Housing prices in peninsular Malaysia: supported by income, foreign inflow or speculation?

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Abstract
Purpose – This paper is motivated by a concern about the ability of the average Malaysian income to catch up with the rapidly increasing house prices in Peninsular Malaysia. Financial innovation in financial system now regards houses as a financial asset and speculation vehicle. Therefore, a house purchase is made to acquire not merely a necessity but also a financial asset which can generate future returns. Given the problems in the housing market, this paper aims to examine the determinants of house prices in Malaysia, including those such as income, population, foreign inflow and speculation.

Design/methodology/approach – This study adopts panel data analyses, namely, the fixed effect model (FEM) and the pooled mean group (PMG), and uses data at state level in quarterly frequency, spanning from 2005Q1 to 2013Q4.

Findings – Based on the results of FEM, these determinants influence house prices significantly. Moreover, the PMG results suggest that there is convergence in the model, which are indicated by the significant and negative sign of the error correction term. In conclusion, the rapidly increasing house price is not caused by speculation activities in the housing market. More precisely, Malaysian income is capable of catching up with the increasing house prices.

Practical implications – As income remains to be one of the major drivers in influencing Malaysian house price, Malaysian Government shall continue the policies of supply low cost houses to the low-income groups and My First Home Scheme (SRP) by offering less stringent rules in applying house loan for the first-time house buyers.

Originality/value – This study used the actual data of foreign housing purchase obtained from Malaysia Valuation and Property Services Department to represent foreign inflow; therefore, the results will reflect the impact of foreign inflow in a better manner.

Keywords Malaysia, Income, Housing bubble, House prices, Speculation, Foreign inflow

Paper type Research paper

Introduction
House prices have traditionally been determined by income and utility, but financial innovation has had a big impact on the housing market. For instance, a house no longer

JEL classification – C32, E31, G14, O11, O53, R30
serves as just shelter, but has also become an instrument for investment and capital preservation. Consequently, determining house prices has become even more complicated due to investment and speculation in the housing market. Moreover, the securitisation process provides an additional investment channel for both investors and speculators. Instead of buying a house, investors can purchase securities such as Mortgage Backed Securities and Real Estate Investment Trusts. These investment and speculative activities can create uncertainty in the housing market. Such uncertainties certainly affect everyone, in both the business and household sectors, because of the necessity characteristic of this sector, and its broad involvement in the economy (Chen, 2006; Reinhart and Rogoff, 2008; Wong et al., 2015).

House prices in Malaysia have increased rapidly in recent years. Several reports such as Suraya (2015) from the Khazanah Research Institute and Cheah and Stefanie (2016) from the Bank Negara Malaysia have commented that the escalating Malaysian house prices have made the housing market unaffordable. Hence, housing affordability has become a major concern for Malaysian citizens and policymakers. Owning a house is a goal for most people. However, because of the long-term commitment, and proportion of income involved in buying a house, such expenditure is vastly different to buying consumer goods. In Malaysia, the repayment period for a house mortgage is typically fifteen to thirty-five years. As can be seen from the existing literature, the foundation of house pricing movements is complex. The first consideration is the demand factor. Demand is mainly determined by several fundamental elements, such as income and population. Holly and Jones (1997) emphasised the role of income in terms of acquiring a house. Without sufficient income, any individual will face difficulty during loan applications for house purchases.

Other than income, population also affects demand. In practice, the capacity of a house may no longer be satisfactory whenever new members enter into a household through marriage or birth. Thus, a new house is needed, and may be either rented or bought. In a macro perspective, income and population density, acting as a proxy for population, will determine house prices. It is therefore not surprising that high-density states such as Kuala Lumpur will have a higher median price level compared to low density states, such as Kelantan. Since houses are investment and speculation vehicles as well as financial assets, the house price determination process becomes more complicated when taking investment and speculation demands into consideration.

Other than this, house prices also differ across the regions and can be caused by various demographic factors such as economic activities, population and income. Figure 1 shows Malaysian state level house prices from the years 2003 to 2016. First, Kuala Lumpur as the capital city of Malaysia exhibits the highest prices among the Malaysian states. This phenomenon is normal and happens in most countries, where the capital city always appears at the top of the list. This is followed by Selangor, Sabah, Sarawak and Pulau Pinang. The five states comprise the top five highest house price states in Malaysia. Higher house prices occur in Selangor and Pulau Pinang primarily because of high urbanisation as well as high density in these two states, especially since Selangor is located nearest to the capital city, Kuala Lumpur. Sabah and Sarawak are situated on Borneo Island, East Malaysia. The price level in East Malaysia tends to be higher than in West Malaysia, regardless of goods or services, because of the extra transportation costs involved in shipping goods through, or flying it across the South China Sea. To avoid the discrepancies between housing
prices in East and West Malaysia, West Malaysia has been chosen as the focus of this study.

Overall, Malaysian housing prices achieved steady growth from 2000 to 2016, except for 2008. National house price growth slowed down during 2008, but still achieved positive growth. The slowdown was caused by the sub-prime crisis which originated from the USA (US) and was transmitted to Malaysia through trade linkage. Figure 2 shows the national aggregated house price and Gross Domestic Product (GDP) in Malaysia. Generally, national house prices show a steady growth from 2000 to 2006, but moderate growth during the period 2008 to 2016.

**Figure 1.**
Malaysia state level aggregate house price 2003-2016

**Source:** Valuation and property services department (JPPH)

**Figure 2.**
Malaysia national aggregate house price and GDP from 2000-2016

**Source:** Valuation and property services department (JPPH)
Based on Figure 2, we can clearly observe that there is an upward trend for both house prices and GDP from 2000 to 2016. Although two major crises affected the Malaysian economy during this time (the sub-prime crisis and recent European and US debt crisis); the increasing trend in house prices still persist. Thus, an important research question arises. What are the causes of the increasing house price? Sin Chew Daily[1], Roberts (2013, Property Showrooms) and Tillmann (2013) commented that the rising price may be caused by foreign capital inflow from western countries to eastern countries, especially since the sub-prime and European debt crisis. However, there is no relevant data regarding foreign ownership and inflow in terms of the housing market. Besides, Tillmann focussed his analysis on a group of Eastern countries, where country-specific policy implications could not be determined. Thus, there is doubt that foreign inflow has been driving growth in Malaysian house prices.

This paper is motivated by the concern about the ability of Malaysian income to catch up to the rapidly increasing house prices in Peninsular Malaysia. As the financial system develops, financial innovation has caused houses to become both financial assets and speculation vehicles. Therefore, this study aims to examine whether the demand for houses in Peninsular Malaysia is supported by Malaysian income, or driven by speculation activities. To answer this question, we have to look at the common factors[2] such as housing service demand, speculation, and foreign inflow, all of which drive house prices. In other words, this study aims to examine the determinants of house prices in the 12 states in Peninsular Malaysia: Kuala Lumpur, Selangor, Johor, Pulau Pinang, Kedah, Kelantan, Melaka, Negeri Sembilan, Perlis, Pahang, Perak and Terengganu.

The results of this study can provide a better understanding of house price determinants in Malaysia, by determining the factors that drive fluctuations of house prices in Malaysia. The findings are expected to provide a reference for households and policy-makers to make wise decisions in the housing market. This paper contributes to the housing market in Malaysia in two important ways. First, many studies in Malaysia, with the exception of Tillmann (2013), have ignored the effect of foreign inflow on the Malaysian housing price – for example, Ibrahim and Law (2014) and Hashim (2010). However, this study differs significantly from that of Tillmann (2013) in terms of the data and method used. Tillmann (2013) used portfolio investment and foreign direct investment in balance of payment as proxy for foreign inflow. However, these proxies are less appropriate, as there is no direct involvement between these variables and housing demand in Malaysia. This study will utilise state level foreign purchase data on housing, obtained from the Valuation and Property Services Department, Malaysia (JPPH), to represent foreign inflow. Therefore, the results will reflect regional foreign inflow better.

Second, this study applies the recent method of dynamic heterogeneous panel data analysis, also known as the pooled mean group (PMG) estimation as proposed by Pesaran et al. (1999), to detect speculation forces in Malaysia housing market, together with the Westerlund error correction term (ECT) Cointegration Test. Previous studies such as Chen et al. (2007) used panel co-integration to detect speculation force. However, panel co-integration alone cannot be used to estimate the long run coefficient. Hence, adopting PMG will improve the results.

**Literature review**

*Fundamentals and hedonic factors*

Malaysian housing affordability is jointly determined by house price, income and the interest rate, where the income must catch up with the pace of hikes in house prices and interest rates (Hashim, 2010). Therefore, to assess affordability, the determinants for
movements in housing prices must be identified. According to Goodman (1978), Jim and Chen (2007) and Selim (2009), house prices vary according to house characteristics such as land area, positioning in built-up areas, number of rooms, location, and other characteristics, while Dumm et al. (2016) specifically emphasised waterfront properties [3]. Holly and Jones (1997) suggested that the major determinants of real house prices are real income, population and age group. In a recent study, Morley and Thomas (2011) included investment and speculation factors because of financial innovations which now regard housing as financial assets.

There are several past literatures on the housing market in Malaysia. These include Malpezzi and Mayo (1997), who studied the impact of government intervention in the housing market during the 1980s. A high degree of government intervention led to high cost for supplying new housing despite government subsidies, which caused an inelastic supply in the Malaysian housing market and ultimately contributed to a boom-bust cycle.

Furthermore, Tan (2010) found that there is a significant negative relationship between the lending rate and housing activities, while house prices show an insignificant result. The insignificance of housing prices on these activities is because of the mismatch between housing supply and demand, especially on the supply side, whose mismatch is the result of new unsold property and abandoned projects. He also investigated house prices based on house buyers’ preferences in neighbourhood features, as well as the determinants of house prices in Malaysia. The results suggested that housing developers should provide more gated or guarded features in new projects, since most of the respondents regarded that as one of the main considerations when buying a house (Tan, 2011). In addition, Ibrahim and Law (2014) and Tang and Tan (2015) also found similar results whereby the interest rate affected house prices significantly in a negative way.

**Regional effect of the housing market**

Both studies of the Malaysian housing market mentioned above ignored the importance of regional effects. In the study done by Fingleton (2006), the author quoted Tobler’s “first law of geography” to explain regional effects in the housing market in England, where “everything is related to everything else, but nearer things are more related than distant things”. In other words, the housing market is spatially segmented. House prices will not be exactly the same within regions. However, house prices are interdependent on each other, especially when houses are located near to each other. Fingleton (2006) used regional data such as income, commuting distance, school quality and housing stock to determine house prices. Because of buyers’ cost and time constraints, commuting distance is one of the major concerns in job and housing decisions. Generally, house prices tend to be higher if the housing area is near a central business district. Similarly, Lean and Smyth (2013) suggested that the Malaysian housing market is segmented by regional demographic factors. House prices will not fluctuate in the same manner across different regions. However, the “ripple effect” caused by migration does take place in developed regions.

Other than that, Beer (2001) studied the housing segmentation of Australia by looking at private rentals. The Australian government has not invested much in rental units, while investors only invest in metropolitan areas. Rent and house prices are not stable in rural areas, causing investors to prefer investing in metropolitan areas. The author contended that the cause is labour migration, where higher income labour with their higher purchasing power moves to metropolitan areas, while low-income labourers such as farmers and settlers work in rural areas where they demand only basic amenities. In other words, house prices in rural areas remain low despite increases in the population and labour force. Other studies complement Beer’s (2001) study. This includes Allen et al. (2009) and Tu (2000), who
investigated the housing market segmentation in Canada and Australia, respectively. Both authors also concluded that house prices depend on local factors or subgroups. Allen et al. (2009) stated that the Canadian labour market is local in nature, and thus city house prices do not converge among the cities. Tu (2000) stated that the disparity of economic performance on a sub-national level will cause different behaviour in house price movements.

Investment and speculation
From an investment perspective, asset pricing is critical. Housing serves a function that is similar to financial assets (Morley and Thomas, 2011; Cannon et al., 2006), which can provide returns in the form of rent. The rational expectation is that it will be one of the keys to explaining the formation of speculation forces or bubbles, based on the existing information in the market. Therefore, the present value model as developed by Campbell and Shiller (1987), which is based on rational expectation and which is meant for financial asset pricing, is feasible to determine house prices by using low frequency data (Clark, 1995). In other words, components in the present value model such as expected return, risk, the discounting factor, other expectations and time frame are useful to determine house prices from an investment perspective. Moreover, the role of foreign inflow in determining house prices has also been discussed extensively in the past (Zheng et al., 2010; Jiang et al., 1998; Tillmann, 2013). Tillmann (2013) used portfolio investment and foreign direct investment in balance of payment as proxy to study the relationship between house prices and foreign inflow. He found that the rising Malaysian house prices were caused by foreign inflow.

Chan et al. (2001) also used rational expectation to define the fundamental pricing of housing as a sum of the expected present value of rent, with the assumption that the rent was discounted at a constant discounting factor. The objective of Chan et al.’s (2001) study was to prove that a rational bubble and miss-specification error exists in the formation of property value in Hong Kong, other than the fundamental components. The results showed that a rational bubble and miss-specification contributed to the establishment of property prices. This is reflected by the sharp bubble bursts during two periods between years 1990 to 1992 and 1995 to 1997. In addition, Liu et al. (2017) also found similar results and emphasised that a rational bubble is the most dominant factor affecting the housing market in Beijing, Shanghai, Guangzhou and Shenzhen.

On the other hand, Kajuth et al. (2013) adopted a stock-flow model to detect the deviation of regional housing prices from its fundamental economic factors. Housing prices are always in equilibrium because of the natural adjustment between demand and supply. However, housing prices may deviate from its fundamental price because of certain shocks. The authors found that apartment prices deviated from the fundamental price, and were overvalued by an average of 5 to 7 per cent. This deviation is caused by the district level house price growth expectation, where growth expectation exhibits a positive relationship with housing prices. However, the authors also commented that the housing growth expectation will be more reliable in the long term, and that insufficient time series data was one of the limitations of the study. The cross-sectional dimension of the data was relatively larger than the time series.

According to Chen et al. (2007), house price and income traditionally co-integrated in the long run. However, the authors found that house prices and income were not in equilibrium in the long run in Taiwan, because movement in house prices are more volatile than the movement in income. The authors also found that the short-term money supply was responsible for the fluctuations of house prices, where money supply is the proxy for

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investment demand. In other words, the deviation between house prices and income was caused by speculation forces.

Besides, because of their concerns on the problem of aggregate data, Mikhed and Zemicik (2009) conducted a time series analysis on aggregate data, and panel data analysis on regional data, to test the effect of housing fundamentals on US house prices. A similar panel study was done by Bhattacharya and Kim (2011) with different region settings that followed the metropolitan statistical areas in the US. From the results, both analyses showed the common result that house prices and fundamental variables were not co-integrated[6]. In other words, the deviation of house prices is not dependent on the fundamentals in the long run. Rather, Mikhed and Zemicik (2009) commented that a housing bubble was the root of the deviation, while the panel data unit root test was more precise than the univariate test.

Literature gap
In a nutshell, the literature discussed above agrees that regional income and population are the more important factors which influence the movement of housing prices. Besides, there is evidence which supports the existence of housing bubbles in different parts of the world. This study contributes to the scant literature on the effects of foreign inflow and speculation forces on Malaysian housing prices. A similar study by Tillmann (2013) used portfolio investment and foreign direct investment in balance of payment as proxy for foreign inflow. This study will utilise the actual data from foreign housing purchases to represent foreign inflow. Besides, different methodologies had been used to detect house price speculation. The data structure and time frames are important in the selection of the appropriate method. One of the branches argued that speculation forces occur if fundamental variables do not co-integrate with house prices (for example, Chen et al., 2007 and Mikhed and Zemicik, 2009). Our study will follow this approach since we have a set of sufficiently long time series data to conduct a co-integration test.

Theoretical framework
Housing demand
The Malaysian housing supply is rigid because of government intervention. Whenever the supply curve is elastic, demand will be the main factor to determine price. Therefore, this study will focus on demand factors rather than supply factors. Maisel (1949) and Stevenson (2008) suggested that housing demand is the function of income, user cost, demographic factors and other non-expressed variables. Stevenson (2008) uses an inverted demand function to explain the house price:

\[
\frac{H}{DEM} = f(y, n, D)
\]  

(1)

Where \(H\) is housing demand and \(DEM\) is the demographic factor, \(n\) is the user cost which consist of house price, and other user cost factors and \(D\) refer to other factors affecting housing demand. Thus, the demand model can be rearranged for an inverted demand function as follows:

\[
P = g\left(\frac{H}{DEM}, y, D\right)
\]

(2)

where \(P\) is the house price.
Housing demand model and co-integration

Previous studies such as Chen et al. (2007) and Malpezzi (1999) suggested that housing price, income, and other fundamental variables always co-integrate in normal circumstances:

\[
\frac{P}{Y} = k, k = Z\delta + \mu
\]

where \( P \) is the house price, \( Y \) is income, \( k \) is the price-income-ratio, \( Z \) as a vector of other factors such as market movements, change in government regime, speculation and so on, \( \delta \) is the vector coefficient, and \( \mu \) is independent and an identically distributed error term.

According to Chen et al. (2007), the price-income-ratio \((k)\) is supposed to be stable in a market in equilibrium. A change or deviation in \( k \) is usually because of government or market factors, especially the speculation factor. These factors will cause an upward deviation between house price and income, making house prices unaffordable as income is unable to catch up. Therefore, the co-integration between house prices and its fundamental variables will be the key to discovering the existence of speculation forces.

The classic demand function has proven that income and the substitution effect will influence demand and further change the price level, provided that supply is constant. However, the substitution effect is less likely to influence the demand for housing. This is because there is no close substitution for housing service. Hence, the income effect will play a major role in housing demand. An increase in income will lead to an increase in the demand for housing. Other than income, population is another fundamental force for housing demand service. An increase in population leads to a larger number of households, thus increasing the demand for housing. In this article, the inverted demand model, which consists of income, population and house price can be written as:

\[
HP_{it} = f(INC_{it}, POP_{it})
\]

where \( i \) denotes the 11 Peninsula states and Federal Territory in Malaysia[7], \( t \) denotes the time period respectively, \( HP \) is house price, \( INC \) is income, \( POP \) is population and \( \varepsilon \) represents the error term. Housing prices use the state level housing price index as proxy, while income uses state level GDP, and population uses total population. Most of the literature has used these two factors as fundamental factors which determine housing prices, and have found a positive relationship with housing prices (Chen et al., 2007; Holly and Jones, 1997; Xiao and Park, 2009).

However, the fundamental model of housing demand is insufficient to reflect house prices. Investment and speculation will boost the demand for houses (Morley and Thomas, 2011; Cannon et al., 2006; Blank, 1954; Williams, 1955; Tillmann, 2013), while foreign investment is selected as a determinant of house prices because Peninsular Malaysia may became one of the popular destinations for investment funds after the sub-prime crisis. Foreign inflow should be considered in the equation. Thus, equation (1) can be extended to the following equation:

\[
HP_{it} = f(INC_{it}, POP_{it}, FI_{it})
\]

where \( FI \) represents foreign inflow, which is the state level total value of purchase by foreigners on a quarterly basis. When foreigners bring in money to purchase housing in Malaysia, housing prices will increase, and therefore foreign inflow will be expected to affect housing prices positively (Tillmann, 2013; Kim and Yang, 2011). The speculation
factor will be captured in the ECT (Clark and Coggin, 2011) and will be explained further in the next section. According to the existing theories, all variables are assumed to affect house price positively. Higher income will lead to higher demand because housing can be considered either luxury goods or financial assets. A higher population that is caused by either natural birth or migration will lead to a higher demand for shelter. Financial inflow in the form of foreign purchasing will lead to a higher demand for houses by providing liquidity to the housing market and creating more job opportunities in a region. Lastly, high speculation activities in property markets will lead to a divergence between fundamental factors and house prices. Using equation (2), the research objective can be reached.

Data and econometrics method

Source of data
The sample data cover the period from 2005Q1 to 2013Q4 and is in quarterly frequency. Furthermore, the sample units include Federal Territory and 11 states in Peninsular Malaysia, namely, Kuala Lumpur, Selangor, Johor Bahru, Pulau Pinang, Kedah, Kelantan, Melaka, Negeri Sembilan, Perlis, Pahang, Perak and Terengganu. Therefore, the total observations are 432 (12 states multiplied by 36 periods). The data for house prices, income, population and foreign inflow can be obtained from the Valuation and Property Services Department (JPPH), International Financial Statistics (IFS) country table, Monthly Statistical Bulletin (MSBD) published by the Department of Statistics Malaysia (DOSM), and the Monthly Statistical Bulletin (MSBB) published by Bank Negara Malaysia (BNM), respectively. The gross domestic product at constant price is used to proxy the income[8], the house price index is used to represent house prices, total population is used to measure population, while foreign purchase (in value) is used to proxy foreign inflow. The data are transformed into logarithmic form.

Panel data analysis
To investigate the determinants of house prices, panel data analysis was adopted. According to Baltagi (2008), there are several benefits to adopting panel data analysis. First is the ability of panel data analysis to control individual heterogeneity. House price determinants vary across state and time. As always, the time series and cross sectional analyses assume that these variables are homogeneous. However, panel data analysis is able to control time and the state variant. Second, more information data sets could be obtained because of pooling the individual and time dimensions. Malaysia has limited state level data, and data availability is the main obstacle to proper empirical research. Therefore, the problem can be solved by using panel data analysis. Last but not least, panel data analysis is able to identify the parameters that could not previously be identified, by using pure cross sections or pure time-series analysis.

In this section, four methods of panel data analysis will be described to provide a clearer picture on the investigation of house price determinants: 1) Pooled ordinary least square (POLS) model, 2) Random effect model (REM), 3) fixed effect model (FEM) and 4) Pool mean group (PMG). PMG will be the main result, as it will provide more comprehensive results among other methods.
Pooled ordinary least square model
The panel data model has a double subscript on its model, different from a time series or cross section model with only one subscript:

\[ y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}, i = 1, \ldots, N; t = 1, \ldots, T \]  

(6)

where \( i \) denotes a cross section dimension (states) and \( t \) denotes the time dimension (quarter), \( \alpha \) is constant, \( \beta \) is the parameter for \( x_{it} \), \( x_{it} \) is the \( it^{th} \) observation of explanatory variables. Pooled OLS can be used to estimate the model by treating \( \varepsilon \) as independent and identical distributed disturbances that are uncorrelated with \( x \). Both the intercept and the slope are assumed to be the same across units and time. To be precise, the econometric model can be specified as:

\[ HP_{it} = \alpha + \beta_1 INC_{it} + \beta_2 POP_{it} + \beta_3 FI_{it} + \varepsilon_{it} \]  

(7)

where \( HP \) is the house price, \( INC \) is income, \( POP \) is population, \( FI \) is foreign inflow and \( \varepsilon \) is a stochastic error.

Random effect model and fixed effect model
In certain scenarios, the data have different intercepts among groups of countries. Therefore, it is not feasible to assume a homogeneous intercept across the cross sectional unit (i.e. countries).

There are two models which can account for this problem, namely the random effect model (REM) and the FEM. Both models allow each unit to have their own intercepts, while restricting the slope to remain homogeneous. Although both models allow for different intercepts, there is a different assumption towards the individual-specific effect. FEM assumes that individual-specific effects are constants, while REM assumes that the individual-specific effect is drawn independently from some probability distribution, and is a random variable – also a part of the error term with zero mean and variance – and that there is no correlation with the regressors.

The Breusch–Pagan Lagrangian Multiplier (LM) test and the Hausman test are adopted to decide whether to choose Pooled OLS, REM or FEM.

Pooled mean group
Both REM and FEM have limitations in estimating long-run effects. In the analysis of house price determinants, the long-run effect is crucial to determine the speculation factor. The concept of co-integration is appropriate to describe the relationship between the fundamental determinants, where these fundamental determinants are traditionally co-integrated with house prices. If there is no co-integration in the system, it is very likely that speculation is taking place (Chen et al., 2007).

The panel co-integration analysis adopted by Chen et al. (2007) only provided information regarding the existence of co-integration, but no long-run coefficient, while PMG as introduced by Pesaran et al. (1999) provides both speed of adjustment, which is measured by the ECT as well as a long run coefficient. The ECT will determine the existence of speculation factors. If ECT shows a significant and positive sign, it implies divergence, suggesting that housing prices are supported by speculation. On the contrary, if ECT shows a significant and negative sign, it indicates convergence, which suggests that housing prices are supported by fundamentals. The model starts by estimating an Autoregressive Distributed Lag \((p, q, q, \ldots, q)\) model as follows:
\[
y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \quad (8)
\]

where \(x_{it} (k \times 1)\) is the vector of explanatory variables for cross section unit \(i\), \(\mu_i\) denotes the fixed effects, \(\lambda_{ij}\) denotes coefficients of the lagged dependent variables and \(\delta_{ij}\) denotes \(k \times 1\) coefficient vectors. PMG uses a more general framework, modified from equation (10) based on Pesaran et al. (1999) assumption\[9\]:

\[
\Delta y_t = \phi_t \eta_{t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \quad (9)
\]

where \(\eta_{t-1}\) is the ECT and \(\phi\) measures adjustment speed of the long run equilibrium. By applying the house price determinants model equation (7) into equation (9):

\[
\Delta \ln (HP)_{it} = \alpha_1 \sum_{j=1}^{p} \Delta \ln (HP)_{i,t-j} + \alpha_2 \sum_{j=0}^{p} \Delta \ln (INC)_{i,t-j} + \alpha_3 \sum_{j=0}^{p} \Delta \ln (POP)_{i,t-j} + \alpha_4 \sum_{j=0}^{p} \Delta \ln (FI)_{i,t-j} - \phi_t \eta_{t-1} + \varepsilon_{it} \quad (10)
\]

Where: \(\phi_t < 0\)

\[
\eta_{t-1} = \ln (HP)_{i,t-1} - \theta_0 - \theta_1 \ln (INC)_{i,t} - \theta_2 \ln (POP)_{i,t} - \theta_3 \ln (FI)_{i,t} \quad (11)
\]

PMG imposes no restriction of homogeneity across the group on intercepts, short-run coefficients or error variances, but restricts the long-run coefficient to remain the same. Both short- and long-run coefficients are computed by the pooled maximum likelihood estimation. The lag length selection is based on Schwarz Bayesian Criterion and Akaike Information Criterion.

**Results and discussion**

In the preliminarily result, the house price-income ratio indicates the ability of income growth to catch up with the increasing house price. Based on Table I, the house price-income ratio has decreased for all states from year 2009 to year 2014, except for Selangor, Pulau Pinang and Pahang. The aggregate level of the house price-income ratio for the whole of Malaysia has shown a reduction of 0.12. Concerning the states, Kedah and Perlis had the greatest drop in the ratio at 1.31, whereas Kuala Lumpur and Negeri Sembilan have the lowest drop in the ratio at 0.06. On the contrary, Selangor, Pulau Pinang and Pahang experienced a rise in the house price-income ratio from 2009 to 2014. Generally, the ratios indicate that income is capable of supporting the rapidly increasing house prices within the period of 2009 to 2014 in Malaysia. Nevertheless, the preliminary conclusion would be better supported with empirical analysis.

Table II presents the descriptive statistics of the original data without log for all variables in equation (5). The upper panel of the table describes the mean, standard deviation, and the minimum and maximum for all variables. All variables are positive values.
Fundamentals determinants are tested using Pooled OLS, FEM and REM. From Table III, GDP as proxy for income is positive in all three models. On the other hand, the sign of the population coefficient has different results, where FEM shows a positive relationship but Pooled OLS and REM show a negative sign. Finally, FI shows negative in Pooled OLS and REM, while FEM shows a positive although insignificant relationship.

The Breusch Pagan LM Test and Hausman Test were conducted to choose between pooled OLS, FEM and REM. Based on Table III; the test statistic suggested that FEM is more appropriate than other tests. In other words, it implied that the panel data consists of state-specific effects.

FEM shows the results of fundamentals where income and population remain the determinants with the highest influence, which is consistent with most of the findings of past literatures. However, the drawback of the FEM is the lack of estimation power in a long-run relationship. Without estimating the long-run model, the speculation factors remain unknown. To overcome this drawback, PMG was conducted to obtain the long-run model and the ECT, which acts as the determinant of the speculation factor. The estimation process begins from the unit root test, using the Im–Pesaran–Shin procedure. The results are presented in Table IV.
The unit root test statistics clearly showed that the null hypothesis of a unit root cannot be rejected for all variables in their level form. However, the null hypothesis was rejected when all variables had been tested in their first-differences. The result supported the notion that the unit root exists in level form, and there is no unit root after the first difference. Since all the variables were integrated as order one, it is feasible to proceed with the PMG and co-integration analysis. The results are presented in Table V.

From Table V, all the variables are significant and yielded a sign similar to FEM. In addition, ECT shows a negative sign and it is significant at the 1 per cent level. These results imply that a co-integrated relationship exists in the model. Meanwhile, the coefficient of ECT shows the speed of adjustment at 32.8 per cent quarterly, with the negative sign

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Pool OLS</th>
<th>REM</th>
<th>FEM</th>
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<tr>
<td>Constant</td>
<td>4.234*** (0.141)</td>
<td>0.489 (0.387)</td>
<td>−7.272*** (0.853)</td>
</tr>
<tr>
<td>INC</td>
<td>0.313*** (0.029)</td>
<td>1.277*** (0.031)</td>
<td>1.016*** (0.044)</td>
</tr>
<tr>
<td>POP</td>
<td>−0.296*** (0.029)</td>
<td>−1.128*** (0.094)</td>
<td>0.553*** (0.203)</td>
</tr>
<tr>
<td>FI</td>
<td>−0.087*** (0.010)</td>
<td>−0.042*** (0.012)</td>
<td>0.004 (0.010)</td>
</tr>
<tr>
<td>Breusch Pagan LM Test</td>
<td>–</td>
<td>1.006***</td>
<td>–</td>
</tr>
<tr>
<td>Hausman Test</td>
<td>–</td>
<td>–</td>
<td>42.85***</td>
</tr>
</tbody>
</table>

Notes: The 10 per cent, 5 per cent and 1 per cent significance is shown as *, **, *** respectively. The figures in parentheses refer to the standard error

<table>
<thead>
<tr>
<th>Level</th>
<th>Constant without trend</th>
<th>Constant with trend</th>
<th>First difference</th>
<th>Constant without trend</th>
<th>Constant with trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>−1.159</td>
<td>−1.947</td>
<td>−4.592***</td>
<td>−4.692***</td>
<td></td>
</tr>
<tr>
<td>INC</td>
<td>−1.799</td>
<td>−2.317</td>
<td>−2.596***</td>
<td>−2.598***</td>
<td></td>
</tr>
<tr>
<td>POP</td>
<td>−1.636</td>
<td>−2.288</td>
<td>−2.642***</td>
<td>−2.886***</td>
<td></td>
</tr>
<tr>
<td>FI</td>
<td>−1.646</td>
<td>−2.121</td>
<td>−3.340***</td>
<td>−3.215***</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The 10 per cent, 5 per cent and 1 per cent significance is shown as *, **, *** respectively. The figures refer to the t-bar statistic. The null hypothesis for Im–Pesaran–Shin unit root test is all panels contain unit roots

<table>
<thead>
<tr>
<th>PMG ARDL (1,1,1,1)</th>
<th>Westerlund ECT test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Coefficient</td>
</tr>
<tr>
<td>INC</td>
<td>0.487*** (0.050)</td>
</tr>
<tr>
<td>POP</td>
<td>4.536*** (0.204)</td>
</tr>
<tr>
<td>FI</td>
<td>0.082*** (0.010)</td>
</tr>
<tr>
<td>ECT</td>
<td>−0.328*** (0.086)</td>
</tr>
</tbody>
</table>

Note: The 10 per cent, 5 per cent and 1 per cent significance is shown as *, **, *** respectively. The figures in parentheses (…) refer to the standard error and the parentheses […] refer to the p-value. The null hypothesis for Westerlund ECT Test is no cointegration. The maximum bandwidth is selected according to Westerlund (2007) suggestion: 4(T/100)²/3
implying convergence. For robustness check, the Westerlund ECT co-integration test was conducted to test the existence of co-integration. From the Westerlund test statistics in Table IV, all the values except the group-weighted average rejected the null hypothesis of the test[10] which suggests that a strong evidence of co-integration exists in the panel. To strengthen the results, a robustness check was carried out by substituting the foreign inflow proxy with the number of foreign transactions or volume (VOL). The robustness of the checked results in Table VI shows that the entire variable has a consistent sign within the main model.

House prices are traditionally co-integrated with income. However, the deviation between the two variables is generally caused by speculation forces (Chen et al., 2007). Hence, the strong evidence of the existence of co-integration in the fundamentals model implies that speculation forces are insignificant in determining house prices currently – at least not within the sample period. The public will usually suspect that speculation is taking place when there is a sudden increase in asset prices in the financial and housing markets. However, with the evidence that fundamentals, especially income, support asset prices, the perception is proven wrong in this case. The increasing house prices from year 2005 to 2013 in Malaysia are supported by income and population.

As pooled OLS, FEM and REM have limited capabilities to determine the long-run model, the PMG model would be the main analysis to examine the speculation factor. The sign of the coefficient for income and population is consistent with the expectation as well as the findings of previous literatures (Mankiw and Weil, 1989; Holly and Jones, 1997; Xiao and Park, 2009; Coleman et al., 2008), where income and population affect house prices positively.

On the other hand, FI shows a significant positive impact towards house price, but the coefficient is relatively small (0.004 and 0.08 respectively). This result is consistent with the findings of Huang et al. (2014), where the author commented that FI is the scapegoat, and causing high house prices. Malaysia is yet to become an attractive destination for foreign purchasers, probably because of the restrictions imposed by Malaysian authorities. Foreigners are not allowed to purchase houses worth less than RM1 million in Malaysia. In addition, according to the Global Property Guide[11], the rental yield in Malaysia is moderate and rental income tax is higher, and thus foreign investors may shy away from certain investments. Therefore, the myth that foreign inflow has caused high house prices in Peninsular Malaysia has been resolved. Nevertheless, the results should be cautiously interpreted.

In addition, the results of co-integration also suggest that the speculation factor is yet to affect house prices. There is no divergence between house prices and its fundamental variables. The sudden hike in house prices since 2008 may be because of the bandwagon effect of buying a house. The expectation of future house prices plays a crucial role in

<table>
<thead>
<tr>
<th>Variable</th>
<th>Main model Coefficient</th>
<th>Robustness check (Replace FI by VOL) Variable Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC</td>
<td>0.487*** (0.050)</td>
<td>INC 0.684*** (0.051)</td>
</tr>
<tr>
<td>POP</td>
<td>4.536*** (0.204)</td>
<td>POP 4.314*** (0.187)</td>
</tr>
<tr>
<td>FI</td>
<td>0.082*** (0.010)</td>
<td>VOL 0.212*** (0.026)</td>
</tr>
<tr>
<td>ECT</td>
<td>−0.328*** (0.086)</td>
<td>ECT −0.294*** (0.107)</td>
</tr>
</tbody>
</table>

**Notes:** The 10, 5 and 1 per cent significance is shown as *, **, *** respectively. The figures in parentheses ( ) refer to the standard error.
driving the housing market. For instance, if house buyers perceive that there is an increasing trend in house price, especially those who do not own a house yet, they would want to buy a house before the price increases again. Hence, this sudden high demand would lead to higher house prices. The only support for this argument is that the home ownership rate increased from 59 per cent in 2010 to 76.1 per cent in 2014 (DOSM). Overall, the results suggest that the fundamental variables, namely income and population, are the main determinants for house prices, which is again consistent with the finding of previous literatures (Mankiw and Weil, 1989; Holly and Jones, 1997; Xiao and Park, 2009; Coleman et al., 2008).

Conclusion and policy implications
Generally, there are thousands of housing projects throughout Malaysia, and the majority of the housing units are sold out. The question arises whether the demand for houses is supported by income or speculation activities. Therefore, this study attempts to investigate the determinants of Malaysian house prices, namely income, population, foreign inflow and speculation. Using Pool Mean Group and quarterly data spanning from 2005Q1 to 2013Q4, the results suggest that income, population and foreign inflow, but not speculation, are the significant factors influencing the house prices in Peninsular Malaysia. In conclusion, the house prices in Malaysia are supported by income and increasing house prices are not affected by speculation activities. The income growth is capable of catching up with the increasing house prices in Peninsular Malaysia. As such, income remains one of the major drivers which influence Malaysian house prices. This can be explained by the Malaysian government assistance such as the supply of low cost housing to increase affordability for low-income groups and the My First Home Scheme (SRP) which offers less stringent rules to first-time house buyers with an annual income of not more than RM60,000 per single borrower when they apply for house loans. Though there are investors or speculators active and influencing housing market prices, the magnitude of this factor is not as great as the income factor yet. Based on the conclusions, the Malaysian government should not implement a restrictive policy to halt speculation or foreign inflow now, but should continue to monitor the housing market to ensure its stability. To avoid an overshoot in house prices, it will also be safer for the Malaysian government to regulate the housing market by ensuring that the demand and supply of houses is balanced. As a result, government should continue to supply low-cost houses and to SRP to achieve high home ownership rate in Malaysia.

Notes
1. For more information regarding the news, visit: www.sinchew.com.my/node/172697?tid=1
2. Most of the studies use housing service demand as fundamentals of the house price, speculation and foreign inflow as other determinants, such as Holly and Jones (1997), Xiao and Park (2009) and Stepanyan et al. (2010).
3. Goodman (1978) and Dumm et al. (2016) studies housing market of US, whereas Chen et al. (2007) and Selim (2009) and focus on Taiwan and Turkey respectively.
4. Clark (1995) estimates rent growth by using present value model. The author commented that low frequency data of housing market is more efficient to apply in the present value model. For more information, see Clark (1995).
5. Time dimension data from 2004 to 2010; cross-section dimension data consist of 402 districts.
6. Mikhed and Zemcik (2009) use five samples period of data from 1980 to 2008 in time series analysis. Three samples periods found no cointegration and the authors suggest this is due to house price bubble.

7. The 11 Peninsula Malaysia states refer to Kuala Lumpur, Selangor, Johor and Pulau Pinang, Kedah, Kelantan, Melaka, Negeri Sembilan, Perak, Pahang, Perak and Terengganu. Federal Territory refers to Kuala Lumpur. East Malaysia (Sabah and Sarawak) was not included in the sample data because the price level and land ordinance between Peninsula Malaysia and East Malaysia is different. To avoid the discrepancies between the housing price in Peninsula Malaysia and East Malaysia, West Malaysia is considered.

8. GDP per capita is not adopted in the model is because of population is included in the model as independent variable. If we include GDP per capita and population in the same model, a redundant variable (population) would exist and could lead to multicollinearity problem.

9. The general framework is based on five assumptions proposed by Pesaran et al. (1999). For more information, see Pesaran et al. (1999).

10. Null hypothesis for Ga and Gt test indicates no co-integration in the cross-sectional group whereas null hypothesis of Pa and Pa test indicates no co-integration in the whole panel.

11. For more information, please visit following website: www.globalpropertyguide.com/Asia/Malaysia

References


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