



Prediction Supply for High-Cost Multi-Storey House toward the Development of Sustainable Cities

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Abstract: The absence of concerns about the problem of housing overhang in developer's inventory can result in the growth rate of supply exceeding the growth rate of demand. The uncertainty of the economic sector at the international level has a direct impact on the economy in Malaysia, especially the real estate sector. This discussion paper applies literature review, analysis as well as regression approach to develop the supply prediction model for high-cost multi-storey houses. The published documents such as GDP per capita, inflation rate, unemployment rate and per centage of housing overhang for 10 years from beginning 2010 until 2020 are analyzed using secondary data analysis before regressed. Based on such findings, the GDP factor resulted in an increase in the percentage of house price supply for categories between RM 300,000 to RM 400,000, RM 600,000 to RM 700,000 and RM 800,000 to RM 900,000. Second, the factor of unemployment rate resulted in an increase in the percentage of house price supply for a category between RM 300,000 to RM400,000. Third, the factor of inflation rate results in an increase in the percentage of house price supply for categories between RM 400,000 to RM 500,000, RM 700,000 to RM 800,000 and above RM1,000,000. This model allows the developers to predict a better outcome for their housing development project besides to help them easily carry out the feasibility study phase without wasting time.

Keywords: Housing overhang, housing oversupply, high-cost multi-storey houses

1. Introduction

The challenging housing market condition due to the growing pile of overhang and oversupply units has been the limelight in the press and become regular debates by government planning and property players. Simply speaking, overhang and unsold is a cyclical problem due mainly to the unmet housing demand in association with the varying economic performance, housing preferences, market sentiment, credit accessibility and so on [14]. Property oversupply, on the other hand, is a structural problem where the number of houses is in excess of the number of households, as a result of a failure in complying with the housing planning policy, guidelines, and other determinations as contained in the development plans [15].

Past experience suggested the severity of overhang varies with the country's housing policy and economic performance. During the period of 2004 to 2008, overhangs of housing peaked from 15,558 units to 26,029 units, which is in conjunction with the weak economic performance following the Oil Price Bubble (2003 to 2009) and Global Financial Crisis (2007 to 2009). Since then, overhangs had reduced substantially, from 22,592 units in 2009 to 11,816 units in 2014 (refer Fig. 1), when the market was boosted by easy credit as well as the introduction of the Developer Interest Bearing Scheme (DIBS) to help lower down the buyers' entry-level [8]. Unsurprisingly, this is also the period when property overhangs reduced drastically and consecutively, reaching its lowest level of 11,316 units in 2015.

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Fig. 1 - Total Overhang Units

2. Malaysian Affordability toward High-Cost Houses

According to [7], the signal of a well-functioning housing market is when most prospective buyers can afford to buy a house irrespective of their income level. [10] mentioned that the median is used, rather than the average, because the median is unaffected when the distribution of household income or house prices are skewed such as the existence of high-income households or luxury housing. In the international comparison of the market’s housing affordability 2019, Malaysia is ranked seventh out of eight countries identified as having an unaffordable housing market [10]. Meanwhile, Hong Kong is ranked as the country with severely unaffordable housing market with Median Multiple (MM) of 20.8 followed by New Zealand and Australia with MM of 7 and 5.9 respectively. For instance, there are three more countries besides Malaysia that have a seriously unaffordable housing market, namely Singapore, United Kingdom (UK) and Ireland with MM of 4.6, 4.5 and 4.1 respectively. Meanwhile, only Canada and the United States (US) are categorized as countries with moderately unaffordable housing market with MM 3.9 and 3.6 respectively.

Based on the report published by Khazanah Research Institute (KRI), the number of overhang houses is dominated by three states, which are Johor with 6,001 units, Selangor with 4,477 units, and Pulau Pinang with 3,679 units. the three states showed that the price range categorized the least in overhang units was from those priced at RM300,000 and below, whereas the category of houses priced between RM600,000 to RM1,000,000 ranked first after the category of houses priced above RM1,000,000 [7]. Ironically, according to [8], houses priced between RM300,000 to RM500,000 are categorized as medium cost and affordable houses for the middle class in Malaysia. However, the sale performance under that category shows the opposite scenario when overhang units for that category dominate the top rung for the total number of unsold multi-storey houses in Malaysia during 2020. From the aspect of affordability, only the flat housing market does not experience the problem of affordability while the serviced apartment market shows the inability of ownership in all states in Malaysia. The condominium market only shows the ability of ownership in one state, namely Negeri Sembilan while the apartment market shows the ability of ownership in four states, namely, Selangor, Wilayah Persekutuan, Negeri Sembilan and Melaka [7].

Realising that the critical figures of unsold, unsold, and low performance mostly involve the high-cost multi-storey sales performance [4] [23] have sparked lively discussions and debates, it is about time to implement the prediction supply model, to highlight the importance of controlling the supply by only focussing on the actual supply needed. A study conducted by [23] successfully proved that housing supply can be controlled when there are measures to overcome the challenge of oversupply by reducing approvals for housing development projects by the authorities. This is evidenced in that study when the existence of an inverted U-shaped housing supply curve in Malaysia indicates that there is a non-linear relationship between housing supply and house prices. Further to those, this paper highlights the current issues of unsold from the oversupply of housing experienced in the Malaysian housing property industry.

3. Malaysian Housing Market Status

Basically, there is no occurrence of housing surplus in Malaysia as the country is experiencing positive population growth. This is because, study done by [6] found that the housing supply rate (calculated in Compound Annual Growth Rate (CAGR)) within the period of 2010 until 2019 is lower than the rate of household growth. The use of total households as a benchmark to limit housing supply is a relatively rough estimate. Although Malaysia is under the category of an undersupply condition for the housing market, but there are some states where the housing supply has exceeded the saturation point. In other words, the growth rate of supply has not only exceeded the growth rate of demand, but the total housing stock has also surpassed the total number of households.

The relationship between oversupply and overhang is very clear if a cross-reference is made between annual stock growth with the overhang unit. Overall, the absorption rate of the housing market in Malaysia has not changed much throughout 2003 until 2020 because the time required to reduce the number of oversupplies of housing to the lowest

level from 9,300 units in 2003 to 11,316 units in 2015 is 12 years. The increase in the amount of overhang in the following occur when there is an excess supply in a particular year. The issue of overhang housing needs to be addressed to provide an effective property supply because the percentage of unsold housing stock is an indicator taken into account to assess the sustainability of a city in the housing sector [20].

3.1 Overhang of Houses

Apart from House Price Index (HPI), total or value of transactions and sales performance, overhang units are also used as an indicator to diagnose the strength of the residential property market [2]. In Malaysia, an unsold property after nine months of being launched and has obtained CF designated as an overhang property [21]. In short, according to [21], the term overhang is not a term used for unsold property for the categories of under construction property and not constructed property. According to [21], the latest definition of the overhang term is the third redefinition done by NAPIC after the definition is remade in 1999 and 2002 because the first and the second definitions were getting comments from parties involved with the real estate industry. Although the use of the term overhang gives the impression that the current state of unsold completed properties in the country is in dire straits and unable to absorb any new supply, all reports issued by NAPIC, REHDA and UPESM use the term. Accordingly, the term overhang is used in this study as the study period limitation only involves the years 2010 to 2020 multi-storey housing that are completed but unsold after nine months from the launch date. The use of the term overhang is important to facilitate understanding of the scope of the study whether it covers completed units, under construction or not constructed.

3.2 Oversupply of Housing

Although Malaysia is under the category of an undersupply condition for the housing market, but there are some states where the housing supply has exceeded the saturation point. In other words, the growth rate of supply has not only exceeded the growth rate of demand, but the total housing stock has also surpassed the total number of households. According to [6], only housing supply in Melaka and Pahang approaching a point of saturation, owing to the increase of housing provision rate which is much faster than the household growth rate. While, the remaining areas are under the undersupply situation, with the shortage of houses in Sarawak being the most critical, followed by Sabah, Kelantan and Kedah [6]. On the other hands, oversupply situation occurs in Pulau Pinang, Kuala Lumpur, Selangor, Johor and Negeri Sembilan as the existing housing stocks had exceeded the number of households in areas [6].

However, prior to 2014, no oversupply was found in states like Pulau Pinang, Kuala Lumpur, Selangor, Johor, and Negeri Sembilan. The indication of this so-called as ‘healthy’ sign to the property market offers opportunities for property developers to continuously launch new houses to the market without exceeding the local market absorptivity [16]. According to the unsold property report published by Valuation and Property Services Department (JPPH), beginning in 2016, the total housing stock in the state began to outpace the number of households and became more pronounced in 2019. The number of housing stocks started to exceed the number of households in states like Kuala Lumpur and Negeri Sembilan since 2016 and became more apparent in 2019 as the housing supply rate became almost 2 to 4-fold more than the household growth rate. Meanwhile, in states like Pulau Pinang, Selangor, and Johor, the housing supply rate also began to accelerate and went beyond the demand rate. The housing supply rate in Pulau Pinang is 6-fold of the demand rate; while in the case of Selangor and Johor, the supply rate is 4-fold of the demand rate

4. Macro Factors Affect on Oversupply of Houses

One of the goals of a country's economic management is to ensure sustainable economic growth. In this regard, Gross Domestic Products (GDP) is one of the components in national accounting, has been widely used around the world as a benchmark for measuring the size and rate of economic growth of a country or region [24]. Fig. 2 shows a comparison of the per centage of unsold high-cost houses as well as the GDP growth rate in Malaysia throughout the year 2010 to 2020. The statement issued by [5] which is GDP growth is correlated positively with housing demand is indeed irrefutable when 2012 saw the highest per centage decline in the supply of unsold houses despite the increase in GDP growth occurring during the year. Nevertheless, [18] argue that in addition to the GDP factor, measures taken by the government to address the problem of instability in demand and supply of housing also affect the housing market. This statement is proved when this study found that there are indeed several measures implemented by the government in 2012 to attract home buyers such as introduction of home purchase through joint loans of husband and wife, payment of house instalments by the buyer after the house is completed and housing loans using Employees Provident Fund (EPF) [15].

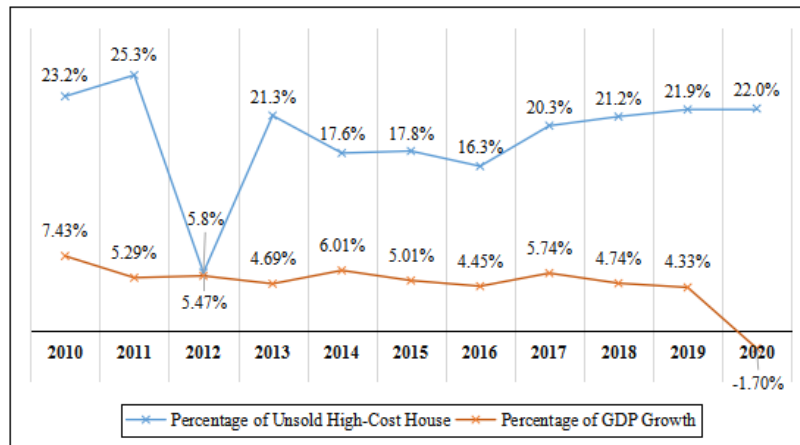


Fig. 2: Malaysian GDP Rate and Percentage of Overhang High-Cost Houses

Meanwhile, this paper identified the second macro factor affecting the oversupply of houses is inflation rate. Consequently, severe inflation has occurred because inflation has caused an increase in the cost of production and resulted in a fall in the value of the currency [1]. Inflation is a major problem that is often faced by a country, especially countries that practice a free market economy. In the construction industry, a rise in the inflation rate is associated with the rise in the materials cost, where workers will also demand an increase in wages to compel the higher living cost [11]. To see in detail, Figure 2.17 shows a comparison of the per centage of unsold high-cost houses and the inflation rate in Malaysia throughout the year 2010 to 2020. Based on the figure, there are five years that show a positive relationship between inflation rate and the per centage of houses which are during 2011, 2012, 2013, 2016 and 2017.

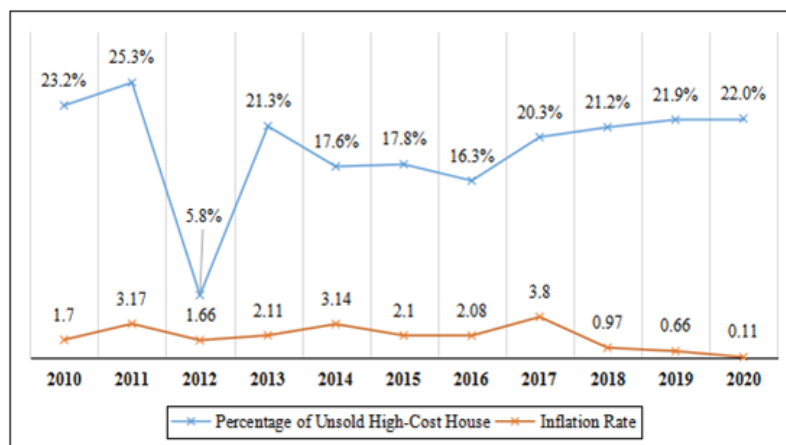


Fig. 3: Malaysian Inflation Rate and Per centage of Overhang High-Cost Houses

Many building materials prices faced a drop and then a sudden increase, which indicates a high fluctuation in the prices even though the inflation rate was dropped but it did not affect their prices, showing that there could be any other possible factor which is increasing their prices [1]. From the developer's perspective, according to [13], the impact of the increase in the cost of building materials has caused developers to focus more on high-cost houses only to be developed. [6] found that developers are said to only reap profits that are multiplied if the inflation rate that hit is low. This statement proved to be true when according to [1], the price increase of construction materials which occurred due to the inflation rate is found to become a major distress of cost overrun.

On the other hands, referring to the statement by [2], the decline in the unemployment rate led to a decrease in the per centage of unsold homes. Okun's study has found that there is an inverse relationship between unemployment and GDP [12]. The study found that a 1 per cent drop in unemployment would increase GDP the potential by 2 to 3 per cent. The simple conclusion stated is that unemployed people do not contribute to production and in turn do not contribute to the growth of domestic production. An oversupply of housing occurs in the event of a shortage of demand due to the rising unemployment rate [17]. This happens because, non-working groups cannot seek financial resources assistance from the bank to finance home purchase. This is indeed undoubtedly as an application for a home buying financing usually requires that individuals must have a fixed income source [9].

Fig. 4 shows a comparison between the unemployment rate that occurred in Malaysia as well as the per centage of unsold high-cost houses over a decade starting in 2010 to 2020. it was found that most of the years that saw the decline

in the unemployment rate still recorded an increase in unsold housing units. The years 2011, 2017, 2018, 2019 and 2020 saw an increase in the per centage of unsold homes even though the per centage of unemployment rate declined. Only 2012 and 2014 showed a decrease in the per centage of unsold homes when the unemployment rate declined. According to [15], individual decisions in home ownership are also influenced by economic elements (income, household expenditure and type of employment), socio-demographic elements (sociology and demographics) and behavioural elements (personality as well as self-motivation and emotions).

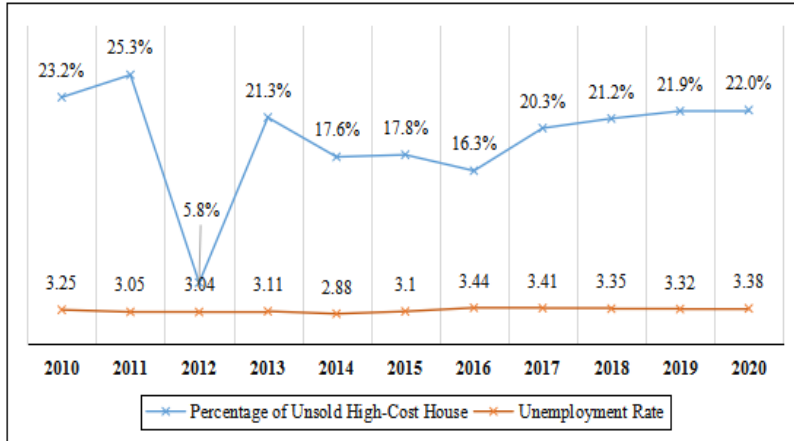


Fig. 4: Malaysian Unemployment Rate and Per centage of Unsold High-Cost Houses

5. Initiatives for Combating Housing Oversupply Issues

To overcome the problem of overhang, this paper found that there are developers who provide free gifts to attract buyers to buy a house with them [22]. Not only that, there are developers who provide interest-free instalment plans for buyers who cannot afford to provide ho. 4wn payment [22]. Apart from that, the developer also seems offering a loan of 88 per cent of the property value to potential buyers who failed to obtain a loan from the local bank [3]. Next, they also introduced a payment scheme of 5 percent of the house price for the process of moving into the house immediately [3].

Besides that, the government through Bank Negara Malaysia (BNM) has prepared six policies to reduce the imbalance in the property market. This step was taken because there is a large number of unsold houses priced at RM250,000 and above. This requires the cooperation of all parties such as developers, the federal government and state governments to address this problem [2]. Therefore, there are six policies provided by the national bank to further boost the housing sector, such as;

- BNM encourages the rental market

The excess housing stock in the market causes losses to developers. Therefore, in order to reduce the losses incurred then the rental method is the best method. However, in order to implement the proposed policy, laws should be enacted to protect landowners and tenants.

- Establishment of a single entity body to manage affordable housing

The establishment of a body that manages affordable housing is necessary because to ensure efficiency in the supply of affordable housing to the people. In addition, to enable a balance between demand and supply to be achieved.

- The affordable house application system is constantly updated

In order to enable each application to be implemented, it must be screened, carefully examined to ensure that only those who are truly eligible acquired the house. This is due to the existence of a monopoly by a group of investors which to enable them to manipulate house prices by increasing the price which is very expensive compared to the purchase price

- Attract foreign investors to set up business in Malaysia

Attracting foreign investors to further expand their business in Malaysia is aimed at increasing demand for existing properties. The Malaysian government is conducting a campaign to encourage foreigners to retire and invest in real estate in Malaysia. Property ownership by foreigners of the property purchased is 100 per cent (Yussof, 2018).

6. Methodology

Regression analysis is used to develop a prediction model for housing supply in Malaysia to achieve the paper objective. This kind of analysis is used because it could predict a dependent variable from a set of independent variables besides describing the relationships among the dependent variables and independent variables in a simplified

mathematical form. The dependent variable (Y) is the supply housing, while the independent variables (X) are GDP per capita, inflation rate and unemployment rate. To ensure the accuracy and the level of trust of a model that has been established, this research conducted several statistical tests such as Coefficient of Determination (r^2), t-test, f-test and Durbin-Watson.

7. Findings

The formation of the supply prediction model is continued by setting up the house prices starting at price RM300,000 to RM400,000 as the lowest house price, followed with the house prices above RM1,000,000 as the highest house price. First and foremost, the analysis began with the diagnostic test such as multicollinearity test by using Variance Inflation Factor (VIF) and tolerance as the size. VIF value that larger than 4 and the tolerance value that smaller than 0.20 are the sign of the instability of b and beta coefficients among independent variables in the regression equation. The results of the multicollinearity test shown in Table 1 indicates that all independent variables for all eight regression models do not have a stronger relationship between the independent variables since the VIF-value obtained were less than 4, and the tolerance value obtained is more than 0.20.

Table 1: Result of Collinearity Statistics

House Price Category	Macro Factor	Collinearity Statistics		Multicollinearity Problem
		Tolerance	Variance Inflation Factor (VIF)	
RM 300,000-RM 400,000	Gross Domestic Product	0.545	1.835	×
	Inflation Rate	0.547	1.828	×
	Unemployment Rate	0.641	1.561	×
RM 400,000-RM 500,000	Gross Domestic Product	0.586	1.705	×
	Inflation Rate	0.596	1.677	×
	Unemployment Rate	0.533	1.878	×
RM 500,000-RM 600,000	Gross Domestic Product	0.592	1.688	×
	Inflation Rate	0.435	2.300	×
	Unemployment Rate	0.683	1.463	×
RM 600,000-RM 700,000	Gross Domestic Product	0.582	1.719	×
	Inflation Rate	0.544	1.839	×
	Unemployment Rate	0.534	1.871	×
RM 700,000-RM 800,000	Gross Domestic Product	0.583	1.714	×
	Inflation Rate	0.552	1.812	×
	Unemployment Rate	0.376	2.657	×
RM 800,000-RM 900,000	Gross Domestic Product	0.590	1.695	×
	Inflation Rate	0.569	1.757	×
	Unemployment Rate	0.506	1.975	×
RM 900,000-RM 1,000,000	Gross Domestic Product	0.613	1.631	×
	Inflation Rate	0.451	2.218	×
	Unemployment Rate	0.414	2.413	×
Above RM 1,00,000	Gross Domestic Product	0.604	1.657	×
	Inflation Rate	0.608	1.645	×
	Unemployment Rate	0.736	1.359	×

Meanwhile, the next statistical test was conducted to test another accuracy of the model formed. The test involves three techniques which are r^2 , f-test or so-called as f-statistic or f-ratio and Durbin-Watson statistic. Table 2 summarises the results of the accuracy tests for all eight predicting models. The equation formed is almost perfect and appropriate for predicting when the value of r^2 is approaching the value of 1.000 because it shows that about 100 per cent of the change that occurs on the dependent variable is due to the change of independent variable whereas the other zero per cent is determined by other factors and cannot be explained by the established model. Besides that, a good regression models must have the f-value that exceeds one hundred. Next, is Durbin-Watson statistic test. The analysis results for Durbin-Watson is used to determine the direction of correlation either positive autocorrelation relationship or negative autocorrelation relationship. Accordingly, positive autocorrelation relationship, which means it would experience the same trend as for an example, a reduction in supply units offered yesterday would most likely result in a reduction in volume as well today. Meanwhile, a negative autocorrelation relationship indicates that a decrease in unit supply that occurs today is likely to experience an increase in unit supply tomorrow.

Table 2: Result of Collinearity Statistics

House Price Category	Coefficient of Determination (r^2)	f-test	Durbin-Watson
RM 300,000-RM 400,000	0.989	134.821	1.776
RM 400,000-RM 500,000	0.964	40.503	2.58
RM 500,000-RM 600,000	0.994	238.277	2.165
RM 600,000-RM 700,000	0.991	168.913	2.277
RM 700,000-RM 800,000	0.952	30.028	2.283
RM 800,000-RM 900,000	0.974	55.845	2.365
RM 900,000-RM 1,000,000	0.913	15.784	2.428
Above RM 1,00,000	0.921	17.414	2.682

First and foremost, the r^2 -value for model of prediction supply for RM 300,000 to RM 400,000 indicate that 99 per cent of the change that occurs on the dependent variable is due to the change of independent variable, whereas one per cent is determined by other factors and cannot be explained by the established model. Meanwhile, the f-test result was above 100 when the f-value obtained was 134.821. Meanwhile, Durbin-Watson test show a positive correlation as the result obtained is 1.776. The thing that can be concluded is that t-test and f-test are not related to each other because t-test does not give significant results even though the f-value obtained is high.

Next analysis, r^2 -value for model of prediction supply for RM 400,000 to RM 500,000 explain that about 96 per cent of the change that occurs on the dependent variable is due to the change of the independent variable. In contrast, the other four per cent is determined by other factors and cannot be explained by the established model. Meanwhile, the f-test result indicates that the regression equation to be formed is moderate. For the Durbin-Watson test, the result indicates that the model has a negative autocorrelation. Based on overall statistical tests done, it can be summarised that t-test and f-test are related to each other since both tests showed a significant result.

On the other hands, results for the accuracy tests presented for model of prediction supply for houses priced between RM 500,000 to RM 600,000 shows the r^2 value is 0.99, which explained that 99 per cent of the change that occurs on the dependent variable is due to the change of independent variable. In comparison, one per cent is determined by other factors that cannot be explained by the developed model. Next, the result for the f-test indicates that the model has a good regression while the result for the Durbin-Watson indicates the model has negative autocorrelation. Hence, it can be summarised that t-test and f-test are related to each other since both tests showed a significant result.

Meanwhile, r^2 for model of prediction supply of houses priced between RM 600,000 to RM 700,000 indicate about 99 per cent of the change that occurs on the dependent variable is due to the change of the independent variable. In contrast, only one per cent is determined by other factors and cannot be explained by the established model. For the accuracy test, the model shows high accuracy, as the f-value obtained is 168.913. Next, the result of the Durbin-Watson test indicates that the model has a negative autocorrelation. Therefore, it is clear that t-test and f-test are not related to each other because only f-test shows a significant result.

The subsequent analysis discusses the model of prediction supply for houses priced at RM 700,000 to RM 800,000. Based on the results, r^2 -value shown explains that 95 per cent of the change that occurs on the dependent variable is due to the change of independent variable and another five per cent is determined by other factors that cannot be explained by the developed model. However, the model seems has a poor regression as the f-value obtained was only 30.028. For the Durbin-Watson test, the result indicates the model has negative autocorrelation. In short, the t-test and f-test are related as both tests show the insignificant result.

Up to this analysis, the f-test result for model of prediction supply for RM 800,000 to RM 900,000 shows the accuracy of the model built reached only 50 per cent as the f-value obtained was 55.845. Meanwhile, r^2 explains about 97 per cent of the change that occurs on the dependent variable is due to the change of independent variable, whereas four per cent is determined by other factors and cannot be explained by the established model. For the Durbin-Watson test, the result shows that the model has a negative autocorrelation correlation. Under this type of model, t-test and f-test are related to each other due to the insignificant results obtained.

Another supply prediction model discussed involve house price between RM 900,000 to RM 1,000,000. Based on Table 2, the model built has very poor regression as the f-value obtained was only 15.784. The second result, r^2 explains about 86 per cent of the change that occurs on the dependent variable is due to the change of the independent variable. In contrast, as much as 14 per cent is determined by other factors and cannot be explained by the established model. Third, the result for the Durbin-Watson test shows the model has a negative autocorrelation. As the t-test and f-test obtained insignificant results, it is concluded that both tests are not related.

Last analysis discusses the regression model for houses priced above RM 1,00,000. Subsequent accuracy test results presented in Table 2 shows the model has the lowest accuracy level. While the r^2 value shown, indicate that 92 per cent of the change that occurs on the dependent variable is due to the change of independent variable and another

eight per cent is determined by other factors that cannot be explained by the developed model. Next, the result of the Durbin-Watson test indicates that the model has a negative type of autocorrelation. Based on the information in Table 2, the model formed can be considered as less suitable to use to predict supply for houses priced above RM 1,00,000. However, although some of the model obtained insignificant results in the t-test and f-test, however, all independent variables would be placed in the following equation model of prediction. Following Table 3 summarises the values involved in developing supply predicting regression models.

Table 3: Regression Model of Prediction Supply

Category of House Price	Constant Value	Standardised Coefficients (Beta)		
		GDP	Inflation Rate	Unemployment Rate
RM 300,000 – RM 400,000	23834.711	-0.164	0.011	-0.116
RM 400,000 – RM 500,000	-2245.047	0.040	-0.023	0.027
RM 500,000 – RM 600,000	-12581.925	0.093	0.136	0.044
RM 600,000 – RM 700,000	-12612.437	-0.032	0.099	0.070
RM 700,000 – RM 800,000	29.212	0.059	-0.289	0.028
RM 800,000 – RM 900,000	-28116.420	-0.031	0.248	0.319
RM 900,000 – RM 1,000,000	-13011.360	0.131	0.064	0.324
Above RM 1,000,000	-20000.518	0.105	-0.138	0.138

Regression values of macro factors marked positive and negative were included in the predicting model equations (Fig. 5) although not all macro factors had a relationship with housing oversupply. This is because, from the similarity of the predicting model that will show the effect of macro factors on the surplus of supply that occurs in Malaysia.

House Price Category	Regression Model
RM 300,000-RM 400,000	23834.711-0.164(GDP)+0.011(inflation rate)-0.116(unemployment rate)
RM 400,000-RM 500,000	-2245.047-0.040(GDP)-0.023(inflation rate)+0.027(unemployment rate)
RM 500,000-RM 600,000	-12581.925+0.093(GDP)+0.136(inflation rate)+0.044(unemployment rate)
RM 600,000-RM 700,000	-12612.437-0.032(GDP)+0.099(inflation rate)+0.070(unemployment rate)
RM 700,000-RM 800,000	29.212+0.059(GDP)-0.289(inflation rate)+0.028(unemployment rate)
RM 800,000-RM 900,000	-28116.420-0.031(GDP)+0.248(inflation rate)+0.319(unemployment rate)
RM 900,000-RM 1,000,000	-13011.360+0.131(GDP)+0.064(inflation rate)+0.324(unemployment rate)
Above RM1,000,000	-20000.518+0.105(GDP)-0.138(inflation rate)+0.138(unemployment rate)

Fig. 5: Predicting Model Equations

8. Conclusion

Overall, all eight regression models constructed looked almost perfect as the value of r^2 obtained exceeded 0.900. However, the best and appropriate prediction model only involves three price categories, namely RM300,000 up to RM400,000, RM500,000 up to RM600,000 and RM600,000 up to RM700,000 when each recorded the highest r^2 value of 0.99. In contrast, prices for category RM900,000 to RM1,000,000 show the lowest r^2 value than other price categories. Second results, since the measurement for the f-test is that the value obtained must exceed one hundred, then again, the price categories in the range of RM300,000 up to RM400,000, RM500,000 up to RM600,000 and RM600,000 up to RM700,000 were found to have a good regression equation model. These three categories demonstrate the importance of the overall regression model formed in giving value to the dependent variables. Meanwhile, other price categories show a value of f less than one hundred. In accordance with that, similar to r^2 test, once again prices for category RM900,000 to RM1,000,000 show the lowest f-value value compared to the rest five price categories. On the other hands, for Durbin-Watson, only house priced between RM300,000 to RM400,000 has a positive autocorrelation relationship, while the remaining price categories have a negative autocorrelation relationship.

It was found that only three categories showed a direct relationship between GDP factors on the oversupply of high-cost multi-storey houses in Malaysia of the eight-model developed. Among those identified are the house price category between RM 300,000 to RM 400,000, house price category between RM 600,000 to RM 700,000 and house price category between RM 800,000 to RM 900,000. However, based on the Significant Coefficient (Beta) shown in Table 3, it turns out that for the unemployment rate factor, almost all household categories are not affected by the factor. It is found that the category of houses that have a direct relationship to the oversupply of high-cost multi-storey

houses is only focused on the first house price category, which is priced at RM 300,000 to RM400,000. In contrast to the inflation factor, this paper found that there are three categories of houses that have a direct relationship to the oversupply of high-cost multi-storey houses. One of the categories is houses priced at RM 400,000 to RM 500,000. It was found that the price category experienced an increase in housing supply of 1 per cent when there was a percentage increase in the inflation rate of 2.3 per cent. Meanwhile, for the category of houses priced at RM 700,000 to RM 800,000, it involves an increase in the inflation rate of 2.9 per cent for every 1 per cent increase in house supply. For the last category, the results obtained from this study found that the increase in housing supply of 1 per cent for the category of houses priced above RM1,000,000 only involves a small increase in the percentage of inflation of 1.4 percent.

The effect when the developer refers to the factors in the model indirectly causes the developer to get a large return on capital and profit since the developer does not need to lower the house price to increase sales performance. In addition, the preparation of eight supply predicting models can help developers to see the optimal amount of housing supply that needs to be developed in accordance with the current economic situation in the country. Indirectly, this model fosters the awareness of developers about the importance of looking from a macro side when developing a project because the country's economic benchmark is a sign of the well-being of the people. Hopefully, the model process could be a useful reference or instrument for private housing developer and effective management when making a real decision.

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