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A STUDY ON THE RELATIONSHIP BETWEEN HOUSE PRICE INDEX AND ITS DETERMINANTS IN MALAYSIA

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ABSTRACT

In Malaysia, House Price is considered high at a certain part of the country causing the lower and middle groups unable to purchase a house. This research examines the long-run relationship and causality effect between House Price Index and determinants of House Price Index. The data was obtained from Valuation and Property Services Department (JPPH), Department of Statistics Malaysia, and Bank Negara. The data was collected over 10 years from 2010 to the first quarter of 2019. Johansen Cointegration Test and Granger Causality Test are applied in determining the long-run relationship and causality effect respectively. The general finding of this study is that the House Price Index shows an upward trend for the past nine years but slightly drop in the first quarter of 2019. This study has found that there is a long-run relationship between the House Price Index and the determinants which are Gross Domestic Product, Interest Rate, Inflation Rate, Population, and Unemployment Rate. Next, all independent variables do not granger cause House Price Index. At the same time, there is only one-way relationship found between House Price Index and Gross Domestic Product, and between House Price Index and Population where House Price Index is identified to granger cause both variables.

Keywords: *House Price Index, Determinants, Long-run relationship, Causality effect, Johansen Cointegration Test, Granger Causality Test*

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1. Introduction

A house is one of the basic needs of human beings. It is an accommodation or shelter that provides space for individuals or families to live and giving temporary protection from bad weather or danger. It can be categorized as a terrace, semi-detach, apartment, flat, bungalow, and condominium. Each individual has the wills to own a house. Owning a house is among one's success. However, housing affordability stops a person to own the house especially those in the low and middle-income groups.

The price of a house is firmly related to the affordability of buyers to own a house. Prices will give an impact on affordability and affordability will affect demand. Therefore, if prices are high, affordability goes down and the demand will have to go down too. The government plays a significant role in ensuring that the housing price is proportionate to the overall level of

income in this issue. In order to help Malaysians to own a house, the sixth Prime Minister Datuk Seri Najib Tun Razak has launched multiple housing programs to help Malaysians overcome this crisis as stated in the journal "Exploring the Elements of Housing Price in Malaysia", (Ernawati *et al*., 2015). It also states among the program that has been performed is First Home Scheme (SRP), the 1Malaysia People's Housing Project (PR1MA), and the 1Malaysia People – Friendly Homes (RMR1M).

In Malaysia, the cost of living is getting higher in several states and the salary is not enough to support life so much that it unable to afford to buy a house. Moreover, house price is also the cause of individuals not to have a house since salary is not on par with living standards. Based on Figure 1, house price index in Malaysia dropped to 1.10 percent in the third quarter of 2018 from 1.70 percent in the second quarter of 2018.

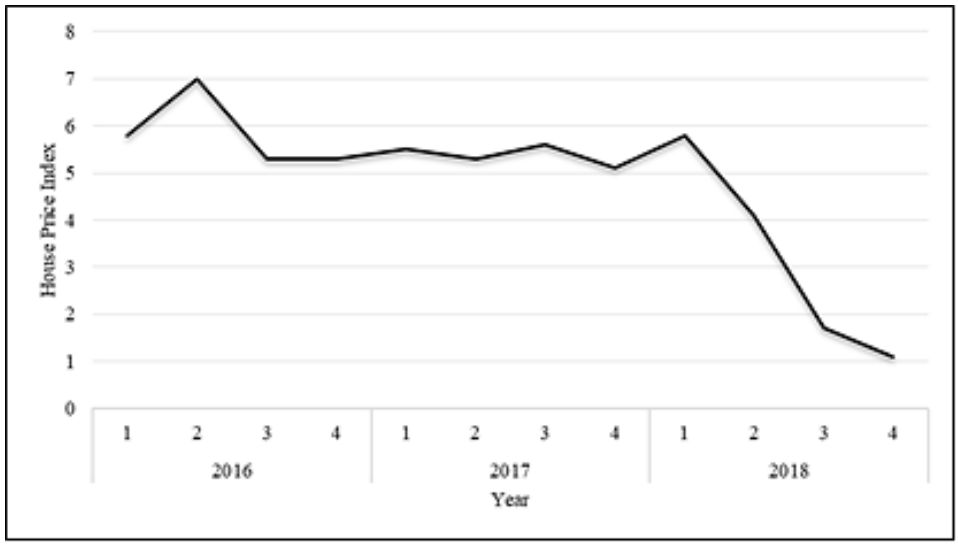

Figure 1: Malaysia house price index

According to Mohamad (2018), in the third quarter of 2018, the average house prices nationwide are RM414, 469 compared to the second quarter which was recorded at RM416, 716. Nine states involve in this house price declining which was Negeri Sembilan, Kuala Lumpur, Sarawak, Selangor, Pahang, Kelantan, Melaka, Pulau Pinang, and Terengganu. Despite this declination, housing prices in Kuala Lumpur remain the highest followed by Selangor (RM478, 466), Sabah (RM457, 182), Sarawak (RM433, 546) and Pulau Pinang at RM416, 941. According to Abllah (2019), the price of residential properties is expected to continue to deteriorate over the next one to two years following the dumping of the unsold house in Malaysia which now stands at RM29.47 billion.

On top of that, with the high price of the house, the possibility to own a house is low regardless of the declination of house prices in these few years. According to Ismail *et al.* (2015), the Malaysian housing market is overpriced as a result of fragmented and inefficient construction business systems.

There are a few factors that contribute in determining the House Price Index (HPI) which includes Gross Domestic Product (GDP), Inflation Rate (INF), Interest Rate (IR), Population, and Unemployment Rate (UR). All determinants were chosen based on the previous study. According to Tan & Razali (2016), GDP is one of factors that are significant in determining the

house price in Malaysia. As for INF, Md. Aris *et al.* (2018) reported that INF measured by the consumer price index (CPI) was found to have a significant and positive effect on residential property prices in Malaysia. Meanwhile, IR was found to be the major effects in determining the housing price and UR is positively related to the Malaysian housing price as mentioned by Lim *et al*. (2016). In the same way, population is also found to be the main factor of housing prices (Mariadas *et al.,* 2016). These factors are important in understanding the housing price issues nowadays. The results of the previous study might be different as the house price kept increasing until it slightly dropped in the third quarter of 2018. Every changes in variables may give a significant effect on the house price. In addition, a different factor may leave a different effect on the house price. Therefore this research aims to determine the relationship and causality effect between HPI and the determinants. This research outcome will provide beneficial information for every party involves.

2. Methodology

2.1 Johansen Cointegration Test

Cointegration tests are used to analyse a non-stationary time series – process that has differed variance and mean over time. In economics, cointegration is most frequently related to economic theories that infer equilibrium associations between time series variables. It recognizes a circumstance where two or more non-stationary time series are bound together in such a way that the time series cannot go astray from equilibrium within the long term. In order to identify a stable and long-run relationship among the variables, the cointegration test will be applied.

In this study, Johansen Cointegration Test is used. The test by Johansen is another leap forward over the Engle-Granger test. The test maintains a strategic distance from the issue of selecting a dependent variable as well as problems when transferring errors in each step. It also tests whether here is a the cointegrating relationship between two or more time-series variables. Therefore, Johansen Cointegration Test is used in order to fulfil the first objective which is to determine the long-run relationship between HPI and the determinants of house price in Malaysia. Johansen derived two tests, the λ−trace (or trace test) and the λ−max (or maximum eigenvalue). The shortcoming of the test is that it depends on asymptotic properties and delicate to specification errors in restricted samples.

2.2 Granger Causality Test

Granger causality is a statistical hypothesis test to assess if one-time series variable is useful in predicting another economic variable that was first introduced in 1969. It also considered a method that use to evaluate the cause and effect of the time-series data. At the same time, a study on the causal relationship is important to predict the future value of time-series by determining the cause of the fluctuation in the time-series itself. In order to determine the cause of HPI, the second objective which is to analyse the structures of the causal relationship between the variable HPI and the determinants (INF, IR, GDP, Population, and UR) is constructed. Therefore, the Granger causality approach is used as the causality relationship and time-series data involve.

Vector Autoregression Lag Order Selection Criteria is done before conducting the Granger Causality Test to decide the optimal lag order number of the model for the test. Generally, the number of lags to be included is normally selected based on the basis of an information criterion such as the Akaike Information Criterion (AIC) or the Schwarz Information Criterion (BIC). Each specific lagged value of one of the variables is retained in

the regression if a t-test is significant, and the other lagged variable values add explanatory power to the F-test model together.

The null hypothesis of no Granger causality is not rejected if and only if the regression has not maintained any lagged values of an explanatory variable. By using Granger Causality, it can be found that neither or both of the Granger variables – causes the other. When each of the variables Granger causes the other, this is called two – ways association or only one of the variables Granger causes the other (one – way association).

3. Results

3.1 The Overall Trend of House Price Index in Malaysia

This section presents the overall trend of Malaysia House Price Index from the first quarter of 2010 to the first quarter of 2019.

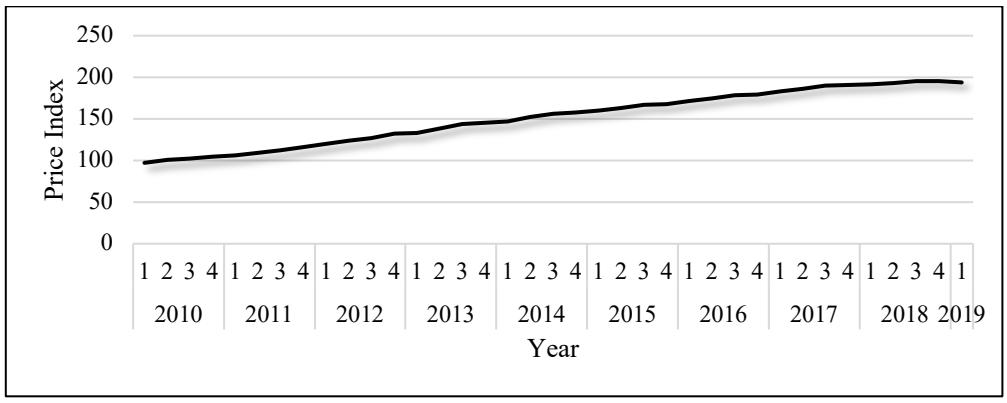

Figure 2: Graph of Malaysia house price index

Based on Figure 2, the HPI shows an upward trend with a significant increase in HPI between 2010 and 2018. However, the HPI fell slightly in the first quarter of 2019. This also has been stated by Kumar (2019) where HPI for the first quarter of 2019 dropped by 0.9 percent on a quarter-on-quarter (q-o-q) basis.

3.2 Johansen Cointegration Test

Johansen Cointegration test enables the determination of the cointegration relationship among two or more variables. Rejecting the null hypothesis indicates that there is a long-run equilibrium between the variables. Meaning to say, the variables continue to shift together in the long-term. Two likelihood ratio tests were used to determine the existence of a cointegration relationship among the variables which are Trace and Maximum Eigenvalue. The findings of the cointegration test of HPI and the independent variables are summarized in Table 1 and Table 2.

Table 1 presents the results of the Johansen test of cointegration between the HPI and independent variables. Based on the significance level at 0.05, the null hypothesis of no cointegrating equilibrium relationship is rejected. Correspondingly, the Trace test specified six cointegrating equations at the significance level of 5%. Hence, it is possible to conclude that a

long-run equilibrium relationship exists between HPI and independent variables such as GDP, INF, IR, Population, and UR.

Table 1: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Probability**
None	0.793851	215.5276	95.75366	0.0000
At most 1	0.766192	163.4155	69.81889	0.0000
At most 2	0.684889	115.4581	47.85613	0.0000
At most 3	0.625022	77.34873	29.79707	0.0000
At most 4	0.528984	44.97942	15.49471	0.0000
At most 5	0.456730	20.13494	3.841466	0.0000

Based on Table 2, similar to the result in Trace test, the Maximum Eigenvalue test also rejects the null hypothesis of no cointegrating equilibrium at the 5% level of significance with p-value equals to 0.0014 or less than 0.05. The maximum eigenvalue test indicates that there are six cointegrating equations as the hypothesis of at most five equations is also rejected. This means that there is an equilibrium relationship exists among all of the variables. As both Trace test and Maximum Eigenvalue Test point out the same results, there is sufficient evidence to indicate that a strong cointegration relationship does exist between HPI and the determinants (GDP, INF, IR, Population, and UR).

Table 2: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	**Eigenvalue**	**Max – Eigen Statistic**	**0.05 Critical Value**	**Probability**
None	0.793851	52.11209	40.07757	0.0014
At most 1	0.766192	47.95738	33.87687	0.0006
At most 2	0.684889	38.10936	27.58434	0.0016
At most 3	0.625022	32.36932	21.13162	0.0009
At most 4	0.528984	24.84448	14.26460	0.0008
At most 5	0.456730	20.13494	3.841466	0.0000

3.3 Granger Causality Test

Granger Causality test is conducted after all variables are stationary at the same order of differencing. Granger Causality test used to assess the variables that Granger cause HPI. It can be either one – way or two – way association. Once the variable is said to be the Granger cause of another, the variable is useful in forecasting another (ElemUche *et al.,* 2018).

Table 3: Pairwise Granger Causality Tests

Null Hypothesis	**F – Statistics**	**Probability**
GDP does not Granger cause HPI	0.58639	0.4496
HPI does not Granger cause GDP	4.68422	0.0383
INF does not Granger cause HPI	0.01257	0.9114
HPI does not Granger cause INF	0.12488	0.7262
IR does not Granger cause HPI	0.04596	0.8317
HPI does not Granger cause IR	0.14803	0.7030
POPULATION does not Granger cause HPI	0.76061	0.3898
HPI does not Granger cause POPULATION	4.71597	0.0377
UR does not Granger cause HPI	3.33205	0.0776
HPI does not Granger cause UR	0.01771	0.8950

Based on Table 3, there is a causality effect found between HPI and GDP and also between HPI and Population. For HPI and GDP, there is one – way relationship found as the probability for the null hypothesis of HPI does not Granger cause GDP is rejected with p-value 0.0383 which is less than 0.05. This shows that the variable HPI is valuable in forecasting GDP but GDP does not Granger cause HPI. There is also one – way association between HPI and Population. Since the null hypothesis of HPI does not Granger cause Population is rejected, it can be concluded that HPI granger cause the Population. Meanwhile, Population does not granger cause HPI. On the contrary, there is no one – way and two – way associations found between HPI and INF, HPI and IR, as well as between the HPI and UR as both null hypotheses for the three relationships are accepted. Figure 3 shows the association between HPI and the determinants.

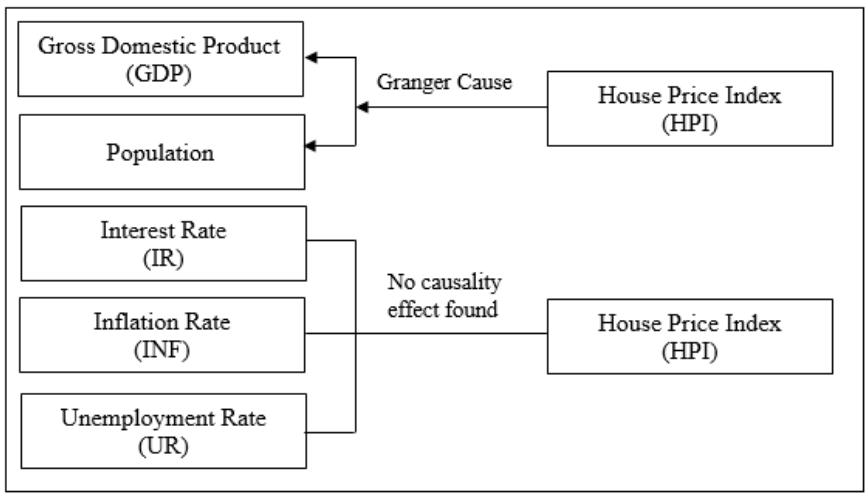

Figure 3: Association between HPI and Determinants

4. Conclusions

The study of factors influencing house prices will give beneficial information for investors, home buyers, housing developers, and government. As for the investors, a better investment plan that involves fluctuations of Malaysia house price index can be done. The home buyers will have more knowledge about the factor contributing to house prices. Thus a future planning can be made on the budget so that the buyer can afford to buy a house. As for the housing developers, the price of house by considering a few factors that have a significant can be set. This study comes up with two contributions. Firstly, by determining the existence of the long run equilibrium relationship between HPI and macroeconomics variables such as Gross Domestic Product, Inflation Rate, Interest Rate, Population, and Unemployment Rate. Secondly, by analysing the causality relationships between HPI and its determinants.

Before carrying out the Johansen Cointegration Test and Granger Causality Test, the unit root test for each variable was tested to ensure that all variables were stationary at the same order. All variables have been integrated at the second order differencing. The results of the cointegrating relationship between HPI and independent variables such as GDP, INF, IR, Population, and UR are based on two approaches in Johansen. For the first approaches which are Trace, there are six cointegrating equations found. This means that there is a cointegration relationship exists among variables of HPI and all independent variables. Similarly, the Maximum Eigenvalue approach has identified that there is a cointegrating relationship among the variables where it also has identified six cointegrating equations. The existence of cointegration between HPI and its determinants comes up with strong evidence that there exists an interactive relation between the variables. Once the variables are highly cointegrated, it can be very sensitive to each other's behaviour and such vulnerability will cause some adverse effects if the fluctuations of the variables are not managed properly. As a result, the variables tend to move together in the long run.

By using Granger Causality Test, there is a causality effect found between HPI and GDP and also between HPI and Population. HPI has been identified to be the Granger cause of GDP and Population. In other words, HPI is the leading indicator in both GDP and Population growth. In contrast, GDP and Population does not granger cause HPI. This means that there is only one–way association occurred between HPI and variables of GDP and Population. Whereas, INF and IR do not have an effect on HPI which are supported by Tze (2013). At the same time, UR has also been found to have no causality effect on HPI. Since all determinants are found not to be a granger cause of HPI, it can be concluded that the determinants do not contain any useful information about the House Price Index. Lastly, for further research, it is recommended that to use an up to date data and includes more variables such as household income, consumer price index and type of house to be included for analysing the data.

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