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PROSPECTING HOUSING BUBBLES IN MALAYSIA

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Abstract

There have been extensive studies pertaining on bubble detection in literature, though very few investigate the Malaysian residential property market. The inflated housing market, however, has sparked widespread public anxiety and there has been a proliferation of comments and forecasts about the presence of housing bubbles in Malaysia throughout the last decade. The purpose of this paper is to assess the housing bubbles in Malaysia by using empirical models in detecting Malaysian residential property bubbles. This research employed the Markov Switching (MS) model to investigate the housing bubbles for the Malaysian residential property market. The findings revealed Malaysian housing prices to be relatively stable over the period 2010 to 2019, with states of upheaval occurring only during short-lived periods. Overall, Malaysian housing prices were generally steady between 2010 and 2019, albeit this has shifted slowly in recent years as economic turmoil faded. This study provides empirical results to explain the situation of Malaysian house prices in the recent years.

Keywords: *bubbles, house price, Malaysia, prospecting, Markov switching*.

JEL Classification: *B41, C00, C01, R31*.

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1. Introduction

This paper is aimed to assess whether Malaysia has been experiencing house price bubbles over the past decade, with the situation analyzed in regards to the combination of a significant increase in housing prices and imbalance between supply and demand of residential properties. Since 2009, Malaysia has been experiencing an extensive increase in housing prices, which in turn has led to a serious problem in regards to affordable housing (see Figure 1). The steady increase in house prices triggered the concern of several parties, especially the public and the governments as policymaker. The major concern is whether this increase is caused by the turning point of the cycle adjustment or other factors, such as materials and macroeconomic factors.

Over the past decade, Malaysia has experienced an approximately 32% increase in house prices and the gradual increasing tendency is worrying. According to the latest report by Ismail (2019), house prices in Malaysia are largely unaffordable due to the imbalance between median house price and household income. The deviation of price from the affordable value may trigger housing price bubbles in Malaysia. According to Brunner- Meier and Julliard (2008), the situation of bubbles occurs when asset prices exceed an asset's fundamental value because current owners believe that a higher price can be achieved during the sale. Moreover, house prices, like many other assets, revealed relatively high volatility, which makes the residential property market sensitive to several factors, such as macroeconomic factors and material costs.

Nevertheless, whether this is an indicator of the house price bubble is yet to be identified. The indicators of house price bubbles have been subjected to debate since the theory of a bubble established by Kindleberger (1978) and then Shiller (1981), which observed that a surge in asset price will initiate bubbles. However, later research by several authors such as Glaeser et al. (2008), Hui and Yue (2006), Barberis et al. (2018), and Flood and Hodrick (1990), is in agreement that bubbles are not necessarily determined by the price surge, but also caused by other factors such as discrepancies between current house prices and affordability levels. Therefore, it can be concluded that the need for research on housing bubbles is indubitable. Therefore, the motivation behind this research is to examine whether the situation of house prices is experiencing bubbles.

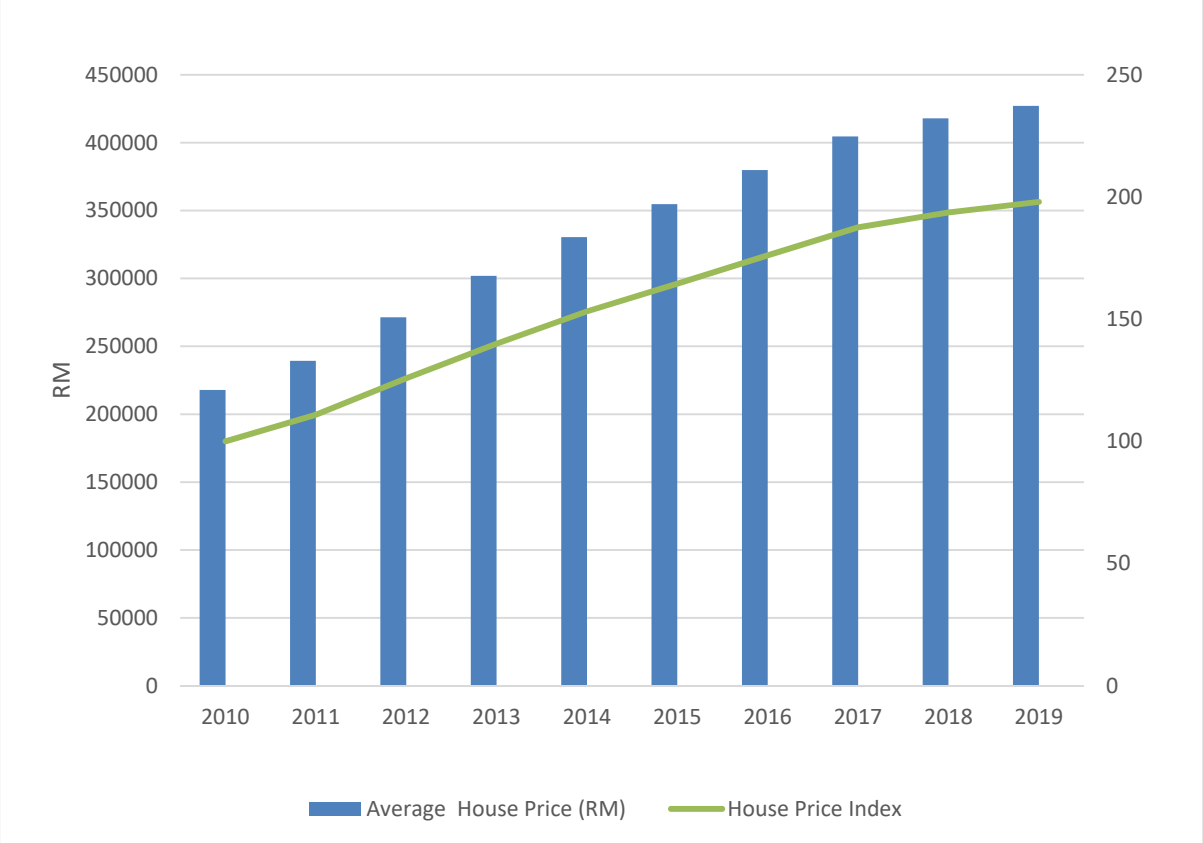

Fig. 1. Average house price index in Malaysia: 2010-2019. *Source*: own study.

According to Pitros and Arayici (2016), in order to determine house price bubbles it is important to

know whether investors are conscious of the over-value of the price but reluctant to leave the market due to the anticipation that the bubble will continue to grow, which able to compensate them. In recent years it has been observed that the supply of housing stocks has been exceeding demand, which indicates that investors continue to remain on the market (see Figure 2). In other words, it also shows that the housing supply in Malaysia continues to increase with the number of unsold houses still not showing any improvement. The combination of imbalance between supply and demand and price increase indicates the need to examine some possibilities of house price bubbles in Malaysia.

Fig. 2. Total residential property listed, sold and not sold in Malaysia: 2015-2019. *Source*: own study.

When compared to previous studies, this paper takes into consideration the factor of construction cost which is vital to determining housing price. According to Mohamed (2003), the cost of construction comprises project planning, budgeting cost, cost estimating and cost of control on the material costs, labor machinery, technology and cost of transportation. Furthermore, developers in Malaysia have indicated construction costs as a major cause of price hikes in residential properties. Based on the study by Ibrahim et al. (2012), the increasing cost of construction costs have made the developer transfer the cost to the buyer by increasing the house price. Several previous studies on Malaysian housing bubbles in Malaysia, such as Majid et al. (2017), Loh et al. (2014), Yin et al. (2017), Yip et al. (2017), Tze-Chan et al. (2016), Fong et al. (2016), Kwakye and Haw (2020) and Nasser and Masih (2016), have examined this phenomenon in regards to several attributes, such Gross Domestic Product (GDP), Base Lending Rate (BLR), unemployment rate, Consumer Price Index (CPI), housing supply, mortgage rate, mortgage credit, Housing Price Index (HPI) and exchange rate. Nevertheless, none of the studies put construction cost as the variable to identify the bubbles of house price in Malaysia. Construction cost involves several elements that contribute to the house price, such as materials and equipment to complete the housing project development. Therefore, it is important in determine the bubbles in the housing sector and factors determining construction cost need to be taken into account.

The situation in Malaysia is where developers are unable to meet the real demand, which is affordable housing. Based on the research done by Ismail (2019) and report by NAPIC (2020) affordable housing prices in Malaysia do not exceed RM211 000 (USD52 750), and housing supply in this category is lesser than demand. Even though there is strong demand for property, the difficulty of catering to such demand may cause an oversupply, especially in the high-end segment. The balance between supply and demand is vital for the movement of the housing market and easy housing loan

approval is able to influence the supply and demand of a property. Furthermore, the difficulty in getting loans affects the real estate industry, thus creating an oversupply of property on the market. This was supported by Muhammad et al. (2011) as housing loans are important in transaction processes and, due to tight regulations, buyers were forced to forfeit the transaction process due to this problem. The government, through the central bank (Bank Negara Malaysia (BNM), has set the objectives of the guidelines to tightening loan approvals, was to prevent huge numbers of debt for every household and to strengthen responsible lending practices (JLL, 2016). Additionally, tight regulation is important to prevent any speculation from happening in the residential segment. Meanwhile, Hashim (2010) revealed that the relationship between housing affordability and availability were almost impossible due to unsustainability in the housing market in Malaysia and the unsustainability was created by the difficulty in making monthly mortgage repayments due to high cost of ownership and the unpredictability of the market, paired with speculation which does not match well with affordability, income and availability. In order to provide an affordable housing product without compromising their returns on investments, developers must understand the policies that were introduced by the government, which will simultaneously allow for enhancing their competitiveness on the market (Nuruddin et al., 2015). The objective of the housing policy that was introduced by the government is to ensure that all Malaysians, mainly from the low-income household group, will be able to have adequate and affordable shelter and facilities.

2.Literature review

2.1. Housing bubbles

The property bubble in Malaysia is not something new. Prior to the Asian Financial Crisis (AFC), the prices of properties in Malaysia were at their peak due to strong demand from foreign interest, which has created many opportunities in the property sector (Razali, 2015). However, it was revealed that the crisis severely affected the performance of the housing segment as well as investments from international and local property players alike, which in turn saw many developers abandon their projects (Said et al., 2014; Razali, 2015). The sudden drop in property prices during the crisis is a sign of the property bubble bursting. This was further supported by Yip et al. (2017) in a study focused on bubble detection in the Malaysian housing segment. By using Phillips, Shi and Yu's (PSY) method, they discovered a property bubble in 1996 which is around the AFC period, and more recently in 2010, which peaked around 2013. This finding is only valid for the medium to high-end segment in the residential property market. However, all of these findings contradict the findings of Naseer and Masih (2016), which, based on their forecasted equilibrium housing prices, revealed that the housing price bubbles in Malaysia were non-existent until 2015. The difference in opinion on housing bubble phenomena has made research into this issue all the more interesting.

A bubble is defined as the expectation of an asset to be at a higher selling price in the future (Stiglitz, 1990) and, based on residential property perspective, it refers to circumstances where the value of a property is high due to the perception that, in the future, the value will be at a certain price point. Garber (2000), on the other hand, defined a bubble as part of an unexplainable asset price movement that was driven by various variables. The bubble exists when there is an extreme period of price movements which can be identified by a sudden increase in the asset price (property value) followed by an immediate decline (Lind, 2009). Meanwhile, Majid et al. (2017) refers to a housing bubble as a situation where there is an ongoing appreciation of house price that was influenced by non-fundamental economic indicators, where it is accelerated purely by speculation and expectations of the property players, especially in the housing market.

One of the most important issues in housing market research is the aspect of housing bubbles. Numerous studies have been conducted on the housing bubble and collapse of price in the United States since the subprime mortgage crisis of 2007. (e.g., Goodman & Thibopdeau, 1998; Clark & Coggin, 2011; Kivedal, 2013; Brauers et al., 2014). Although the performance of housing markets in the Eurozone has been an important research topic, few studies investigate housing bubble-like behavior in the Eurozone, compared to the numerous studies analyzing US housing bubbles. Some studies have looked at the factors that influence housing prices in the Eurozone (e.g., Risseand Kern, 2016; Rahal, 2016; Maas et al., 2018; Sol e-Olle & Viladecans-Marsal, 2019), while others at housing price correlation or contagion (e.g., Vansteenkiste & Hiebert, 2011; Sol e-Olle & Viladecans-Marsal, 2019).

There are many indicators of housing bubbles that were discovered in previous studies. As such,

these findings have provided an indicator for property players to strategize their investment decisions. Many real estate researchers, such as Stiglitz (1990), Siegel (2003), Lind (2009), Aggarwal (2012), Phing and Martin (2012), Oliveira and Almeida (2014), Yin et al. (2017), Yip et al. (2017), relate the unrealistic booming of house prices with a property bubble. This is then followed by the sudden drop in property values. Other than the sudden movement of property prices, Wu and Lux (2018) have categorized bubbles as the difference between the expected growth in house prices based on previous findings and the actual price growth. Lastly, speculation that was led by property speculators was one of the main causes of the housing boom and bubble (Glaeser, 2016; Shi, 2016; Majid et al., 2017). Property speculation has created an unrealistic expectation of future property value, while Dreger and Kholidilin (2011) suggest that speculation-driven bubbles tend to burst suddenly. The recent financial crisis is evidence of how speculative bubbles are able to affect an economy.

According to research, the lifespan of housing bubbles is highly variable, (Gomez-Gonzalez, et al., 2017; Pavlidis et al., 2016). These researchers also indicate that bubbles that arose in the aftermath of the current international financial crisis lasted substantially longer than bubbles that arose in the 1980s and 1990s. Studying what causes certain bubbles to stay around for longer than others is critical and has important policy implications, especially if monetary policy plays a role in bubble duration.

It is important to identify a housing bubble before it is too late, as the impact from housing bubbles can deteriorate an economy. Thornton (2006) has described the impact of housing bubbles as economically harmful, with homeowners who bought their property during the market boom during the period of a housing bubble being the most affected. Furthermore, the author also suggested that the bubble has the potential to spread to the labor market, which leads to unemployment as well as forcing many people and industry players into bankruptcy. Baker (2005) further explained that the housing bubble provides a greater impact compared to a stock bubble due to the wealth or value of the housing segment being more evenly distributed than stock, where unprecedented bubbles have created more than USD 5 trillion in value. Housing bubbles also led to a surplus of properties (Aggarwal, 2012). The oversupply of property makes it difficult for developers to achieve the target return on investments, thus putting the company at risk of bankruptcy. Previous studies have employed numerous methods in measuring housing bubbles. For instance, Gelain et al. (2018) uses the quantitative asset pricing model to reverse-engineer the movement of the U.S. housing market, where the model has provided clear insight into the underlying reason behind.

2.2. Determination of House Prices

The movement of house prices is determined by many variables, including macroeconomic variables such as gross domestic product (GDP), population and interest rate. The close relationship of macroeconomic factors and house prices has been discussed extensively in previous works. Dipasquale and Wheaton (1992) mentioned that house prices and macroeconomics are derived from the disequilibrium of housing demand and supply. Sutton (2002), Terrones and Otrok (2004), Kose et al. (2017) and Cesa-Bianchi et al. (2015) all concluded that macroeconomics has significant impact on house prices. Empirical evidences revealed GDP to play a significant role in regards to house price changes. Examples of this are studies by Tsai and Chiang (2012) and Fererro (2015).

Economic factors may trigger the housing bubble when asymmetric responsiveness exists during an economic boom or recession (Adams and Fuss, 2010). The boom in the residential sector, through the increase in demand, has investments in real estate for property investors and developers alike, as they provided an opportunity for them to gain higher profits. The high demand for property during a boom market has caused property developers to build more residential properties. However, paired with high prices of properties, this led to an oversupply of residential real estate. Due to the oversupply of property, property players had to reduce the prices of their properties on offer.

Malaysian house prices were discovered to be significantly and positively correlated with GDP, population and real property gains tax (RPGT) (San Ong, 2013). The link between house prices and macroeconomic variables was also discovered by Naseer and Masih (2016), where it provides significant impact in the long run. The increase in house prices in the recent years has brought the attention the issue of whether the increase was the effect of a housing bubble.

2.3.Malaysia House Price Index

The MHPI is calculated based on the hedonic regression technique. According to Rosen (1974), this

model creates an assumption regarding the price of a product and can detect significant determinants by considering both spatial and structural attributes of the product itself. In this paper, the product refers to residential property. As a result of this technique, the index that was produced is able to include certain characteristics of the property, such as location, house type, neighborhood classification and much more (Kassim et al., 2017). It was also revealed that the base year shown in the index is intended to reflect the changes of residential property prices due to the preferences shown by the buyers and the emergence of new trends in the property market.

In Malaysia, house price is determined by the market, where the government has no control. The government always plays a role in establishing a policy to ensure that the residential property sector is run in accordance with rules and regulations. In recent years, Malaysia has seen a significant increase in house price. Previous studies carried out by Collyns and Senhadji, (2002); Lai et al., (2009) and Cerutti et al., (2015) showed that financial aspects, such as a low-interest rate, have been able to spark speculative buying among property speculators. The speculation has driven the housing market and pushed property prices upwards to levels which exceed the actual value of the property. The boom in the housing market is the main cause of housing bubbles. As a result, this trend has led to the issue of affordable housing. The issue of affordable housing in connected with the concern of whether Malaysia house prices experienced a housing bubbles situation.

With the property market in Malaysia becoming more dynamic, the instability shown by the movement of residential property is important to the present study as it focuses on housing bubbles. Research into this issue is vital in measuring the level of bubbles in the residential sector. Concerns regarding a property bubble have been greater in recent years due to the sharp increase of the overhang unit (see Figure 1). Since the residential property price is determined by a free market, property players as well as stakeholders really want to know whether this situation will lead to property bubbles. Therefore, the need for ongoing investigation of property bubbles is highly necessary. The information gained from this study is important to homebuyers and investors alike. Moreover, the mechanism to measure the bubbles is vital in controlling the movement of housing prices, thus reducing the instability generated by the market. This can be an important indicator for stakeholders in assessing their investment decision. Although property bubbles cannot be prevented, the problem can be reduced. Well-informed stakeholders in the housing sector in Malaysia are important in reducing instability in the market. Furthermore, sufficient information related to a property bubble is vital in controlling the value of residential properties in this country. This study applied several statistical techniques to answer the question related to the housing bubble in Malaysia.

3. Data and Methods

This paper employed a quantitative approach by using the Markov- Switching (MS) model. For the purpose of this study, the underlying assumption to detect house bubbles is that house prices will, at some point, create a bubble and then untimately burst. The approach to detect a bubble in this research is based on the volatility of the market. The burst of the bubble will occur when the market is more volatile. Therefore, the suitable model to detect a bubble for the Malaysian housing market is by employed Markov Switching (MS) model. This approach allows stochastic bubbles which allow lag order selection and determination of window size, and partially collapsing bubbles (Balcilar et al., 2016). This paper uses the property transaction data provided by NAPIC alongside other variables, such as inflation rate, base lending rate (BLR), the country's population, household income and the construction cost price index to measure the housing bubble in Malaysia. The transaction data on residential properties between 2010 and 2017 is used for the purpose of this study. Moreover, these data cover Malaysian residential sector comprises of different types of residential property, such as landed (terrace, detached and semi-detached) and high-rise properties.

As for the additional variables, they can be obtained from reliable sources, such as: the Department of Statistic Malaysia (DOSM), Bank Negara Malaysia (BNM) and Construction Industry Development Board of Malaysia (CIDB). The data that has been collected is then analyzed using several statistical methods that were designed to investigate the housing bubble phenomena in Malaysia.

The housing price index provided by National Property Information Centre (NAPIC) which has been recognized as a benchmark for housing prices in Malaysia, is considered in this paper. The Malaysia House Price Index (MHPI) mainly reflects the supply and demand situation of the housing market in Malaysia. The data sample covers the annual house price indexes for the period 2010 to

2017. MHPI is based on the sample size allocated to each housing group-neighborhood combination. The housing group-neighborhood is the combination of a house type by cost and housing neighborhood. In addition, the number of price observations for each housing-group neighborhood is based on the volume of residential house transactions in a given year. In terms of calculations, the sampling of price indices is fixed weight Laspeyres indices which use a semi-logarithm house price model to estimate the current period house price of the average house. It is then compared to the actual house price of an average house sold in the base year. As a result, the fixed basket of house characteristics of the average house is re-valued for each period, and the index reflects only pure price changes whereas the variations in house characteristics are kept constant. The Laspyeres index is represented by the following equations:

$$L_t = \frac{\exp(\sum Bj\ (t)Q_j(t)}{\exp(\sum B_j(t)Q_j(t)} \quad (1)$$

where:

Exp – symbolises exponents,

B_j –the hedonic model regression coefficient of the current period,

Q_j –the characteristic averages for houses sold in the year *t*.

For each of the 86 Laspyeres indices of a given time period, linear regressions estimated the natural algorithm of the current house prices of an average house sold in the base year by using the basket characteristics that affect price. The log linear dependent variable, the numerical and quality characteristics as independent as follows:

$$\mathrm{lnPit} = \mathrm{B0(t)} + \mathrm{B1(t)x\ 1it} + \mathrm{B2(t)x\ 2it} + \cdots . + \mathrm{Bm(t)xmit} + \mathrm{eit} \quad (2)$$

where:

lnPit – natural logarithm of sale price for the *i* th house sold during time *t*,

B1(t), B2(*t*),….Bm(*t*) – the coefficient for the numerical and quality variable m for period *t*,

x1it…xmit – the observed value of the quantitative values of the qualitative variable (1 or 0) for house *i* in period *t*,

BO(t) – the constant term in the regression,

e – the random error which is unexplained by the equation.

The regression coefficients are logarithms of implicit proportionality factors. The antilog *Bi* for the quantitative variables, such as land area and age, and qualitative variables such as land tenure and building condition, is a multiplicative factor. The multiplicative factor for numerical value for houses that have the same qualitative characteristics with house prices increased faster than the numerical value when the factor is greater than one, and conversely, house prices increased slower than the numerical value when the numerical value is less than one. For qualitative variables, the antilog Bi denotes a proportionate increase in sales price if the factor is positive or a decrease in the sales price if it is negative.

In order to provide in-depth analyses in terms of the bubbles detection procedure, other macroeconomic variables were included in the analyses. The use of macroeconomic data in detecting bubbles is essential as it contributes to the behavior of house prices. According to Stevenson (2008), key elements in any analysis of possible speculative behavior are the definition of a possible analysis and also empirical analysis of such extreme price movement. His analysis of the Irish housing market encompassed several macroeconomic factors in detecting housing bubbles, such as population, income, housing stock and interest rate.

The selection of these variables is based on previous findings which revealed that these four factors are the main factors determining house prices in Malaysia.

i. *Inflation rate*

Inflation rate is among the major attributes that need to be assessed in order to detect the housing bubbles as it's a main indicator of a financial crises. According to Reinhart and Ragoff (2009), financial crises throughout history have always gone along with some kind of asset price inflation, which house price is a major component of. This view is also in agreement with Ahamed (2009) and Ferguson (2008), who found that financial crises are often preceded by an asset market bubble or widespread credit growth.

ii. *Base Lending Rate (BLR)*

Research done by Teck Hong (2010) found that there is a significant negative relationship between

the lending rate and housing activities, while house prices have an insignificant result due to the mismatch between housing supply and demand. Another study done by Tang and Tan (2015) also revealed that interest rate affected house prices significantly in a negative way. Therefore, it is important to study the impact o the BLR on housing bubbles.

iii. *Housing supply*

Housing supplies relate to the population which affects demand. When the demand increases, property players, especially developers, increase the supply of houses to meet demand as well as maximize the profits. Nevertheless, according to a study done by Wong et al. (2019), population will affect the demand as a house may no longer be satisfactory whenever new members enter into a household through marriage or birth, and therefore new houses will be needed. The research also added, in a macro perspective, income and population density acting as a proxy for the population which determines the house price.

iv. *Household income*

A study done by Wong et al. (2019) suggested that income is of the main determinants of house prices. Several other studies also found the similar findings, such as Zhang et al. (2016) who mentioned that, when the income for the majority of households declines, the median household income falls, which leads to an increase in the house price-income ratio. From the local context, data revealed by Bank Negara Malaysia (2018) mentioned that the rate of increases in income is getting slower than the rate of increases in house prices, therefore making dwellings less affordable among Malaysians. Furthermore, the relationship between income factors and house prices has been long established in paper (Ibrahim & Law, 2014).

v. *Construction cost*

According to a report by BNM (2018), the cost of construction has steadily increased 10% from the year 2013. Construction costs have been part of the major attributes in determining house prices. Previous research done by Diba & Grossman (1988) highlights that the construction indicator has a commonly adopted approach to analyzing the stationarity process of house prices. It is important to include construction costs as the main variables in detecting bubbles due to the fact that the buyer is the party that will bear the increase in the costs of materials. According to Ibrahim et al. (2012), due to the increasing costs of material, the developer will not take such costs onto himself but instead transfer them onto the buyer by increasing the housing price. Therefore, there is a strong relationship between construction costs and house prices. The summary of the data obtained for this research is tabulated in Table 1.

Table 1

The summary of data for housing bubbles analyses

No.	Data	Type	Period	Source
1.	House price	Malaysia House Price index	2010-2019	National Property Information Centre (NAPIC)
2.	Inflation rate	Percentage	2010-2019	Central Bank (Bank Negara Malaysia- BNM)
3.	Base Lending Rate (BLR)	Percentage	2010-2019	Central Bank (Bank Negara Malaysia- BNM)
4.	Housing Supply	Transaction Unit	2010-2019	National Property Information Centre (NAPIC)
5.	Household Income	Monetary Value	2010- 2019	Department of Statistics Malaysia (DOSM)
6.	Construction Cost	Monetary Value	2010-2019	Construction Industrial Development Board (CIDB)

Source: authors compilations.

Multivariate Regression Model to assess house price bubbles

The first model to assess the house price bubble of residential property in Malaysia over the period from 2010 to 2017 employs the multivariate regression model. The model is able to detect the relationship between house prices and the attributes that contribute to housing bubbles. The model (3) is specified as follows:

$$\text{lhouseprice}_t = \alpha + \beta_1 \text{ inflation} + \beta_2 \text{BLR} + \beta_3 \text{population} + \beta_4 \text{income} + \beta_5 \text{constructioncost} + \mu_1 \quad (3)$$

Where the donations of all the variables are transformed into logarithmic forms due to lack of normality in the regression model.

Markov-Switching (MS) model

The Markov-switching (MS) model in its logarithmic change rate allows us to understand the evolution of house price bubbles in Malaysia with the autoregressive characteristics. The model also quantifies the bubble evolution process and helps to gain an understanding of the transitional process from one state to another. This research employs the MS approach in assessing the housing bubbles in Malaysia residential property market. Equation (4) is the MS equation as follows:

$$\text{dlbubble}_t = \mu_t + \emptyset_t \text{dlbuble}_{t-1} + \sigma_t \varepsilon_t \quad (4)$$

where:

$dlbubble_t$ – $\log(bubble)_t \log(bubble_{t-1})$,
$\mu_t \emptyset_t \sigma_t$ – intercept,
t –autoregressive coefficient, standard deviation and under regime at time t,
ε_t – normal distribution.

According to Runfang et al. (2017), the transition of states for MS model is "stochastic and not deterministic," which means that the transition shown by the MS model is unpredictable. The transition process from low to high volatility states is dynamic. Therefore, the house price bubble anticipates in 2 level of volatility, where t equals 3 or 4, which corresponds to the autoregressive mechanism in two regimes, as follows:

$$t_1 = \text{dlbuble} = C_1 + \emptyset_1 \text{dbubble} + \sigma_1 \varepsilon_t \quad (5)$$

$$t_2 = \text{dlbuble} = C_2 + \emptyset_1 \text{dbubble} + \sigma_2 \varepsilon_2 \quad (6)$$

The parameter vector for this equation will denote the transition possibility between the level of volatility from one state to another.

4. Findings

The findings of the regression results are exhibited in Table 2. The findings revealed that all variables which act as fundamentals to the housing bubble calculation are in good fit and statistically independent. The regression coefficients indicate that Malaysia house prices have a negative correlation with BLR and construction costs, which generally means that house price in Malaysia increase when the housing supply decreases. Nevertheless, it should be noted that the regression implications are only average during the case study period and not necessarily valid across time. For instance, the indication of housing supply in not a sign which confirms the existence of bubbles as a whole.

Table 2

Regression results for Malaysian house price and major variables

Variables	Coefficient	t- statistics
C	2.57289	0.3349 (0.7328)
lBLR	0.6674	-2.4985 (0.0067)
lsupply	-0.5983	2.0324 (0.0451)
lincome	0.3198	2.1109 (0.0365)
lconscost	1.3987	-2.3498 (0.0210)

Source: own study.

This finding contradicts the study by Yip et al. (2017) which revealed that Malaysia faces several housing bubbles, with the most recent in 2010, which peaked around 2013. Nevertheless, the findings from Yip et al. (2017) were only valid for the medium and high-end housing segments. Furthermore, a different method employed by previous studies also contributed to the difference in output in terms of the view of the housing bubble in Malaysia. The study done by Majid et al. (2017) also detected housing bubbles in a certain state in Malaysia over the study period of 2000-2012.

However, their study did not include several variables, such as supply, income and construction costs, which can be categorized as important variables in determining house prices. Other studies that reported similar findings include Yip et al. (2017), Kwakye and Haw (2020) and Hussain et al. (2011). However, all of these studies have different fundamentals and methodologies, as well as covering different time periods. As the condition of the house prices in Malaysia seems to show some volatility in condition, the most suitable approach to detecting house price bubbles is by using Markov Switching Model. The MS model is suitable as a periodic testing procedure which allows the dynamics of changes in house prices to be assessed across the study period. The methodology constitutes a generalization of the ADF unit root test applied to the class of MS regime model (Hamilton, 1989).

The descriptive statistics of the Malaysian house price bubble series over the period 2010-2017 are shown in Table 3. The p-value of ADF unit root test indicates that the Malaysian house prices over the case study period were revealed to be non-stationary even at the 10% significance level. Therefore, the results indicate that Malaysian house prices are not stationary during the case study period. As such, over this period, regime switches may have occurred which does not meet the requirement of autoregressive (AR) modelling. The logarithmic change of house price bubble is indicated as *dbubble*, and the p-value of ADF unit root test has shown that *dbubble* is stationary at the 1% significance level. Thus, the parameter model of AR (1), AR (2) and AR (3) results is tabulated in Table 4. The T-Test for regression results suggest that the first-order lag is appropriate. The stationary data suggest that the time series is constant over time in terms of mean and variance. Therefore, the null hypothesis can be rejected at log first difference as none of the countries exhibited unit roots in their time series. In addition, AIC and SC values also showed that AR(1) model is a more reasonable model to accept. With the time series data of each variable in this research being stationary, there is good reason to conduct further analyses on the housing bubble of the residential property in Malaysia.

Table 3

Descriptive analysis: all residential properties

Year	Mean	Median	Standard Deviation	Skewness	Kurtosis	Jarque-Bera	ADF Test
2010	247,276	241,688	78,814	0.0637	1.1123	2.3864	-3.85
2011	267,253	259,846	79,727	0.0274	1.0746	2.4734	-1.81
2012	301,452	291,115	89,641	0.0697	1.1273	2.3510	-3.01
2013	341,096	328,841	103,772	0.0968	1.1700	2.2576	-2.8
2014	367,129	353,713	106,888	0.1168	1.1902	2.2199	-1.72
2015	394,177	381,624	113,394	0.1027	1.1772	2.2431	-3.2
2016	434,114	410,525	131,784	0.2871	1.4909	1.7381	-2.01
2017	503,400	501,190	159,732	0.0078	1.0239	2.6036	-0.88

Source: own study.

Table 4

AR(p) models

Independent	Model			
		AR(1) Model	AR(2) Model	AR(3) Model
Dlbubble	Coefficient	0.2398	0.2276	0.2301
	Std. error	0.0895	0.0974	0.0895
	T stat.	2.5312	2.3217	2.3410
	(Prob.)	(0.02)	(0.02)	(0.01)
Dlbubble (-2)	Coefficient	-	0.0589	0.06590
	Std. error	-	0.0897	0.1007
	T stat.	-	0.5897	0.6905
	(Prob.)		(0.57)	(0.44)
Dlbubble (-3)	Coefficient	-	-	-0.0297

Std. error	-	-	0.0976
T stat.	-	-	-0.3105
(Prob.)	-	-	(0.81)

Source: own study.

The estimation of the model of parameters by using the Markov Switching Model is tabulated in Table 5. Findings from the parameter models revealed that the regression coefficient is significant and that there have been structural changes in Malaysian house prices in two distinct regimes. Nevertheless, the results also found that the bubble change is relatively stable. The significance change in house price has been identified in 2013. Comparatively, there is a high possibility that the house price bubble in Malaysia turns into a stable state after 2013, which could possibly be due to the establishment of the public housing scheme by the federal and state government. In addition, the Malaysian government also introduces several tax schemes in order to curb speculation as well as to encourage property transactions.

Table 5

Markov Regime Switching Model results

Parameter	Coefficient	Parameter	Coefficient
x_1	0.7184 (0.21)	σ_1	1.0394 (0.02)
x_2	0.0050 (0.58)	σ_2	0.1289 (0.00)
ϕ_1	3.9045 (0.03)	p_{11}	0.15
ϕ_2	0.1593 (0.00)	p_{22}	0.94

Source: own study.

Table 6 tabulates the two states analyses of Malaysian house prices over the period from 2010 to 2017. The stable state covers 80 observations, accounting for 92.5% of the total. The coefficient of ϕ_2 is 0.1593, which implies that every 1% change at the time of t may contribute to a 0.14% change at the time of t on average. Therefore, the findings revealed that, in comparison with the upheaval state, the stable state dominates the Malaysian house prices over this period. In addition, the bubbles change is not persistent. Furthermore, the variance of the residual series in the upheaval state indicates that it is bigger than in the stable state, which verifies that Malaysian house prices were relatively more stable with slow changes across the period when no major events occurred. The findings also indicate that the Malaysian house prices probably turn into a stable state after the upheaval state where p = 0.15, which denotes that the probability house state in the upheaval state in a given month then steps into a stable state the month after experiencing an upheaval. In another finding, when p = 0.94, which denotes that the probability is 0.96 when the house price bubble is in a stable state and remains stable for another month. In particular, the duration of upheaval state is 1.16 months, which is shorter than the stable state, i.e., 26 months (see Table 6)

Table 6

Two states of Malaysian house price: 2010-2017

State	Observation ratio (%)	Expected duration (month)
Upheaval State	6.8	1.16
Stable state	92.5	26.32

Source: own study.

5. Conclusions

A housing bubble is a situation where there is a significant increase in housing prices that are irrelevant based on current market conditions that make it unsustainable. This is followed by a drastic drop in house prices. The increase in residential property prices in recent years has created an awareness of the housing bubble phenomena in the current market. Malaysia has faced several property bubbles, with the most notable being during the AFC in 1998. Due to the crisis, the property market as well as the economy were severely affected. As such, research on detecting housing bubbles in the current market needs to be conducted to prevent the phenomena from happening at earlier stages.

This research consists of different types of residential property segments (landed and high-rise)

over the period of 2010 to 2019. This paper studies the housing bubble phenomena in Malaysia and provides an empirical model for detecting the bubbles in the market. The findings of this paper revealed that, over the period of 2010 to 2019, house prices in Malaysia were relatively stable. Furthermore, the findings from this paper do not detect any housing bubble phenomena in Malaysia between 2010 and 2019. Further study needs to investigate the root cause of the significant increase of house prices in Malaysia and its relationship with the macroeconomic factors that could contribute to the determination of house prices. Furthermore, the issue of affordable housing also needs to be addressed before it becomes serious issue, most importantly to avoid housing bubbles.

Overall, Malaysia house prices over the period from 2010 to 2019 were relatively stable, which changed slowly in the years, where the upheaval state is in a short-lived period. This result is in line with the government efforts made over the past 10 years for cooling measures by introducing several public housing projects to overcome the significant increase in housing prices. Nevertheless, this condition is not considered a bubble which needs to correct the imbalances in the Malaysian house price.

In summary, the findings of this work are vital to all stakeholders involved in the property industry in Malaysia. They can be an important indicator in detecting and measuring housing bubbles in this country. With the awareness of the implication of a housing bubble, the model developed for this paper will hopefully benefit all stakeholders, thus preventing a housing bubble from happening.

6. References

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