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REITs, interest rates and stock prices in Malaysia

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Abstract

This paper examines the dynamic linkages between real estate investment trusts (REITs), which are a proxy for investment in real estate, interest rates and stock prices in Malaysia over the period 2006 to 2009. Two mechanisms have been proposed to interpret the relationship between investment in real estate and stocks. The first is the wealth effect, which states that investors with unanticipated gains in share prices will invest in real estate. The second is the credit-price effect, which states that if real estate prices increase, firms holding commercial real estate will have large unrealized capital gains, meaning that investors will bid up the equity value of the firm. This suggests that the housing market will lead the stock market. Over the period 2006 to 2009, real estate and stock prices have surged in tandem in Malaysia. We find evidence of a wealth effect in the short-run, while in the long-run for some REITs we find support for the wealth effect, while for others we find evidence of feedback effects between real estate and stocks. This finding is consistent with a spiralling upturn in both prices and provides support for both effects operating together. The results lend support to concerns that the Malaysian real estate market is characterized by an asset bubble and that a decline in the stock market could burst the Malaysian real estate bubble.

Keywords: REITs, interest rates, stock prices, Malaysia

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Introduction

Housing and stocks can be considered as investment alternatives. Both real estate and stocks are often important assets in many investors' portfolios. Several authors have argued that commercial real estate offers diversification benefits to institutional investors because of its low correlation with commonly used stock price indices (see Quan & Titman, 1999). Two mechanisms have been proposed in the literature to interpret the relationship between real estate prices and stock prices (Kapopoulos & Siokis, 2005). The first is the wealth effect. The wealth effect suggests that households with unanticipated gains in share prices will increase the amount of housing. Hence, the stock market will lead the housing market. This will occur through two channels because housing is both a consumption and investment good. One channel is that an increase in share market wealth will result in an increase in aggregate consumption. The other channel is through investment portfolio adjustment. When share prices increase, the share of households' portfolios in the stock market will increase and households will seek to rebalance their portfolios through selling stocks and purchasing other assets, including housing (Markowitz, 1952). The second mechanism linking housing and stock prices is the credit-price effect, which focuses attention on the balance sheet position and collateral value of credit constrained firms. Since commercial and residential property can act as collateral for loans, when real estate prices increase, credit constrained firms are able to borrow more for investments. The credit-price effect tends to suggest that the housing market will lead the stock market because firms holding commercial real estate will have large unrealized capital gains that will mean that investors will bid up the equity value of the firm. However, since firms demand more land and buildings to carry out expanded investment, the price of commercial, as well as residential, property will also increase, suggesting an upward spiral in both property and stock prices and persistent feedback effects. Feedback effects between the two markets are consistent with the existence of both effects.

Several studies have examined the relationship between real estate prices and stock prices. Most of the early studies were for the United Kingdom or the United States and focused on correlations between the two assets returns (see eg. Ibbotson & Siegel, 1984; Hartzell, 1986; Worzala & Vandell, 1993; Eichholtz & Hartzell, 1996). Most of these studies found the correlation between housing and stock returns to be negative. However, none of these studies provide any indication as to whether the credit-price or wealth effects are in operation because no inference can be made about the direction of causation. More recent studies have applied cointegration and Granger causality to time series data to examine the causal interactions between housing and stock prices. These studies include Chen (2001) – Taiwan; Sutton (2002) – Australia, Canada, United Kingdom, United States, Ireland and Netherlands; Green (2002) – four geographic locales in California with different housing prices; Kakes and Van den End (2004) – Netherlands; Kapopoulos and Siokis (2005) – Greece; Sim and Chang (2006) – South Korea; Ansari (2006) – United States; and Ibrahim (2010) – Thailand. Overall, Ansari (2006) and Sim and Chang (2006) found support for the credit-price effect. Each of the other studies, though, found support for the existence of a wealth effect.

This paper contributes to the literature by examining the relationship between the real estate market and stock market for Malaysia. To this point most studies have focused on advanced markets and there are few studies of the dynamic linkages between real estate and stock markets for developing markets. Malaysia has experienced a relatively high rate of economic growth. Between 2006 and 2009, Malaysia's economic growth averaged just under 6 per cent. Housing prices and stock prices peaked prior to the United States sub-prime crisis. Both fell in the aftermath of the sub-prime crisis, but both housing prices and stock prices have strongly rebounded in parallel following the crisis. Stock prices in Malaysia increased prior to the United States sub-prime crisis. The Kuala Lumpur Composite Index (KLCI) finished 2007 on 1,445 points, up from 1,096 points at the end 0f 2006 (World Bank, 2008). Stock prices fell in the aftermath of the sub-prime crisis. On March 10, 2008 alone the KLCI dropped 9.5 per cent (World Bank, 2008). However, since the sub-prime crisis, the KLCI has rebounded strongly. In December 2009, the Kuala Lumpur Composite Index (KLCI) was 45 per cent higher than its lowest point of 838 points in March 2009 (Raj, 2010).

In the period since the sub-prime crisis in the United States, housing prices have increased sharply, particularly in Kuala Lumpur, the Klang Valley and Penang. To illustrate, a terrace house in the Klang Valley sold for about RM400,000 in 2008, but in 2010 it cost over RM700,000. In 2010, semi-detached and detached houses in the Klang Valley sold for more than RM2 million.[1] In 2010, Penang new condominiums sold for RM600 to RM700 per square metre, semi-detached houses and terraced houses with some land were selling for more than RM1 million and bungalows from RM3.5 million to RM4 million (Ng, 2010).

There are several reasons for the increase in housing prices (Ng, 2010). First, there has been an increase in foreign acquisition of property in Malaysia. This trend has been encouraged by government policies promoting foreign ownership of property (such as the ‘my second home program’). Second, there has been substantial property development with low entry costs for new home owners (property developers are allowing down payments of 5-10 per cent). Third, there have been a range of flexible mortgages available coupled with low interest rates to

[1] ‘A real estate bubble’ <Mysinchew.com> 15 May 2010 (last accessed 19 July, 2010).

stimulate economic growth, following the sub-prime crisis. Fourth, Malaysia is a developing country which has undergone rapid urbanisation as a result of structural change in the economy. The urbanisation rate was 38.8 per cent in 1980 before almost doubling to 62 per cent in 2000 and 66.9 per cent in 2005 (Jaafar, 2004). Such trends create excess demand for housing and push up prices (Hui, 2009). Fifth, demographic statistics from Ng (2006) suggest that population in Malaysia consists of a much larger number of working adults than retirees. Over 60 per cent of the population are in the age group of 15-64, while less than 5 per cent of the population are over 65. This implies that a bigger pool of first-time buyers and up-graders exists relative to the pool of households trading down, which push prices up (Hui, 2009). Sixth, the Malaysian government's economic development strategy is contributing to higher prices in some areas as it rezones land. For example, in 2010 it was announced that the Malaysian government and the Employee Provident Fund will form a joint venture to develop a 3000 acre tract of land in Sungai Buloh into a new hub for the Klang Valley.[2]

There is evidence of speculation in housing markets. This has created fears of an asset bubble in the housing market.[3] The surge in housing prices and stock markets following the sub-prime crisis is also apparent in other parts of Asia. The value of major stock indices in China, India and Indonesia doubled in 2009, while property prices in major regional centres, such as Hong Kong, Shanghai and Singapore, experienced substantial growth throughout 2009. As a result, property prices in many Asian countries were nearing previous highs and many Asian asset markets are being characterized in terms of bubbles (Bryson & Kamaruddin, 2010).

[2] 'A real estate bubble' <Mysinchew.com> 15 May 2010 (last accessed 19 July, 2010).
[3] 'A real estate bubble' <Mysinchew.com> 15 May 2010 (last accessed 19 July, 2010).

The parallel surge in housing and stock prices in Malaysia since the sub-prime crisis raises the issue of whether there is a long-run relationship between the two variables and, if so, is there a credit-price or wealth effect driving the long-run relationship between the variables. The purpose of this paper is to examine the relationship between Real Estate Investment Trusts (REIT), stock prices and interest rates in Malaysia. Reliable data on direct investment in real estate is not available. However, one can indirectly trade real estate through REITs. REITs have two defining characteristics; their primary business is managing groups of income-producing properties and they distribute most of their profits as dividends to shareholders. Generally REITs distribute 90 per cent of taxable profits as dividends. In contrast to unit trusts, REITs are actively traded on stock exchanges and form an avenue for exploring the linkages between stock and real estate investments (Surahmanyam, 2007).

The strength of the causal relationship between housing and stock prices will depend on the extent to which purchasing real estate is considered an investment (Ansari, 2006). As mentioned above, the Malaysian government is keen to attract more foreign property investors, particularly from India, Singapore and the United Kingdom. Malaysia's Foreign Investment Committee has deregulated investment guidelines with a view to making it easier for foreigners to purchase property. To this point, foreign investors from India, Korea, Singapore and the United Kingdom have been the biggest investors in the country, investing on average US$150,000 to US$300,000 with Kuala Lumpur, Penang and Johor the most popular destinations.[4] REITs are considered a new sector on the Malaysian stock market compared to their presence in developed markets. In December 2009, Malaysia's REITs had a market capitalization of US$1540 million, which was less than market capitalization in Singapore and Hong Kong where the corresponding figures were US$20617 million and

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[4] 'Malaysia keen to attract overseas property investors as analysts predict steady real estate recovery' <http://www.propertywire.com/news/asia/malaysia/real-estate market> (last accessed 19 July, 2010).

US$9521 million respectively.[5] There are not many REITs listed in Bursa Malaysia and the trade volume is low. Many are under priced. However, investors believe that REITs are profitable with good prospects and with housing prices booming, coupled with relatively low interest rates, Bursa Malaysia has been promoting REIT to investors.

Consistent with the recent literature on this topic, we employ a unit root, cointegration and Granger causality testing framework. Because the housing and stock markets have been potentially subject to a major structural break in the form of the sub-prime crisis over the period we examine, we allow for a structural break in the unit root and cointegration tests. While the focus is on the relationship between real estate and stock markets, employing bivariate analysis is not satisfactory because the relationship between the variables might be spurious reflecting common factors (Quan & Titman, 1999; Ibrahim, 2010). This suggests that other control variables need to be added. We use the interest rate, which is likely to be a key determinant of an investor's ability to borrow to finance investment in the housing market and stock market (Chen, 2001). The availability of credit has been shown to be important in reinforcing boom-bust cycles in asset markets (see Oikarinen, 2009).

Data

The sample consists of daily data on 13 REITs, the KLCI and the interbank deposit rates (proxy for interest rate) for the period from 3 January 2006 to 31 March 2009. We have data on 13 REITs as follows: Amanah Harta Tanah PNB 1 (AHP1), Amanah Harta Tanah PNB 2 (AHP2), AmFIRST (AMFIRST), Al-'Aqar KPJ (ALAQAR), ATRIUM, AMANAHRAYA (ARREIT), Axis Real Estate Investment Trust (AXREIT), Al-Hadharah Boustead

[5] http://www.theedgeproperty.com/research/2459-reits-around-asia-2h2009.html (last accessed 19 July, 2010).

(BSDREIT), HEKTAR, Quill Capita Trust (QCAPITA), Starhill Real Estate Investment Trust (STARREIT), Tower Real Estate Investment Trust (TWRREIT) and UOA Real Estate Investment Trust (UOA REIT). Most of these REITs have investments predominantly, or exclusively, in Malaysian commercial real estate. Exceptions are ALAQAR with investments in hospitals in Bangladesh, Indonesia and Malaysia and BSDREIT, which is an Islamic plantation-based REIT. AHP1 and AHP2 were listed in 1989 and 1990 respectively, while the others have been listed since 2005. For the purposes of this study, the 13 REITs have different starting dates as follows: Group 1: 3/1/2006 - AHP1, AHP2, AXREIT, STARREIT, UOAREIT; Group 2: 12/4/2006 – TWRREIT; Group 3: 10/8/2006 – ALAQAR; Group 4: 4/12/2006 – HEKTAR; Group 5: 21/12/2006 – AMFIRST; Group 6: 8/1/2007 – QCAPITA; Group 7: 8/2/2007 – BSDREIT; Group 8: 26/2/2007 – ARREIT; and Group 9: 2/4/2007 – ATRIUM. The time span on all the series is dictated by data availability. Table 1 displays the summary descriptive statistics for the interest rate, KLCI and 13 REITs. Only two out of the 13 REITs showed positive returns during the sample period. AHP2 has the highest return while ATRIUM has the lowest. Most of the REITs exhibit negative skewness. Each of the Jarque-Bera statistics are statistically significant, meaning that all of the series are not normally distributed, which is a common feature of financial data.

Methodology

Order of Integration of the Variables

All data were transformed to natural logarithms before the analysis. Although the REITs have different starting dates, the number of observations for each REIT is more than 500 which is sufficiently long for the unit root analysis. We begin with testing the order of integration of the variables. We first applied the standard Augmented Dickey Fuller (ADF) unit root tests. Perron (1989) showed that the power to reject the null of a unit root decreases when the stationary alternative is true and a structural break is ignored. Hence, to further examine the stationarity properties of the data for each series, we employ the lagrange multiplier (LM) unit root test with one structural break proposed by Lee and Strazicich (2003). In contrast to the Perron (1989) and Zivot and Andrews (1992) ADF-type unit root tests, the LM unit root test has the major advantage that its statistical properties are unaffected by the existence of a structural break under the null hypothesis (see Lee and Strazicich, 2003).

The LM unit root test can be explained with the following data generating process (DGP): $y_t = \delta' Z_t + e_t$, $e_t = \beta e_{t-1} + \varepsilon_t$. Here, Z_t consists of exogenous variables and ε_t is an error term with classical properties. Lee and Strazicich (2003) developed two versions of the LM unit root test with one structural break. Using the same nomenclature as employed by Perron (1989), Model A is known as the 'crash' model, and allows for a one-time change in the intercept under the alternative hypothesis. Model A can be described by $Z_t = [1, t, D_t]'$, where $D_t = 1$ for $t \geq T_B + 1$, and zero otherwise; T_B is the date of the structural break, and $\delta' = (\delta_1, \delta_2, \delta_3)$. Model C, the 'crash-cum-growth' model, allows for a shift in the intercept and a change in the trend slope under the alternative hypothesis. It can be described by $Z_t = [1, t, D_t, DT_t]'$, where $DT_t = t - T_B$ for $t \geq T_B + 1$, and zero otherwise.

The LM unit root test statistic is obtained from the regression: $\Delta y_t = \delta' \Delta Z_t + \phi \bar{S}_{t-1} + \mu_t$, where $\bar{S}_t = y_t - \hat{\psi}_x - Z_t \hat{\delta}_t$, $t = 2,\ldots,T$; $\hat{\delta}$ are coefficients in the regression of Δy_t on ΔZ_t; $\hat{\psi}_x$ is given by $y_t - Z_t \delta$; and y_1 and Z_1 represent the first observations of y_t and Z_t respectively. The LM test statistic, $\tilde{\tau}$, is given by the t-statistic for testing the unit root null hypothesis that $\phi = 0$. The location of the structural break (T_B) is determined by selecting all possible break points for the minimum t-statistic as follows: $inf\ \tilde{\tau}\left(\bar{\lambda}_i\right)=\underset{\lambda}{inf}\ \tilde{\tau}\left(\lambda\right)$, where $\lambda = T_B/T$. The search is carried out over the trimming region (0.15T, 0.85T), where T is sample size. To select the lag length, we used the general to specific procedure proposed by Hall (1994). We set the maximum number of lags equal to eight and used the 10 per cent asymptotic normal value of 1.645 to ascertain the statistical significance of the last first-differenced lagged term. After deciding the optimal lag length for each breakpoint, we ascertained the break where the endogenous LM statistic is at a minimum. Critical values for the LM unit root test with one structural break are tabulated in Lee and Strazicich (2003).

Cointegration

Once the order of integration of each of the variables is ascertained, we proceed to test for cointegration. The existence of cointegration would imply that even though each individual series is non-stationary, one or more linear combinations of them are stationary.

The long-run multivariate model estimated for each REIT is as follows:

$$\ln REIT_t = \alpha + \beta_1 \ln IR_t + \beta_2 \ln SP_t + \varepsilon_t \qquad (1)$$

where $\ln REIT, \ln IR$ and $\ln SP$ are the natural logs of the REIT, interest rate and KPCI respectively, while the ε term is the serially independent random error with mean zero and finite covariance matrix. This equation is used to test whether the REIT, interest rate and KLCI are cointegrated. Gregory and Hansen (1996) proposed three models for testing cointegration where there is a structural break in the cointegrating vector.

The first contains a level shift (Model C):

$$\ln REIT_t = \alpha_1 + \alpha_2 D_t^{\tau} + \beta_1 \ln IR_t + \beta_2 \ln SP_t + \varepsilon_t,\ t = 1, ..., n \qquad (2)$$

The second model contains a level shift and trend (Model C/T):

$$\ln REIT_t = \alpha_1 + \alpha_2 D_t^{\tau} + \beta_0 t + \beta_1^{\tau} \ln IR_t + \beta_2^{\tau} \ln SP_t + \varepsilon_t\,,\ t = 1,...,n \qquad (3)$$

Here $D_t^{\tau} = 0$ for $t < \tau$ and $D_t^{\tau} = 1$ for $t \geq \tau$. The intercept before the level shift is denoted as α_1, while α_2 is the change in intercept due to the level shift.

The third model allows for a regime shift (Model C/S):

$$\begin{aligned}\ln REIT_t &= \alpha_1 + \alpha_2 D_t^{\tau} + \beta_0 t + \beta_1^{\tau} \ln IR_t + \beta_2^{\tau} \ln SP_t \\ &\quad + \beta_3^{\tau} \ln IR_t D_t^{\tau} + \beta_4^{\tau} \ln SP_t D_t^{\tau} + \varepsilon_t, \quad t = 1,...,n\end{aligned} \qquad (4)$$

Here, α_1 and α_2 are as in Equations 2 and 3. β_1^{τ} and β_2^{τ} denotes the cointegrating slope coefficient before the regime shift; and β_3^{τ} and β_4^{τ} denote the change in the slope coefficient. In order to test for cointegration between $REIT_t$ and IR_t and SP_t with structural change, i.e. the stationarity of ε_t in Equations 2–4, Gregory and Hansen (1996) propose a suite of tests. These statistics are the commonly used ADF statistics and extensions of the Z_{α} and Z_t test statistics proposed by Phillips (1987). These statistics are defined as:

$$ADF^* = \inf_{\tau \in T} ADF(\tau)$$

$$Z_{\alpha}^* = \inf_{\tau \in T} Z_{\alpha}(\tau)$$

$$Z_t^* = \inf_{\tau \in T} Z_t(\tau)$$

As the break point, τ, is unknown *a priori*, the model is estimated recursively allowing the break point to vary between (0.15T, 0.85T), where T is the sample size. The null hypothesis of no cointegration is examined using the three statistics with interest in the smallest values for the three statistics across all break points required to reject the null.

Granger Causality

Once it is established whether or not there is a long-run relationship between the series, we test whether there is Granger causality between interest rates, REITs and stock prices. If interest rates, REITs and stock prices are cointegrated, an error correction term should be included in the multivariate autoregression model as follows (Granger, 1988)

$$\Delta \ln REIT_t = \alpha + \sum_{i=1}^{k} \delta_{1i} \Delta \ln REIT_{t-i} + \sum_{i=1}^{k} \gamma_{1i} \Delta \ln IR_{t-i} + \sum_{i=1}^{k} \lambda_{1i} \Delta \ln SP_{t-i} + \phi_1 ECT_{t-1} + \varepsilon_t$$

$$\Delta \ln IR_t = \alpha + \sum_{i=1}^{k} \delta_{2i} \Delta \ln REIT_{t-i} + \sum_{i=1}^{k} \gamma_{2i} \Delta \ln IR_{t-i} + \sum_{i=1}^{k} \lambda_{2i} \Delta \ln SP_{t-i} + \phi_2 ECT_{t-1} + \varepsilon_t$$

$$\Delta \ln SP_t = \alpha + \sum_{i=1}^{k} \delta_{3i} \Delta \ln REIT_{t-i} + \sum_{i=1}^{k} \gamma_{3i} \Delta \ln IR_{t-i} + \sum_{i=1}^{k} \lambda_{3i} \Delta \ln SP_{t-i} + \phi_3 ECT_{t-1} + \varepsilon_t$$

where Δ is the first difference, ECT is the error correction term derived from Equation (1) and all variables are as defined above. The VECM combines the long-run information as well as their short-run dynamics; specifically, the lagged error correction term depicts long-run causality while the lagged first difference variables depict short-run causality.

To illustrate the difference between short-run and long-run Granger causality assume that there is a long-run equilibrium relationship between stock prices and REITs, stock prices Granger cause REITs and a shock occurs that changes stock prices. The shock will affect the dynamic path of REITs in two ways. First there is a short-run transitory impact that is captured by the coefficients on REITs. Second, there is then a further long-run impact through the error correction term operating to restore the long run equilibrium. This long-run impact is absent in the case when only the short-run causality is present. If we have only short-run causality a change in stock prices Granger causes only a short term change in REITs. However, if we have both short-run and long-run causality two impacts operate, the short term impact, and a long term impact as equilibrium between the variables is restored.

The presence of long-run causality is based on the significance of the error-correction coefficient using the standard t test. We apply standard F-tests to the *k* lagged coefficients of each variable to make Granger causal inferences. In particular, we test the hypotheses below:

$H_{01}:\gamma_{11}=\gamma_{12}=...=\gamma_{1k}=0$ for the pairwise causality relationship running from IR to REIT.

$H_{02}:\delta_{11}=\delta_{12}=...=\delta_{1k}=0$ for the pairwise causality relationship running from REIT to IR.

There are four alternative causality relationships from the hypotheses above. First, if we reject H_{01} but do not reject H_{02}, this implies Granger causality is running from IR to REIT. Second, if we do not reject H_{01} but reject H_{02} this implies that Granger causality is running from REIT to IR. Third, if we reject both H_{01} and H_{02} this means that there is a feedback effect between REIT and IR. Fourth, if we do not reject H_{01} or H_{02}, this means that REIT and IR are independent. The same explanation can be applied for the other pair of variables.

Results

The results of the ADF test are reported in Table 2. AHP2, ALAQAR and QCAPITA are integrated of order zero (I(0)) with constant and trend included; however, they do not reject the null of a unit root if the series are tested without constant and trend. The other nine series are each integrated of order one (I(1)). The results for the LM unit root test with one structural break are presented in Tables 3 and 4. In Model A, we find that the unit root null for AHP2 and ARREIT is rejected at the 5 per cent level and in Model C the unit root null for AHP2 is again rejected at the 5 per cent level. All other series are (I(1)) at the per cent level or better for both models. In Model A, the break in the intercept is statistically significant at the 5 per cent level or better for each of the variables except the interest rate. In Model C, except for HEKTAR and UOAREIT, the break in the intercept and/or slope is statistically significant at the 5 per cent level or better in each case. The breakpoints for the REITs mostly coincide with the worst months of the subprime crisis in July to September, 2008. In Model A, the breakpoint for KLCI is on the next Monday after the twelfth General Election which is often described as a ‘political tsunami’ in Malaysia, in which the ruling Barisan National Party lost government in five states and its two-third majority in the Parliament.

The results of the Gregory and Hansen (1996) cointegration test with a structural break are presented in Table 5. There are a range of break points across the test statistics and models, but almost all coincide with the subprime mortgage crisis. We find strong evidence of cointegration between the REIT, interest rate and stock index for most of the REIT except AXREIT, ATRIUM and STARREIT. The null hypothesis of no cointegration is not rejected with any of the test statistics for any of the three models (C, C/T, C/S) for AXREIT. For ATRIUM, the null hypothesis is rejected with Z_t^* for model C/T at the 10 per cent level. For STARREIT, the null hypothesis is rejected for model C/T with the three test statistics.

Table 6 presents the Granger causality results. For 12 of the 13 REITs we include an error-correction term. For AXREIT, we only test for short-run Granger causality. Beginning with the short run, there is no short run Granger causality between IR and the other two variables except for BSDREIT, for which Granger causality is running one way from REIT to IR. At the 5 per cent level or better there is unidirectional Granger causality in the short run running from SP to REIT, consistent with a wealth effect, for AHP1, AHP2, AMFIRST, AXREIT, QCAPITA, STARREIT, TWRREIT and UOAREIT. For ALAQAR, BSDREIT and HEKTAR, REIT and SP are independent in the short run. Turning to the long-run, for six REITs (AHP2, AMFIRST, ATRIUM, QCAPITA, STARREIT, UOAREIT) there is long-run Granger causality running from REIT and SP to IR. There is strong support for the wealth effect. For five REITs (ATRIUM, BSDREIT, HEKTAR, TWRREIT, UOAREIT) unidirectional Granger causality runs from IR and SP to REIT at the 5 per cent level or better in the long run, consistent with the wealth effect. For four REITs (AHP1, AHP2, ALAQAR, ARREIT), there is bidirectional Granger causality between REIT and SP at the 5 per cent level or better in the long run. The feedback effect is consistent with both a wealth effect and a credit-price effect and can be a potential explanation of spiralling upturns of both prices. For three REITs (AMFIRST, QCAPITA, STARREIT), IR and SP are independent, meaning that the two markets are segmented in the long-run. For those cases where the error-correction term is significant, given deviations from long-run equilibrium, the speed of adjustment towards the long-run equilibrium is faster for REITs than SP.

Conclusion

The main finding is this paper that for some REITs there is a wealth effect and for others there is a feedback effect, consistent with a spiralling upturn in both housing and stock markets, lends credence to concerns that the Malaysian real estate market is characterized by an asset bubble and that a decline in the stock market could burst the Malaysian real estate bubble. Such an explanation places the stock market centre stage and suggests that the stock market is crucial for stability in the real estate market. This result is similar to Ibrahim's (2010) findings for Thailand. He argued that the burst in the Thai housing market following the Asian financial crisis in 1997-1998 was a result of declining stock markets. The result is also consistent with the findings of other studies that the stock market Granger causes economic growth in Malaysia (see eg. Mun *et al.*, 2008). The policy implication of finding widespread evidence of a wealth effect is that policymakers should implement policies to promote stability in the stock market. Following the Asian financial crisis, the Kuala Lumpur Stock Exchange and Securities Commission put in place a series of standards designed to improve transparency, disclosure, accounting and corporate governance, but these standards still fall short of international standards (Shimomoto, 1999). As it stands, for most of the period studied there has been a positive wealth effect, reinforced by a positive credit-price effect, in the Malaysian asset market. As a result the real estate and stock markets have had positive feedback effects on each other. But, if stock markets were to decline, a negative wealth effect would have a large negative impact on the real estate market and this would then feedback to the stock market creating a downward spiral in prices.

One of the limitations of this study is that the sample is constrained due to the availability of data on REITs. REITs are still an embryonic form of investment in Malaysia and, as such, may not be a very good proxy for investment in real estate. Further research is needed for other Asian markets, such as Singapore, in which REITs are more established. A second potential limitation is that we have looked at the relationship between investment in real estate, proxied by the REITs, and the stock market for Malaysia as a whole. If consistent data in housing prices in ‘property hot spots’ such as Kuala Lumpur, the Klang Valley and Penang were to become available, future research could examine if there are differences in the dynamic linkages between real estate and stocks between geographical areas with different price levels. As pointed out by Green (2002) and Kapopoulos and Siokis (2005), a more expensive housing market could be a prime candidate for the wealth effect to be large.

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Table 1: Descriptive statistics

Series	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	n
Interest Rate	3.376478	0.312774	-3.20251	13.06543	5017.387	846
KLCI	1119.53	194.559	0.174121	1.522888	81.18542	846
AHP1	110.8045	8.850188	0.244806	1.804574	58.82393	846
AHP2	117.0304	11.65211	0.236375	2.613118	13.15429	846
ALAQAR	95.50557	5.673908	-1.04978	3.390093	130.9193	689
AMFIRST	99.72768	5.451265	-0.36957	3.301087	15.76542	594
ARREIT	92.58428	6.492529	-1.64153	4.841701	322.9661	547
ATRIUM	93.57565	16.23328	-0.45463	1.842493	47.12328	522
AXREIT	96.39578	13.28555	-0.63423	4.071186	97.16423	846
BSDREIT	110.5848	13.31546	-0.05599	1.730429	37.83382	559
HEKTAR	116.8389	25.16724	-0.16963	1.623914	50.80348	607
QCAPITA	**124.3234**	**28.60912**	0.683746	2.799889	46.31935	582
STARREIT	90.91726	8.736932	-0.14522	2.640069	7.540312	846
TWRREIT	102.7857	18.23294	0.544356	1.854855	80.62105	775
UOAREIT	97.85946	11.44492	0.278515	2.251751	30.67311	846

Table 2: ADF unit root test

series	level		First difference	
	lag	t-statistic	lag	t-statistic
Interest Rate	0	0.673320	0	-29.38520***
KLCI	1	-0.574735	0	-26.10894***
AHP1	5	-1.718209	4	-18.43804***
AHP2	2	-3.965816**	1	-26.18868***
ALAQAR	1	-3.662181**	1	-22.94522***
AMFIRST	1	-3.020460	0	-33.58209***
ARREIT	4	-1.295491	3	-16.95810***
ATRIUM	2	-2.295732	1	-21.81740***
AXREIT	0	-1.519717	0	-29.52673***
BSDREIT	0	-1.984224	0	-25.80888***
HEKTAR	2	-1.444554	1	-22.56293***
QCAPITA	2	-4.912277***	1	-19.80769***
STARREIT	2	-1.741549	1	-24.38664***
TWRREIT	0	-1.219509	0	-30.42831***
UOAREIT	3	-1.349659	2	-21.02486***

* (**) *** denote statistical significance at the 10%, 5% and 1% levels respectively.

Table 3: LS test Model A with a Structural Break

	TB	k	S_{t-1}	1	B_t
Interest rate (IR)	29/8/06	0	-0.0044 (-1.3619)	0.0009 (0.7859)	0.0143 (1.1196)
KLCI	10/3/08	3	-0.0018 (-0.9537)	0.0003 (0.5712)	0.0430*** (4.0360)
AHP1	5/9/08	7	-0.0277 (-2.3137)	0.0010 (1.3839)	-0.1227*** (-6.9830)
AHP2	4/7/08	2	-0.0579** (-4.1617)	-0.0024** (-2.3182)	-0.0683*** (-3.0747)
ALAQAR	18/8/08	7	-0.0480 (-3.1089)	0.0005 (0.8441)	-0.0333** (-2.4120)
AMFIRST	3/9/08	1	-0.0305 (-2.6716)	0.0001 (0.2665)	-0.0400*** (-3.3207)
ARREIT	13/11/08	6	-0.0684** (-3.7105)	-0.0001 (-0.1636)	-0.1891*** (-9.2918)
ATRIUM	22/7/08	6	-0.0203 (-1.9740)	0.0015 (1.1149)	-0.0752*** (-3.8359)
AXREIT	20/4/07	7	-0.0078 (-1.8607)	0.0004 (0.6000)	0.0669*** (4.6496)
BSDREIT	5/8/08	1	-0.0104 (-1.6028)	0.0012 (1.1424)	-0.0467*** (-2.8999)
HEKTAR	12/8/08	4	-0.0081 (-1.2664)	0.0015 (0.9197)	-0.1760*** (-6.4640)
QCAPITA	1/4/08	6	-0.0128 (-1.9622)	0.0036* (1.6986)	-0.1875*** (-7.1573)
STARREIT	10/4/07	2	-0.0150 (-2.2486)	0.0003 (0.5423)	0.0622*** (5.4024)
TWRREIT	7/3/08	1	-0.0043 (-1.2477)	0.0003 (0.3948)	-0.1194*** (-6.7367)
UOAREIT	15/7/08	4	-0.0088 (-1.5781)	0.0002 (0.3833)	-0.0796*** (-4.7793)

Notes: Critical values for the LM test at 10%, 5% and 1% significant levels = -3.211, -3.566, -4.239.
Critical values for other coefficients based on standard t distribution = 1.645, 1.96, 2.576.
* (**) *** denote statistical significance at the 10%, 5% and 1% levels respectively.

Table 4: LS test Model C with a Structural Break

	TB	k	S_{t-1}	1	B_t	D_t
Interest rate	3/10/08	0	-0.0309 (-3.6410)	0.0022*** (3.0273)	0.0048 (0.3770)	-0.0041*** (-3.3238)
KLCI	20/12/07	3	-0.0193 (-3.0857)	0.0004 (0.7602)	-0.0338*** (-3.4103)	-0.0030*** (-4.2089)
AHP1	25/6/07	7	-0.0811 (-4.1535)	-0.0028** (-2.4071)	0.0659*** (3.6852)	0.0034** (2.1753)
AHP2	10/3/08	5	-0.0641** (-4.9804)	0.0008 (0.9387)	0.3323*** (15.9143)	-0.0157*** (-4.7332)
ALAQAR	3/9/08	7	-0.0594 (-3.4407)	0.0002 (0.2806)	-0.0368*** (-2.6383)	-0.0021 (-1.5093)
AMFIRST	26/7/07	1	-0.0612 (-3.7682)	-0.0003 (-0.2922)	0.0057 (0.4761)	-0.0027** (-2.2051)
ARREIT	23/6/08	4	-0.1225 (-4.0843)	-0.0049*** (-2.8900)	-0.0001 (-0.0035)	0.0046* (1.9008)
ATRIUM	31/10/07	8	-0.0552 (-3.0188)	0.0021 (1.3366)	0.0146 (0.8195)	-0.0041** (-2.2459)
AXREIT	1/6/07	7	-0.0198 (-2.8676)	-0.0010 (-1.1164)	0.0424*** (2.9518)	0.0002 (0.2160)
BSDREIT	7/7/08	0	-0.0568 (-4.0396)	0.0023** (2.4613)	-0.0203 (-1.2652)	-0.0099*** (-4.2004)
HEKTAR	18/7/07	4	-0.0259 (-2.2570)	-0.0018 (-0.6149)	0.0435 (1.5743)	-0.0002 (-0.0558)
QCAPITA	3/7/07	6	-0.0636 (-4.1073)	0.0178*** (4.3382)	-0.0190 (-0.7436)	-0.0197*** (-4.5080)
STARREIT	10/4/07	2	-0.0347 (-3.5576)	-0.0021** (-2.4918)	0.0606*** (5.2887)	0.0019* (1.7885)
TWRREIT	27/7/07	2	-0.0231 (-2.7207)	-0.0043** (-2.0430)	0.0600*** (3.3463)	0.0036 (1.5109)
UOAREIT	25/6/07	8	-0.0200 (-2.3003)	-0.0024 (-1.6436)	-0.0225 (-1.3168)	0.0022 (1.2469)

Critical values

location of break, λ	0.1	0.2	0.3	0.4	0.5
1% significant level	-5.11	-5.07	-5.15	-5.05	-5.11
5% significant level	-4.50	-4.47	-4.45	-4.50	-4.51
10% significant level	-4.21	-4.20	-4.18	-4.18	-4.17

Notes: The critical values are symmetric around λ and (1-λ).

* (**) *** denote statistical significance at the 10%, 5% and 1% levels respectively.

Table 5: Gregory and Hansen Test for Cointegration with a Structural Break

Series	Model	ADF*	k	TB	Z^{*}_{t}	TB	Z^{*}_{α}	TB
AHP1	C	-4.8180^{*}	5	14/5/07	-8.2939^{***}	10/5/07	-123.24^{***}	10/5/07
	C/T	-4.8099	5	14/5/07	-8.2835^{***}	10/5/07	-122.91^{***}	10/5/07
	C/S	-4.8701	5	14/5/07	-8.5373^{***}	25/5/07	-129.97^{***}	25/5/07
AHP2	C	-6.3427^{***}	1	28/6/07	-7.3158^{***}	29/6/07	-96.945^{***}	29/6/07
	C/T	-6.8613^{***}	1	28/6/07	-8.0226^{***}	29/6/07	-115.58^{***}	29/6/07
	C/S	-7.1022^{***}	1	2/7/07	-8.2612^{***}	29/6/07	-121.85^{***}	29/6/07
ALAQAR	C	-5.5448^{***}	1	14/8/08	-6.6858^{***}	18/1/07	-82.138^{***}	18/1/07
	C/T	-4.6401	7	18/8/08	-7.0120^{***}	28/5/07	-89.663^{***}	28/5/07
	C/S	-4.7053	2	3/9/08	-7.1211^{***}	24/4/08	-92.796^{***}	24/4/08
AMFIRST	C	-4.3818	1	15/10/07	-4.9745^{**}	15/10/07	-45.412^{*}	15/10/07
	C/T	-5.0442^{*}	1	15/10/07	-5.7239^{**}	15/10/07	-58.693^{**}	15/10/07
	C/S	-4.6002	1	15/10/07	-5.1794	15/10/07	-48.797	15/10/07
ARREIT	C	-5.6323^{***}	2	20/11/08	-8.9005^{***}	5/12/08	-129.89^{***}	5/12/08
	C/T	-8.2592^{***}	1	5/12/08	-10.918^{***}	5/12/08	-183.47^{***}	5/12/08
	C/S	-6.2615^{***}	1	13/6/08	-9.2745^{***}	14/11/08	-140.29^{***}	14/11/08
ATRIUM	C	-3.4089	6	15/11/07	-3.6980	20/11/07	-25.807	20/11/07
	C/T	-3.9539	2	19/7/07	-5.0385^{*}	18/7/07	-45.984	18/7/07
	C/S	-3.8646	4	7/3/08	-4.7916	19/3/08	-40.033	19/3/08
AXREIT	C	-3.6944	0	3/10/08	-3.6833	3/10/08	-26.425	3/10/08
	C/T	-3.5232	0	3/10/08	-3.4946	3/10/08	-24.104	3/10/08
	C/S	-3.6655	0	17/9/08	-3.6452	17/9/08	-25.998	17/9/08
BSDREIT	C	-5.1380^{**}	0	1/2/08	-5.1540^{**}	23/1/08	-49.970^{**}	23/1/08
	C/T	-6.6221^{***}	0	30/7/08	-6.4902^{***}	30/7/08	-77.946^{***}	30/7/08
	C/S	-5.3910^{*}	0	12/2/08	-5.4875^{*}	5/3/08	-56.412^{*}	5/3/08
HEKTAR	C	-4.3565	8	7/6/07	-4.8651^{*}	15/6/07	-43.046^{*}	15/6/07
	C/T	-4.8063	1	15/6/07	-5.1587^{*}	15/6/07	-49.197^{*}	15/6/07
	C/S	-4.6405	1	8/5/07	-5.1249	24/5/07	-48.693	24/5/07
QCAPITA	C	-5.5432^{***}	6	3/9/07	-5.2905^{**}	4/9/07	-43.565^{*}	4/9/07
	C/T	-5.5237^{**}	6	3/9/07	-5.4713^{**}	10/9/07	-50.732^{*}	10/9/07
	C/S	-6.2054^{***}	0	13/9/07	-6.1470^{***}	10/9/07	-69.731^{***}	10/9/07
STARREIT	C	-3.5956	7	28/8/07	-3.5568	3/9/07	-23.469	3/9/07
	C/T	-5.3217^{**}	0	8/2/07	-5.2367^{*}	7/2/07	-53.010^{*}	7/2/07
	C/S	-4.2759	1	4/9/07	-4.4824	3/9/07	-39.106	3/9/07
TWRREIT	C	-3.8480	1	2/7/07	-3.8723	2/7/07	-24.627	28/6/07
	C/T	-6.0021^{***}	0	10/7/07	-5.8067^{***}	10/7/07	-62.395^{**}	10/7/07
	C/S	-5.6722^{**}	0	29/6/07	-5.6416^{**}	18/6/07	-60.936^{**}	18/6/07
UOAREIT	C	-4.3773	2	12/9/06	-5.1082^{**}	13/9/06	-49.583^{**}	13/9/06
	C/T	-8.3552^{***}	0	13/6/07	-8.5224^{***}	19/6/07	-132.49^{***}	19/6/07
	C/S	-6.6004^{***}	0	11/6/07	-6.4981^{***}	7/6/07	-80.187^{***}	7/6/07

Note: * (**) (***) denotes statistical significance at the 10(5)(1)% level.

Critical values with m = 2 (excluding intercept)

	ADF* and Z^{*}_{t}			Z^{*}_{α}		
Model	1%	5%	10%	1%	5%	10%
C	-5.44	-4.92	-4.69	-57.01	-46.98	-42.49
C/T	-5.80	-5.29	-5.03	-64.77	-53.92	-48.94
C/S	-5.97	-5.50	-5.23	-68.21	-58.33	-52.85

Table 6: Granger Causality Results

Series		REIT	IR	SP	ECT
AHP1	REIT	-	2.9781	24.5911***	-0.0429***
	IR	0.3325	-	1.59221	-0.0065
	SP	8.3850*	1.7729	-	-0.0158**
AHP2	REIT	-	1.4299	25.2572***	-0.0344***
	IR	1.711542	-	0.3421	-0.0181***
	SP	5.6295*	0.4655	-	-0.0129***
ALAQAR	REIT	-	0.9425	2.5558	-0.0314***
	IR	3.4889	-	1.0042	0.0008
	SP	1.9709	0.4537	-	0.0281***
AMFIRST	REIT	-	3.8135	18.5312***	-0.0015
	IR	0.8069	-	1.4970	0.0050***
	SP	0.9044	1.2722	-	-0.0002
ARREIT	REIT	-	3.1866	0.0791	-0.1413***
	IR	0.1215	-	0.9365	0.0159
	SP	1.0825	0.2855	-	-0.0385***
ATRIUM	REIT	-	1.4615	1.5470	-0.0069**
	IR	0.8751	-	0.2651	-0.0066***
	SP	4.4600	0.5323	-	-0.0010
AXREIT	REIT	-	3.4774	10.1655***	-
	IR	0.0994	-	0.9989	-
	SP	2.6611	0.5296	-	-
BSDREIT	REIT	-	0.0393	1.4161	-0.0207***
	IR	4.9025**	-	0.1221	-0.0104
	SP	1.7600	0.4085	-	-0.0050
HEKTAR	REIT	-	2.2835	0.0711	-0.0293***
	IR	0.1768	-	0.3506	-0.0048
	SP	2.2923	0.6486	-	-0.0016
QCAPITA	REIT	-	0.4528	5.6784**	-0.0005
	IR	0.0068	-	0.0027	-0.0019***
	SP	0.6271	0.5096	-	-0.0000
STARREIT	REIT	-	0.6878	11.4901***	-0.0033
	IR	1.2098	-	1.7546	0.0153***
	SP	1.8638	1.8440	-	0.0003
TWRREIT	REIT	-	0.5764	13.8574***	-0.0187***
	IR	0.9241	-	0.6160	-0.0022
	SP	1.9347	0.6072	-	-0.0056*
UOAREIT	REIT	-	0.7670	12.4154**	-0.0196**
	IR	1.8287	-	3.0484	0.0158**
	SP	7.4930	1.7433	-	0.0011

* (**) *** denote statistical significance at the 10%, 5% and 1% levels respectively.