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The Determinants of House Prices in Malaysia

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Abstract

This paper studied how house prices were affected by macroeconomic factors from Q1 2009 to Q4 2018. The short and long-run effects of real income, nominal interest rates, inflation rate and stock prices on house prices in Malaysia were examined with the autoregressive distributed lag (ARDL) of a restricted error correction model (ECM). It was discovered that the selected macroeconomic factors were cointegrated with house prices. Income, represented by real Gross Domestic Product (GDP), significantly affected house prices in the short and long-run. Inflation and interest rate, proxied by Consumer Price Index (CPI) and Overnight Policy Rate (OPR), respectively, affected house prices significantly in the long-run. The stock market, tracked by Kuala Lumpur Composite Index (KLCI), had no significant impact on house prices signifying no wealth effect. Through the findings of an inelasticity of demand and an undesirable result of monetary policies, this paper concluded that more effective solutions needed to be carried out to ensure affordability of house ownership in Malaysia.

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1. Introduction

House prices are rising globally, with over half of the countries facing a higher growth rate of house prices versus people's income (IMF, 2019). This leads to an increased cost of living as income is not on par and creates inflationary pressure on the economy. Housing, categorised under the safety needs in Maslow's hierarchy of needs (Maslow, 1943), takes up a huge portion of household expenditure and assets. Also, not to mention that the housing market has significant contributions to the economy. By having an impact on household's net wealth and their ability to spend and borrow as well as financial gains, unexpected growth in house prices have serious implications on house ownership in Malaysia.

A report by Khazanah Research Institute stated that between 2002 and 2016, there was no significant improvement in housing affordability (Ismail, et al., 2019). Since 2009, house prices in Malaysia had skyrocketed at a compounded annual growth rate (CAGR)[1] of 9.1%, peaking from 2011 to 2013 at 11.7% annually. The median house price of the country increased by a CAGR of 23.5% between 2012 and 2014 while median household income only increased by a CAGR of 11.7%, less than half the rate of house price increase. Between 2002 and 2016, the median multiple[2] for Malaysia was in the range of 4.0 to 5.0, surpassing the 3.0 threshold of housing affordability.

Furthermore, a report by Malaysia's Ministry of Finance stated that Malaysia's residential housing loans made up of RM628 billion or 53.2% of the total household debt of RM1.16 trillion in June 2018 (MOF, 2018). This led to two significant issues which were the necessity of obtaining a home and housing affordability. There had been a growing imbalance in the housing market over the years. Households will need to borrow more to purchase a house as the median multiple continues to widen.

Currently, the high increase in house prices persists, yet the real causes of this worrying trend are still up for debate as limited studies are surrounding this particular research area in Malaysia. Due to this, the study examined the effect of economic factors, namely income, inflation, interest rates and the stock market, on house prices. The contribution of this paper lies in its use of OPR data as a measurement for interest rates. Focusing on Malaysia, nominal interest rate could be represented by several data. Some

[1] Compounded annual growth rate is a measure of growth over multiple time periods.
[2] Median multiple is the ratio of the median house price by the median gross annual income.

studies used the Base Lending Rate (BLR) (Yeap & Lean, 2016) or the Treasury Bill rates (Ibrahim, 2005). However, since the change of BLR to Base Rate (BR) usage by Bank Negara Malaysia (BNM) in 2015, BLR is no longer the main reference point for housing loans interest rate. BR is not used in research due to the varying rates, as each bank sets its BR. Thus, this study is among the first to use OPR to proxy for nominal interest rates to determine house prices in Malaysia. Another representation of variable that sets this paper apart from other studies on house prices is its use of KLCI data to represent the stock market.

In the next section of this paper, an overview of the previous literature on house price determinants is provided. It is followed by a discussion on data and empirical method used to study the research questions. Next, the empirical results, discussion and conclusion of the study are provided.

2. Literature review

There have been several studies that demonstrated strong links between factors of macroeconomic fundamentals and housing prices. Tsatsaronis and Zhu (2004) and Hofmann (2004) both investigated the factors of the price of housing in selected developed economies and observed that inflation, bank lending, interest rates, stock prices and economic growth had explanatory powers of significance. Hashim (2010) found that in a market economy, house prices were determined by the interrelation of demand and supply. This finding was supported by Riddel (2004) as well as Wigren and Wilhelmsson (2007) where they concluded that the dynamics of the price of houses were also taken into account when being presented with disequilibrium in the market for which interrelation of demand and supply was used to forecast the trends of housing prices. Stevenson and Young (2014) also supported this finding.

Country-specific studies were referenced where determinants of the housing market were examined for Japanese (Nagahata, et al., 2004), British (Meen, 2002), Irish (McQuinn, 2004), Americans (McCarthy & Peach, 2004) and Finnish (Oikarinen, 2005). Since this study focuses on Malaysia, similar country-specific study by Wan, Singaravello and Hanif (2010) was reviewed, where the growth of Malaysia's housing market was found to be supported by high rates of urbanization, growing population and the expanding economy. Similarly, Ibrahim and Law (2014) also supported Lean and

Smyth (2014) findings that there was cointegration between housing prices and other macroeconomic variables such as interest rate, real output, stock price and bank credits.

A study by Ge (2009) used House Price Index (HPI) to represent New Zealand's house prices as the usage of an index provided an indicator of price trend and capital growth. For the Swiss economy, Borowiecki (2009) also used HPI as a means to observe the movement of house prices in the country. In a Malaysian context, Yeap and Lean (2016) used HPI as a proxy for house prices in their research, where they were looking at the relationship between inflation and house prices.

Sutton (2002) ran data for six developed economies — United States of America (USA), Canada, United Kingdom (UK), Netherlands, Ireland and Australia — and found that house prices were boosted by positive changes in GDP. The author also found in a panel study that GDP dynamics averagely explained around 10 percent movement of house prices. Meen (2002) examined data from UK and USA and observed that price of houses, in the long-run, was extremely elastic to changes in income. Besides that, a study analysing Spanish data (Pagés & Maza, 2003) using error correction model (ECM) and cointegration also concluded that income is an extremely important determinant for house prices in the short and long-run. However, not all literature agreed that GDP as a variable had a significant relationship with house prices. Borowiecki (2009) researched the determinants of price of houses in the Swiss economy and observed that real GDP had limited explanatory power.

Besides GDP as a significant variable in explaining house prices, Tu (2000) observed that nominal mortgage rates, among other variables, was a main determinant of Australian housing prices. Other studies supporting this were by Abelson et al. (2005) and E´ gert and Mihaljek (2007) where they found interest rates had a strong explanatory power when determining price of houses. A study by Karantonis and Ge (2007) found real interest rate to be a main factor in determining price of housing in Sydney. However, not all studies agreed that interest rate played a major part in driving house prices. A study by Ong (2013) found that house prices in Malaysia were not significantly related to interest rate. The author further justified the finding by stating that buyers did not take interest rate into account when demand and supply of houses were not in equilibrium.

A long-lasting and strong relationship between price of housing and inflation had been shown through a study by Tsatsaronis and Zhu (2004). Another study by Hossain

and Latif (2009) also found that inflation rate, among other variables, Granger-cause house price volatility significantly. Anari and Kolari (2002) and Lee (2013) through their research gave proof to support the hypothesis of a long-run relationship between inflation and house prices using the autoregressive distributed lag (ARDL) approach. Even though some literature agreed inflation rate was a significant variable, some did not. Ong (2013) took Malaysian data and ran it through regression analysis. It was discovered that the inflation rate could not determine the movement in the price of houses significantly.

The need to include stock prices in the research was supported by Kakes and End (2004), using data from the Netherlands. The authors observed that equity was a determinant of price of housing. Abelson et al. (2005) in their study found equity prices alongside housing stock were important in explaining the dynamics of house prices in Australia. Their findings were further supported by Sutton (2002). Sutton emphasized the significance of stock prices on house prices, where it was observed that equity prices account for about 10% of changes in house prices. There were certain limitations to using KLCI to measure equity prices. KLCI as the stock price index for Malaysia did not take into calculation households that had foreign stocks as other forms of investments of wealth. From a different perspective, a study by Lean and Smyth (2014) did not find evidence of found stock prices and house prices had no long-run relationship.

3. Methodology

The various data selected had an objective of being representatives for several drivers of housing demand. All datasets were taken and calculated in quarterly terms from 2009Q1 to 2018Q4 with 40 observations. The data were taken quarterly to observe the change in trends of the dataset. All data were observed at the national level to better assess the determinants that affected house prices in Malaysia.

This study was spanned over a decade as a longer time series of data on house prices may not directly make the result more significant. Since most economies in Asia had gone through a regime shift in the housing sector and the housing finance system, they might result in discontinuities of the dynamics (Glindro, et al., 2011). Studies in similar research by Tu (2000) and Lean and Smyth (2014) also used 10 years of data.

For the dependent variable, Malaysia's HPI had been chosen to represent the changes in house prices. The data were taken from National Property Information Centre

(NAPIC). No rebasing was necessary as NAPIC had recently published their rebased data (2010=100) for the year 2009 onwards. Lean and Smyth (2014), Ge (2009) as well as Yeap and Lean (2016) had used HPI as a variable to reflect house prices.

As for the independent variables, GDP in real terms had been selected as it remained a popular demand-side indicator in various studies of the housing market. The dataset for real GDP was taken from Malaysia's Department of Statistics (DOS). Before 2010, the dataset had the base year of 2000. Thus, using the formula shown below in Equation (1), the 2009 dataset had been rebased to 2010 for all four quarters.

$$\frac{2010\ GDP\ at\ constant\ prices\ _{2010}}{2010\ GDP\ at\ constant\ prices_{2000}} \times 2009\ GDP\ at\ constant\ prices_{2000} = 2009\ GDP\ at\ constant\ prices_{2010} \quad (1)$$

Sutton (2002), Abelson et al. (2005) and E'gert and Mihaljek (2007) used GDP as a variable in their studies towards determining the factors affecting house prices. Real GDP will act as a proxy for disposable income and changes in demand.

Another independent variable used was interest rate in nominal terms. The interest rate was chosen in its nominal terms due to a study by Tsatsaronis and Zhu (2004) that showed real interest rate outperformed nominal interest rate in explaining the movement of house prices. OPR was used to reflect interest rates in Malaysia as changes in OPR influenced changes in the BR for a housing loan, among other rates. OPR dataset was taken from BNM. Each year, the OPR is published in January, March, May, July, September and November. BNM changes the OPR on these months or lets it remain the same, depending on the health of the economy. The use of OPR as a variable of monetary policy followed the study by Domac (1999) and Ibrahim (2005). This study averaged out the OPR at the end of every quarter so as to create a consistent dataset with the other variables.

Besides that, the other independent variable for this study was Malaysia's CPI. The variable was used by Yeap and Lean (2016) to measure household inflation in their study. CPI was an important as it took into account the change in prices in the economy. The dataset used was taken from Malaysia's DOS. Prior to 2010, all data published were with a base year of 2005. Thus, this study had to rebase the 2009 dataset to a base year of 2010 using Equation (2) below for all four quarters. This was so that the data were consistent and accurate.

$$\frac{CPI\ in\ 2010_{\ 2010}}{CPI\ in\ 2010_{2005}} \times CPI\ in\ 2009_{2005}$$

The main groups that were tracked to determine the CPI were different than the indices observed for HPI. One of the groups in the CPI that linked to housing calculated the actual housing rental which was not correlated with any indices in the HPI.

Last but not least, the final independent variable that was used in this study was the KLCI. It was used by Lean and Smyth (2014) in their research as a tool to measure stock prices in Malaysia. The index proxies for equity prices which was found to have been significant in a number of studies worldwide (Borio & McGuire, 2004; Kakes & End, 2004). The dataset for KLCI was supplied by Bursa Malaysia. The index tracked the top 30 companies by market capitalisation and was an indicator for the performance of Malaysia's stock market. The base year for the data was 2 January 1977. For this study, the paper had calculated the average figure of the KLCI at the end of every quarter so as to create a consistent and reliable dataset with the other variables.

All data uses 2010 as a base year except for KLCI and were changed to the natural logarithm series, with exception of the OPR data. This was done following the same method carried out by Yeap and Lean (2016) in their study.

Estimation model

This study used the error correction model (ECM) through ordinary least squares method to analyse the short and long term dynamics. The ECM employs an error-correction term to explain short term deviation from the long-run equilibrium. The ECM directly estimated the speed a dependent variable adjusted to return to its equilibrium when changes occurred in other variables.

To check for the long-run relationship, this study used ARDL bounds test to observe for cointegration as the characteristics and size of the data made ARDL the optimum choice. The advantages of a bounds approach to cointegration was that it can be applied even if the variables were integrated at different levels. ARDL itself had good properties for small samples and were used together with sample specific critical values. First and foremost, the study carried out the augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979; 1981) and Phillip-Perron (PP) test (Phillips & Perron, 1988) on each variable's dataset to check for stationarity as well as order of integration. A

significant value would allow us to reject the null hypothesis that the variable had a unit root.

Using ARDL framework (Pesaran, et al., 2001), the long-run equation for house prices was as shown below in Equation (3):

$$lnHPI_t = \gamma_0 + \sum_{i=1}^{m1} \gamma_{1i} lnHPI_{t-i} + \sum_{i=0}^{m2} \gamma_{2i} lnGDP_{t-i} + \sum_{i=0}^{m3} \gamma_{3i} OPR_{t-i} + \sum_{i=0}^{m4} \gamma_{4i} lnCPI_{t-i} + \sum_{i=0}^{m5} \gamma_{5i} lnKLCI_{t-i} + \mu_t \quad (3)$$

The optimum lag chosen (m1, m2, m3, m4, m5) by putting the model through lag selection criterions, for which the paper employed the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQC), as these three were the most used and dependable criteria. For this research, the paper will choose a lag based on the three criteria with the lowest value. Since this study used quarterly data, the lag was set at maximum four. The restricted ECM based on Equation (3) is shown in Equation (4):

$$\Delta lnHPI_t = \tau_0 + \tau_1 ECT_{t-1} + \sum_{i=1}^{m1-1} \lambda_{1i} \Delta lnHPI_{t-i} + \sum_{i=0}^{m2-1} \lambda_{2i} \Delta lnGDP_{t-i} + \sum_{i=0}^{m3-1} \lambda_{3i} \Delta OPR_{t-i} + \sum_{i=0}^{m4-1} \lambda_{4i} \Delta lnCPI_{t-i} + \sum_{i=0}^{m5-1} \lambda_{5i} \Delta lnKLCI_{t-i} + \varepsilon_t \quad (4)$$

where $ECT_t = lnHPI_t - a - b_1 lnGDP_t - b_2 OPR_t - b_3 lnCPI_t - b_4 lnKLCI_t$. The error-correction term's coefficient (τ_1) showed how fast the HPI reacted in the long run. The ARDL bounds test checked if the model had cointegration by examining the *F*-statistic and comparing it with the critical values by Narayan (2005), case III (unrestricted intercept and no trend) with n=36, k=4. The lower and upper bound value for the 1% level was 4.428–6.25, 5% level was 3.202–4.544 and 10% level was 2.66–3.838.

A number of studies with similar research objectives had used ARDL and ECM approach to interpret their data. Yeap and Lean (2017) used ARDL and ECM to analyse

Malaysian data. The study concluded that income and interest rates were of lower significance for determining house prices in the long-run. Abelson et al. (2005) used an asymmetric ECM on Australian data. Among other variables, their study found house prices were influenced by interest rates and real disposable income in the long run.

4. Findings

First and foremost, the lag length of ARDL model constructed was determined. Taking a cue from Pesaran (1997), a bivariate vector autoregressive model was specified for the selection of lag order using AIC.

Table 1: Lag Selection Criteria

Criteria	Lag Order			
	1	2	3	4
Akaike Information Criterion	-6.0917*	-6.0894	-6.0388	-6.0036
Schwarz Information Criterion	-5.8277*	-5.7815	-5.6869	-5.6078
Hannan-Quinn Information Criterion	-5.9996*	-5.9819	-5.9159	-5.8655

Note. * indicate lag order selected by criterion

Table 1 showed the values of AIC, SIC and HQC to determine lag order of underlying test equation based on intercept. All three of the criterions used concluded that a lag of order one should be used for the ARDL model. Even though this study used the three tests to strengthen the reasoning of choosing a lag order of one, AIC test was selected as the main reference point and was used throughout the study due to it having the lowest value among the three criterions.

Table 2 Unit Root Tests

	At level		First difference	
	ADF	PP	ADF	PP
HPI	-3.7973***	-2.0375	-0.6274	-5.6023***
KLCI	-6.8132***	-6.7881***	-4.8749***	-4.8986***
GDP	-0.3874	-1.1530	-5.0681***	-11.1015***
CPI	-0.3167	-0.2583	-6.2023***	-7.0211***
OPR	-1.7741	-1.7792	-4.9381***	-4.9381***

Note. ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent level respectively.

The results of ADF and PP unit root tests were shown in Table 2. For ADF unit root test, HPI and KLCI were both stationary at level while KLCI, GDP, CPI and OPR were stationary at first difference, all at a significance level of 1%. For PP unit root test,

all series were stationary after first difference. However, KLCI was stationary at level as well as at first difference. It was found that no variables were integrated in order two. Thus, the results that were shown by the two unit root tests on each variable's datasets necessitated the study to use the ARDL bounds test to investigate whether the variables were cointegrated.

Table 3: ARDL Bounds Test

ARDL (3,4,4,4,3)	
F-statistic	6.2807***
Long-run coefficient:	
GDP	-0.1806***
CPI	0.2842*
KLCI	0.0344
OPR	0.0152*
Constant	-0.5129
Short-run coefficient:	
ECT*(t-1)*	-1.3856***
GDP	-0.1883***
CPI	0.3431
KLCI	0.0356
OPR	0.0024

Note. ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent level respectively. The optimum lags are selected based on AIC. The lower and upper bound critical figures are taken from Narayan (2005), case III (unrestricted intercept and no trend) with n=36, k=4: 4.428–6.25 (1 percent level), 3.202–4.544 (5 percent level) and 2.66–3.838 (10 percent level).

Table 3 showed the outcome of ARDL bounds test for cointegration on the model. The result of *F*-statistic, being highly significant at 1% level, indicated that there was cointegration between price of houses and observed determinants which were real GDP, CPI, OPR and KLCI. The fact that cointegration existed signified the suggestion that price of houses and the tested variables had the inclination to adjust together in the long-run.

The findings were in line with studies done by Pagés and Maza (2003) and McQuinn and O'Reilly (2008) using Spanish data and Irish data respectively, where the authors found that their chosen variables were cointegrated with price of houses. Looking at researches that were carried out using the ARDL route similar to this study, Anari and Kolari (2002) using US data and Yeap and Lean (2016) using Malaysian data both showcased evidence of a long-run affiliation between price of houses and their investigated factors. This was however the opposite of what was found by Lean and

Smyth (2014) where stock prices and interest rates were not cointegrated with house prices.

The result of short and long-run coefficients were shown in Table 3. Looking firstly at the long-run outcome, it was interesting to observe that real GDP had a 1% significance negative influence on house prices in Malaysia. An interpretation of this could mean that price of houses kept on increasing even with an economic slowdown happening throughout the investigated period. Housing demand was inelastic. Changes in HPI led to a smaller change in demand. Affordability of houses was worse off. Inflation, proxied by CPI, had significantly and positively impacted house prices. However, the figure showed that housing investment was not that effective of a hedge against rising inflation hitting consumers in Malaysia as a rise of 1% in CPI increased the HPI by 0.28%.

Further examination of long-run coefficients indicate that interest rates were also significant and reacted positively with HPI. This indicated that increasing the interest rate was not the most ideal move that should be taken by policymakers in efforts to reduce house prices as it had the opposite effect of what was desired. A unit increase in OPR led to a 1.52% rise in HPI. This outcome could be further explained by Riddel (2004) where the author stated that mortgage interest rates had a smaller influence on homeowners than those looking to purchase a house. This was due to constant monthly payments including mortgage installments and the fact that homeowners had a lower chance of selling their homes when there was an increase in interest rates as it cost more to borrow.

Although stock prices were shown to have impacted positively on house prices in the long-run, it was statistically insignificant. The direction of influence could point to a wealth effect occurring where an increase in stock prices provided more disposable income that could be invested in other forms of investment, in this case, properties.

In interpreting the analysis of short-run coefficients, this paper first gave its attention to the lagged error-correction term which had a negative and highly significant coefficient. This further gave evidence to support the result of ARDL bounds test in Table 3 that economic factors and house prices in Malaysia were cointegrated in the long run. The error-correction term signifies the speed of adjustment of HPI towards long-run equilibrium. Observing the result, price of houses adjusted at a very high speed of

138.6%. This implied that around 138.6% of any movement into disequilibrium were corrected for within one period through an oscillatory convergence.

The outcome of the short-run analysis showed similar direction of effects as in the long-run, albeit only real GDP effected house prices significantly. Real GDP, being highly significant, had about the same level of effect in the short-run as in the long-run, both having about 18% of effect through a negative relationship with HPI. Housing demand was inelastic. This again proved to be interesting and worrying at the same time as it could be interpreted that house prices were increasing at such a high level that it is not in line with the short-run growth of the nation's economy and affected the affordability of house prices significantly.

The other economic factors that were being observed, which were interest rate, inflation rate and stock prices, all had positive effects on price of houses. Consumer prices had a higher effect in the short than in the long-run while it was the opposite for interest rate, which made sense as interest rate was only reviewed every few months and also its effects were lagged as it took time for banks to adjust their rates following central bank of Malaysia's interest rate adjustment.

Table 4 Diagnostic Tests

Normality test, Jarque-Bera	3.6025
Serial correlation, LM(1)	0.4920
Heteroscedasticity, Breusch-Pagan	2.1616
RESET test (Number of fitted terms=1)	0.1222

Note. ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent level respectively.

To certify that the model was reliable and concrete, a few tests were conducted. Referring to Table 4, the model showed that the result of Jarque-Bera test (Jarque & Bera, 1980) was not significant, thus this paper did not reject the null hypothesis and concluded that the model was normally distributed. The study also ran the model through Breusch-Godfrey serial correlation Lagrange Multiplier (LM) test (Breusch, 1978; Godfrey, 1978) to check for autocorrelation in the residuals. The result showed that the model had no serial correlation at up to a lag of one, which was the lag chosen by the selection criterions in Table 1.

The model was then ran through Breusch-Pagan-Godfrey test (Breusch & Pagan, 1979; Godfrey, 1978). A model being homoscedastic was important as a heteroscedastic model would mean that regression analysis could not be used. Based on the model's test

outcomes in Table 4, this paper could conclude that it was homoscedastic as the null hypothesis was not rejected. After confirming that the model was normally distributed, homoscedastic and had no serial correlation, this study took the model and checked it with Ramsey Regression Equation Specification Error Test (RESET) test (Ramsey, 1969). Running the model through the test with one fitted term shows that the functional form of the model had the correct specifications. The paper did not choose a higher number of fitted terms due to strong collinearity between powers of the fitted values, as justified by Thursby (1989) and Ramsey and Gilbert (1972).

Figure 1: CUSUM Test

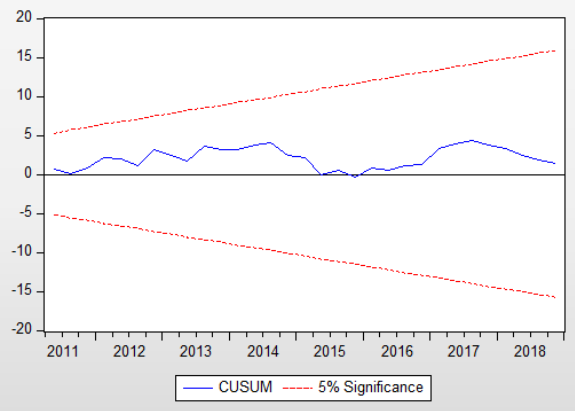
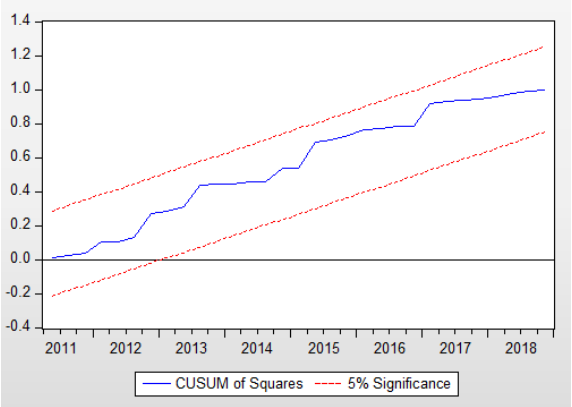


Figure 2: CUSUM of Squares Test



To check for model stability, this paper put the model that was being studied through cumulative sum (CUSUM) and CUSUM of squares tests. Based on Figure 1 and Figure 2, the model was stable throughout the period analysed within the 5% significance boundary.

5. Discussion and Conclusion

The result from ARDL bounds test of the correlation between real GDP, CPI, OPR and KLCI with HPI supported the hypotheses that fundamental economic factors and Malaysian house prices were cointegrated, similar to the findings by Lean and Smyth (2016). An interesting and important observation from the analysis was the inelasticity of housing demand and negative coefficient of real GDP in both the short and long-run which was worrying as even with an economic slowdown, house prices kept on increasing signifying real underlying issues and lea to unaffordability problems. This issue was first similarly found by Yeap and Lean (2017) where negative values of GDP were found affecting some sub-indexes in HPI. KLCI showed less significant influence

on HPI in the long-run, in line with findings by Lean and Smyth (2014). The result proved that there was no wealth effect in Malaysia as any changes in the stock market have no significant effect on changes in house prices.

It is clear that a better policy governing the housing industry is necessary as current efforts such as the real property gains tax has done little to solve the affordability issue. For real GDP, being a proxy to income, a negative coefficient result indicating inelasticity of housing demand, which signifies that our income has not kept pace with the price of houses in Malaysia. Thus, the government should be aware of this and tackle our stagnating income through an increase in minimum wages to the recommended level, lowering the cost of living and other initiatives as these will increase the household's disposable income and thus reduce the median multiple. For OPR, a positive coefficient result signifies that the government has to find other means to cool down the property sector rather than through the use of monetary policies. The government should introduce a tax for unsold properties that are completed on developers as well as vacant properties on homeowners, as this will force them to reduce their exorbitant prices and control price speculations that are making housing unaffordable for the majority of Malaysians. An example of this is a "Speculation and Vacancy Tax" introduced in British Columbia, Canada, where C$115mil have been collected by the government and average sale prices for houses have reduced by 5.6 percent. The money collected through the tax can be used as funding for affordable housing. This paper advocates for the government to highly consider the policies and actions recommended by Khazanah Research Institute (Ismail, et al., 2019) through their extensive research.

There are certain limitations to this research. The data collected throughout the period studied had to be analysed through ARDL method due to the stationarity of certain variables at first difference while others at level. A research using a longer dataset than this paper may open up possibilities for the data to be analysed through different methods which may give a different result. Future studies similar to this paper are recommended to include more macroeconomic factors into the analysis such as population as well as Producer Price Index. Moreover, fellow researchers are also encouraged to analyse different frequency of data for example annual or monthly instead of quarterly with a different time period. A more in-depth study is recommended on speculative demand in

the property sector, as questions abound on reasons for property prices to remain high when real demand remain low due to income, as shown by this paper.

House prices are affected by economic factors. Real GDP, as a proxy for income, is shown to have a significant negative relationship with house prices in Malaysia in the short and long-run. Besides that, the analysis also shows that CPI and OPR, as a proxy for inflation rate and interest rate respectively, have a significant positive relationship with house prices in the long-run only. However, KLCI has no significant impact on house prices in Malaysia, either in the short or long-run. Through the findings of this study, the Malaysian government and relevant parties in the housing industry have to formulate policies that better serve the people, no matter how unpopular they are with key market players. With a combination of right policies, the possibility to address financial concerns on the affordability of houses in Malaysia exists.

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