	Causality (overall)	Causality (uni-directional)	Causality (bi-directional)
(Continued)			
Thailand	Malaysia		Singapore
	Singapore		
	Taiwan		
	Vietnam		
	Japan		
	South Korea		
	Taiwan		
India	Malaysia	Malaysia	Singapore
	Singapore	South Korea	Hong Kong
	Hong Kong	Indonesia	Vietnam
	South Korea	Taiwan	Japan
	Indonesia	India	The Philippines
	Vietnam		
	Japan		
	Taiwan		
	India		
	The Philippines		
Vietnam	India		India
	The Philippines		The Philippines
Japan	Malaysia		Malaysia
	Singapore		Singapore
	South Korea		South Korea
	Taiwan		India
	Indonesia		Thailand
	India		
	Vietnam		
	China		
	India		
The Philippines	Taiwan	Indonesia	Taiwan
	India		India
	Vietnam		Vietnam
	Indonesia		

causes the market. The results suggested Malaysia's listed property companies influenced only a few pan-Asian countries such as India, Vietnam, Japan, South Korea and Thailand over this period. This is because p-values of Malaysia to these countries indicated that the null hypothesis of block exogeneity is rejected. There is also evidence of bi-directional causality between Malaysia and Japan and Malaysia and India. The findings also suggested Malaysia had uni-directional causality with South Korea and Thailand for the whole analysis period.

For other pan-Asian countries, South Korea influenced all pan-Asian countries (10 countries) followed by Singapore and Japan (nine countries). However, among all the most developed countries in Asia, Japan was most evident in terms of bi-directional causality (with Malaysia, Singapore, South Korea, India and Thailand). South Korea only showed evidence of bi-directional causality with Taiwan. Nevertheless, South Korea showed uni-directional causality with nine other pan-Asian countries. The results also showed that Vietnam was the lest influenced in terms of causality testing to other pan-Asian countries. Vietnam only influenced Indonesia and Thailand in a uni-directional way. Overall, the findings showed that the majority of pan-Asian countries had causality relationships, hence indicating that no pan-Asian country can be treated as purely exogenous. The findings also showed that Hong Kong and Singapore were the most influential countries during this period in terms of listed property companies, while the least influential were Vietnam and Malaysia. The findings contrast with an earlier study by Yunus and Swanson (2007) which investigated linkages between the USA and Asia-Pacific securitised property market. In their findings, Hong Kong dominated lead-lag relationships between the markets.

3.4. ARCH and GARCH analysis

This section presents the empirical results to assess the dynamic of volatility issue in the pan-Asian listed property companies' portfolio markets. ARCH will identify if there is a linear combination of two or more series. If there is a common volatility process it is an indicator of volatility convergence between the two markets which are responding to similar factors that cause volatility. According to Engle and Kozicki (1993), common ARCH features are only applicable to a bivariate market-pair. As such, this study will also use a GARCH model. The GARCH model will give an insight into the degree of the dynamics of volatility and the dynamics of volatility co-movement of listed property companies in pan-Asian countries.

The calculation for the Maximum Likelihood estimation for the ARCH model suggested none of the conditional mean coefficients for pan-Asian countries seem to be significant for the listed property companies' returns, whereas most of the conditional variance coefficients are indeed significant. The results indicate no problems with the assumptions of normality, static heteroskedasticity, linear dependence and second dependence. From the analysis, the ARCH parameters in the conditional variance were only significant at the eight lag, thus showing problems in the long lag in the ARCH model.

Table 6 displays the results of the ARCH heteroskedasticity test on the residual after applying LS regressions. The results suggest that significant ARCH effects are present for all pan-Asian listed property companies. As such, the null hypothesis of homokedasticity of the residuals is rejected and the presence of time-varying volatility clustering is accepted. The results are consistent with the findings by Liow and Chen (2011) which found the presence of ARCH effects in almost all real securities index series in the Asia-Pacific market.

Table 7 exhibits the findings from the GARCH (1,1) model for the listed property companies returns for pan-Asian countries over the period January 1998 to August 2012. The findings indicate that the conditional mean coefficients for listed property companies in pan-Asian countries were significant over this period. The presence of unit roots occurred in the case of Malaysia, Singapore, Taiwan and Indonesia. In addition, the GARCH specification was appropriate for capturing the presence of time-varying volatility. The results suggested that the GARCH specification failed to model the volatility for Singapore's

listed property companies, together with other pan-Asian countries namely South Korea, China, Hong Kong and India. In contrast, GARCH (1,1) was successful in modelling the volatility over this period for Malaysia, Japan, Taiwan, India, Thailand and Vietnam. The volatility persistence indicated by (α + β) for those countries was 0.929402 (Malaysia), 0.8036894 (Japan), 0.889674 (Taiwan), 0.916158 (India), 0.965976 (Thailand) and 0.984569 (Vietnam). These indicate high persistence and slow decay of the volatility shocks for these countries over the period of the study. For all indices, the volatility was high during this period, thus indicating higher standard deviations for all indices. This was expected since pan-Asian countries experienced three major financial crisis during the study period (the Asian financial crisis, the GFC and the Euro zone debt crisis). The results were consistent with the earlier study by Newell and Chau (1996) and Liow (1997) who commented that in relation to property companies in Asia, markets were more risky and volatile due to the high proportion of property activities in Asian development. The institutional investors play a major role in the market volatility, as mentioned by Gabaix *et al.* (2006). The results also correspond with the findings by Liow (2008) which found some volatility persistence in Asian property securitised markets.

4. PROPERTY IMPLICATIONS

The dynamic of listed property companies in Malaysia was not only assessed in the context of mixed-asset portfolios. In order to investigate a greater perspective of the performance on local listed property companies, the analyses continued to assess the performance of listed property companies from the context of major asset portfolios (listed property companies, shares and bonds) among pan-Asian countries. Similar methods were employed for the study on performance and significance of listed property companies in mixed-asset portfolios within pan-Asian countries.

Literature section in this paper has detail out the brief of literature background study regarding on the listed property companies in Malaysia from the context of pan-Asian countries' point of view. The performance and significance of listed property companies in Malaysia have been measured from different perspectives, such as risk-adjusted performance, correlation, portfolio optimisation and dynamic of volatility. This section will discuss the summary of results and the implications to the

Table 6. ARCH model results for listed property companies in pan-Asian countries: Jan 1998-August 2012

	MY	SG	JP	SK	HK	CN	TW	IN	TH	VT	ID	PH
β_0	0.0004 (0.002)	0.0004 (0.002)	-0.0002 (0.005)	0.073 (0.021)*	0.0010 (0.010)	0.0002 (0.013)*	0.0010 (0.005)	0.0002 (0.003)	-0.0001 (0.004)	0.082 (0.032)	0.0009 (0.007)	0.0003 (0.001)
β_1	0.006 (0.035)	-0.001 (0.023)	-0.029 (0.024)	0.062 (0.032)*	0.0021 (0.043)	-0.004 (0.032)	0.003 (0.025)	-0.002 (0.014)	-0.031 (0.022)	0.054 (0.033)	0.0032 (0.032)	0.004 (0.023)
β_2	0.042 (0.032)	0.062 (0.041)	0.062 (0.026)	0.043 (0.029)	0.041 (0.043)	0.071 (0.032)	0.035 (0.024)	0.054 (0.032)	0.054 (0.022)	0.042 (0.032)	0.039 (0.0041)	0.041 (0.031)
α_0	0.014 (0.000)*	0.011 (0.002)*	0.012 (0.025)*	0.014 (0.002)*	0.018 (0.004)*	0.0013 (0.003)*	0.021 (0.002)*	0.012 (0.003)*	0.014 (0.022)*	0.011 (0.001)	0.012 (0.001)*	0.011 (0.001)
α_1	0.051 (0.031)*	0.011 (0.019)	0.026 (0.021)	0.054 (-0.21)*	0.113 (0.032)*	0.134 (0.034)*	0.043 (0.024)*	0.021 (0.022)	0.022 (0.014)	0.062 (-0.43)	0.112 (0.029)*	0.043 (0.022)
α_2	0.002 (0.011)	0.062 (0.025)	0.081 (0.029)*	0.003 (0.012)	0.132 (0.013)*	0.132 (0.031)*	0.001 (0.011)	0.071 (0.043)	0.076 (0.032)*	0.002 (0.010)	0.130 (0.013)*	0.003 (0.012)
α_3	0.267 (0.045)*	0.176 (0.048)*	0.212 (0.062)*	0.281 (0.072)*	0.172 (0.052)*	0.051 (0.021)*	0.254 (0.052)*	0.165 (0.034)*	0.321 (0.043)*	0.272 (0.064)	0.175 (0.067)*	0.272 (0.048)
Log L	432.381	355.042	354.213	432.543	343.042	382.234	543.234	421.324	343.324	324.542	344.042	443.212

* 5 % level of significance.

Note: MY = Malaysia, SG = Singapore, HK = Hong Kong, CN = China, SK = South Korea, TW = Taiwan, IN = Indonesia, TH = Thailand, ID = India, VT = Vietnam, JP = Japan, PH = The Philippines.

Table 7. Diagnostic for GARCH (1,1) Model for listed property companies in pan-Asian countries: January 1998- August 2012

Countries	MY	SG	JP	SK	HK	CN	TW	IN	TH	ID	VT	PH
Mean equation												
C	0.002192 (0.0002)	0.001510 (0.0151)**	0.000432 (0.0031)	0.001490 (0.0000)**	0.001432 (0.0293)**	0.015324 (0.0153)**	0.000326 (0.0029)	0.003023 (0.0003)	0.000492 (0.0025)	0.001421 (0.0000)**	0.016394 (0.0143)	0.002181 (0.0001)
Variance equation												
ω	0.032341 (0.0000)	2.02E-02 (0.0217)**	4.65E-25 (0.0000)	4.54E-04 (0.0184)**	2.12E-01 (0.0301)**	0.542831 (0.0254)**	5.80E-02 (0.0002)	7.40E-04 (0.0000)	5.02E-13 (0.0000)	3.92E-02 (0.0176)**	2.12E-01 (0.0342)	0.023941 (0.0000)
α	0.113042 (0.0000)	0.160321 (0.0001)**	0.160454 (0.0001)	0.132453 (0.0000)**	0.160324 (0.0000)**	0.163451 (0.0001)**	0.049434 (0.0000)	0.531234 (0.0001)	0.372934 (0.0000)	0.139304 (0.0000)**	0.174221 (0.0000)	0.112342 (0.0000)
β	0.830294 (0.0000)**	0.832012 (0.0000)**	0.643234 (0.0000)	0.842343 (0.0000)**	0.432332 (0.0000)**	0.823002 (0.0000)**	0.840240 (0.0001)	0.384924 (0.0000)	0.593042 (0.0000)	0.543042 (0.0001)**	0.810349 (0.0000)	0.792034 (0.0000)

** indicate failure to improve likelihood.

P-values is given in parenthesis.

Note: MY = Malaysia, SG = Singapore, HK = Hong Kong, CN = China, SK = South Korea, TW = Taiwan, IN = Indonesia, TH = Thailand, ID = India, VT = Vietnam, JP = Japan, PH= The Philippines.

Note: $\sigma^2_t = \omega + \sum^a_{t-1} \beta \sigma^2_{t-1} + \sum^p_{t-1} \alpha \varepsilon^2_{t-1}$.

property market in Malaysia generally and listed property companies specifically.

The results of the Malaysian listed property companies over the past 14 years give a signal to all property players in Malaysia and the government that property profile investment needs to be revolutionised to be more competitive with other mixed-asset portfolios. It can be seen that property investment is very uncertain and corresponds to the economic situation. Although listed property companies are still able to show positive growth, compared to other mixed-asset portfolios it can be considered an unattractive portfolio investment. The results from this analysis are similar with other results from researchers such as Newell *et al.* (2009a), Nguyen (2011) and Liow and Adair (2009). Therefore, the evidence of the poor performance of Malaysian listed property companies is strong and indicates that all property stakeholders in Malaysia need to do something from a long-term point of view. Property investment in Malaysia might be attractive as an investment for a short-term period, however based on the record of the last 14 years, this type of portfolio is still less encouraging for the longer term.

The risk-adjusted performance results suggest that listed property companies have performed poorly over the last 14 years, compared to other listed property companies in pan-Asian countries. Malaysia ranked seventh among 12 pan-Asian countries. The results also signify the impact of two major financial crises over the whole period of study, the AFC and the Global financial crisis. The implications of these on the property sector can be seen in different ways. First investors will well informed for over the past 14 years, listed property companies investment portfolios in Malaysia facing severe challenges due to the several financial crises. Although there was poor performance in terms of risk, listed property companies were still competitive compared to other Asian countries. As such, investment in listed property companies in Malaysia will be able to offer moderate to high returns of investment in the future, taking into account competitive risk and low to moderate annual returns. When there is stabilisation in politics, high transparency and less natural disasters, Malaysia can still offer very good opportunities in property investment. Secondly, other asset classes seem able to attract more investors to Malaysia compared to other pan-Asian countries. Malaysia has one of the largest bonds investment portfolios in Asia, which has been proven from the performance of bonds over the past 14 years in pan-Asian

countries. The opportunity to gain more profits from investments may come from share portfolios, as this investment type has had an outstanding previous performance record.

The diversification potential aims to assess diversification benefits from the investments that have been made in certain portfolios. As such, correlation analyses were done on listed property companies in comparison with other similar portfolios among pan-Asian countries. The results suggested listed property companies in Malaysia were able to offer diversification potential based on the previous record on the total return indices over the last 14 years. Although listed property companies in Malaysia experienced low Sharpe index performance levels, opportunities from diversification benefits from the investment still exist. This is proven from the results attained from the analysis. In general, the implications for the Malaysian property market are very positive, as the results from the correlation have improved confidence in investment in listed property companies, notwithstanding the low performance of this portfolio from the Sharpe ratio performance. In addition, this will give more confidence to investors, as well as other stakeholders in listed property companies' asset class, specifically in pan-Asian countries.

The significance and performance of Malaysian listed property companies in pan-Asian countries have also been analysed from the perspective of dynamic volatility. This is because substantial changes in volatility eventually impact significantly on real estate markets as well as potential investors, specifically in listed property companies' portfolios. Similar to the previous sections testing of dynamic volatility on listed property companies in mixed-asset portfolios, the analysis will also be based on several advanced statistical techniques, such as vector autoregression, causality tests, ARCH and GARCH.

The results from the vector autoregression analysis have revealed that all ADP and PP test for variables that they are non-stationary in the log first differences. The parameter estimates from fitting VAR models has showed Malaysia and other pan-Asian countries were significant during the analysis time period. Furthermore, the variance decomposition test has revealed Malaysia's listed property companies account for between 1% and 12% of the forecast error variance of other markets. The results showed that Malaysia was moderately vulnerable compared to other pan-Asian countries. This period of analysis showed Taiwan and Japan as being the most endogenous

and vulnerable listed property companies' market among pan-Asian countries. The implication for Malaysia based on the results has showed listed property companies still in sustainable growth in fact among the best within pan-Asian countries. Although in terms of Sharpe index performance, listed property companies have performed poorly, however in terms of volatility measured from vector autoregression, Malaysia's performance has been decent. The analysis with vector autoregression has implications for the property market from the perspective of volatility levels in listed property companies' portfolio. Consequently, it is proven that a combination of low performance in the Sharpe index analysis, but with a moderate volatility level, makes listed property companies in Malaysia a justifiable investment. However, decision makers such as government and property players in the market need to make further enhancements in order to maintain or improve performance growth in the future.

The analysis to assess the dynamic of volatility of listed property companies in Malaysia and other pan-Asian countries continue by using Granger causality technique to test causality among countries. The causality test is aimed to measure the leading and lagging relationships existing in the volatility of the pan-Asian listed property companies' market. The results indicated that Malaysia influenced several pan-Asian countries, such as India, Vietnam, Japan, South Korea and Thailand over this period. Furthermore, there was also evidence of bi-directional causality between Malaysia and Japan and Malaysia and India. The results also suggested that South Korea influenced all pan-Asian countries, followed by Singapore and Japan. The causality test can be seen from the perspective of relationships between Malaysia listed property companies and other pan-Asian countries in term of volatility of each country in pan-Asia. Granger causality testing informs investors, as well as property players and stakeholders, including government, of the potential risk from the selection of investments. As for Malaysia, the analysis has shown the risk and volatility from the investment has potential influence, whether one or two ways with certain countries, as mentioned previously. In addition, there are significant lead-lag relationships between Malaysia and other pan-Asian countries' listed property companies markets. The causality test will add value to the property investment knowledge, in particular knowledge relating to listed property companies investment in Malaysia.

The final techniques used in order to measure dynamic volatility for listed property companies in Malaysia and pan-Asian countries were the ARCH and GARCH models. These techniques are designed to assess if there is a linear combination of two or more series, as well as a common volatility process, thus indicating the volatility convergence between markets. For all pan-Asian countries, including Malaysia, the results suggested significant effects were present, thus the null hypothesis of homokedasticity of the residuals is rejected. In addition, this indicates the presence of ARCH effects in all listed property companies' portfolio markets in pan-Asian countries during this period.

The GARCH model for all pan-Asian countries has shown the presence of unit roots in Malaysia, together with several pan-Asian countries such as Singapore, Taiwan and Indonesia. Furthermore, the GARCH specification was successful to model the volatility for Malaysia, along with countries such as Japan, Taiwan, India, Thailand and Vietnam. The results showed that Malaysia has high persistence and slow decay of volatility shocks. However, overall most of the pan-Asian countries showed high volatility which is believed resulted from the several financial crises which occurred during the case study period. During this period, Vietnam showed a higher volatility compared to other pan-Asian countries.

The results achieved by using the two different volatility models, namely the ARCH and GARCH techniques, have enriched the literature in relation to property investment, especially for listed property company investment in Malaysia. Over the past 14 years, high volatility levels have been observed for listed property companies by using all three different models. However, out of these three models, the performance of listed property companies is best captured by using the ARCH model, based on the results. The results have shown that investors in listed property companies in Malaysia experienced high risk which is very prospective as a guideline to investors for future decision making strategies in investment in Malaysia. Although the results indicated high volatility, compared with other pan-Asian countries, Malaysia showed more moderate volatility levels. Moreover, most of the pan-Asian countries experienced high volatility, thus indicating the impact from the several financial crises that occurred during the case study period. The combination of several techniques and modelling will improve the knowledge regarding the background to investment in Malaysia,

particularly in relation to listed property companies from the pan-Asian countries perspective. The comparison of Malaysian listed property companies with other pan-Asian countries, clearly represents performances based on historical records.

5. CONCLUSIONS

Understanding the behaviour of international listed property markets has captured the attention of many researchers. The study of this behaviour, particularly during the financial crises, has become extremely important especially in recent years. The rapid growth and performance of the Malaysian listed property companies market has enhanced the transparency of the local property sector and contributed to the number of listed property companies since 1998.

The primary purpose of this paper is to utilise the available data on total return indices for listed property companies, not only in Malaysia, but also for other major pan-Asian countries. By using modern time series techniques and developed diagnostic testing, this paper has tried to evaluate the performance and significance of listed property companies over the period January 1998 to July 2012. A secondary objective is to examine the impact of the GFC to the dynamics of investment in listed property companies in Malaysia. The third objective is to examine the performance of listed property companies in Malaysia, compared with other pan-Asian countries in mixed-asset portfolios within the same time period. In addition, the impact of the GFC on the pan-Asian listed property companies sector was also examined to investigate the dynamics of pan-Asian listed property companies during turmoil.

When there is stabilisation in politics, high transparency and less natural disasters, Malaysia can still offer very good opportunities in property investment. Secondly, other asset classes seem able to attract more investors to Malaysia compared to other pan-Asian countries. Malaysia has one of the largest bonds investment portfolios in Asia. This has been proven based on the performance of bonds over the past 14 years in pan-Asian countries. The opportunity to gain more profits from investments may come from share portfolios, as this investment type has had an outstanding previous performance record.

This paper has comprehensively contributed to the property investment literature, specifically from the Malaysian context. In particular, this research has analysed the role of Malaysian listed property companies from the Malaysian perspective. The implications of this research to the overall property sector, especially in Malaysia, have been described in previous chapters. This research contributes to the property sector knowledge base as follows:

1. This paper examines the performance analysis of Malaysian listed property companies over the period January 1998 to July 2012. This is the first study to examine this extended period of time which encompasses two financial crisis, namely the Asian financial crisis and the GFC;

2. This paper also presents the profile of the performance of listed property companies in Malaysia within mixed-asset classes over the period January 1998 to July 2012. This complete performance profile of major asset classes in Malaysia is the first to analyse this subject matter;

3. This paper also details extensive analyses by using econometric techniques such as Granger causality, ARCH and GARCH. Previous studies have not explored the volatility aspect of listed property companies in Malaysia by using these techniques. This will enable property stakeholders, especially in Malaysia, to be well informed in relation to the level of volatility when investing in Malaysia, in particular listed property companies;

4. The value adding role of Malaysian listed property companies is analysed within the pan-Asian countries to provide a benchmark for cross-border investors. Investors will not only know the performance of listed property companies in Malaysia, but also within the same region for the similar portfolio. These findings have strong implications for investors, but also contribute to the body of knowledge of the pan-Asian property markets;

5. The findings of this study will extend the knowledge, not only in terms of the performance of listed property companies in Malaysia, but also for information on risk, diversification benefits and dynamic volatility in Malaysia, as well as across the pan-Asian countries. The various circumstances of performance in terms of higher return, low risk and low volatility can be part of decision making strategies for investors and other stakeholders to invest in Malaysia or other pan-Asian countries. Although historical findings may not guarantee the future out-

look due to unforeseen circumstances, especially in dynamic environments, these findings set a benchmark for later research by other stakeholders.

Overall, this study has made significant contributions, especially to the background of Malaysian property investment research. In reality, very few academicians have been interested in researching this subject matter. This has been shown in the literature review where very few papers have been devoted to the subject of property investment, particularly assessing the performance and significance of listed property companies. In addition, this research also improves our understanding of the pan-Asian listed property companies market and the role of Malaysia in this dynamic region. As the pan-Asian region becomes more dynamic, beyond the traditional markets, such as the USA and Europe, the research on this topic will become more significant in future years.

6. RESEARCH LIMITATIONS

Throughout the research process, there were a number of limitations that could affect the validity and reliability of the overall results. The first limitation is that the model to assess return and volatility was strictly limited to indirect properties. Currently, there are no commercial property indices being developed in Malaysia, as such the real estate sector performance heavily relies on the analysis of the listed property companies. It also hampers any analysis that compares the performance of listed property companies with direct properties market such as office, retail and hotels. Whilst this limitation is recognised, as the performance in terms of return and volatility does not cover all investments, it should not be considered to be an impediment to a rigorous and insightful study seeking to understand the assessment on return and volatility of the real estate sector in Malaysia.

The next limitation is the short time series for Vietnam which could affect the results in terms of comparison and ranking of performances for pan-Asian countries. As one of the objectives of this research is to assess the dynamics of Malaysian listed property companies compared to other pan-Asian countries, the overall results could be affected, however only for the purpose of ranking and comparing performance and dynamic volatility. Although the data may not cover all investments or property cycles, this limitation is reasonable as Vietnam has only just established its own property

market index and recovered from domestic problems. This limitation should also not impede the research in terms of understanding the performance and significance of Malaysian listed property companies as a whole.

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