

HOUSING DEMAND PREDICTION IN SELANGOR

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*Special dedication to my beloved son
Rayyan Iskandar
for accompanied me during this study carried*

- Mummy -



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ABSTRACT

Housing provision is one of the important sectors in ensuring socio-economic stability in Selangor as well as direct contributor to its economic growth. Its populations increased from 4.2 million in year 2000 to 6.3 million people in year 2016 affected the demand for housing. Thus, the sufficient houses should be provided to the next generations. The goal of the study is to develop housing demand prediction model based on 4 categories of housing in Selangor which are low cost, low-medium cost, medium cost and high cost houses. This study was focused in Selangor because the state was recorded highest residential after Johor and Penang. The aim was to determine housing demand for 4 categories of housing based on household formation. The study used Census Data 2010 from Department of Statistic Malaysia to determine the headship rate in Selangor using Headship Rate Method based on household formation. Then, a questionnaire was conducted on 415 respondents to determine the choice probability of selecting housing type by using Multinomial Logit (MNL) analysis in producing a Choice Probabilities (CP) Model. Result showed that low medium cost housing was the most preferable with the highest value of 0.899. Double Exponential Smoothing (DES) method was used to predict population for 14 level age groups from years 1970 until years 2020 based on Quick Population Info's data from the Department of Statistics Malaysia. Then total housing demand for 4 categories housing were determined by multiplying population with headship. This prediction model was validated using Mean Absolute Percentage Error (MAPE) between an actual and predictive data. The validation of error shows a value of 36.88% which is acceptable when the value close to zero. Thus, a small error indicates the high effectiveness performances in develop model prediction housing demand in Selangor. The finding helps *Lembaga Perumahan dan Hartanah Selangor* (LPHS) and other government agency to plan constructions for all housing categories in line with the demand.



ABSTRAK

Penyediaan perumahan adalah salah satu sektor penting dalam memastikan kestabilan sosio-ekonomi di Selangor serta penyumbang kepada pertumbuhan ekonomi secara langsung. Populasi penduduknya yang meningkat daripada 4.2 juta pada tahun 2000 kepada 6.3 juta pada tahun 2016 telah mempengaruhi permintaan perumahan. Oleh itu, perumahan yang mencukupi perlu disediakan sebaiknya untuk generasi mendatang. Matlamat kajian adalah membangunkan model ramalan permintaan perumahan berdasarkan 4 kategori perumahan di Selangor iaitu rumah kos rendah, kos sederhana rendah, kos sederhana dan kos tinggi. Kajian ini memberi tumpuan di Selangor kerana negeri ini mencatat rekod hartanah tidak terjual tertinggi selepas Johor dan Pulau Pinang. Objektif kajian adalah mengenalpasti jumlah permintaan perumahan bagi 4 jenis kategori berdasarkan pembentukan isi rumah. Kajian ini menggunakan Data Banci 2010 daripada Jabatan Perangkaan Malaysia untuk menentukan kadar ketua keluarga dengan menggunakan *Headship Rate Method*. Kemudian, soal selidik dijalankan ke atas 415 responden untuk menghasilkan model *Choice Probabilities* berdasarkan kebarangkalian pemilihan jenis perumahan menggunakan analisis *Multinomial Logit*. Keputusan menunjukkan bahawa permintaan terhadap perumahan kos sederhana rendah mencatat nilai tertinggi sebanyak 0.899. Kaedah *Double Exponential Smoothing* pula digunakan untuk meramal populasi 14 kumpulan umur sehingga tahun 2020 berdasarkan data "*Quick Population Info*" daripada Jabatan Perangkaan Malaysia. Model ramalan ini disahkan menggunakan MAPE di antara data sebenar dan data ramalan. Pengesahan ralat menunjukkan nilai 36.88% iaitu sebagai ralat yang diterima apabila nilainya hampir kepada sifar. Oleh itu, ralat kecil menunjukkan prestasi keberkesanan yang tinggi dalam membangunkan model ramalan permintaan perumahan di Selangor. Penemuan ini membantu Lembaga Perumahan dan Hartanah Selangor serta agensi kerajaan lain dalam merancang pembinaan semua kategori perumahan supaya selaras dengan permintaan.



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LIST OF SYMBOL AND ABBREVIATIONS

%	Percentage
α	Smoothing constants for level
β	Smoothing constants for trend
exp	Exponent
HR _i	Number of Household
L _t	Level
P _i	Total population in the age group
P_i/Pr	Input parameter/Probabilities of decision maker
Pr(i)	The probabilities of the decision maker choosing alternative i
T _t	Trend adjustment
X _t	Current actual value
V _j	The system component of utility of alternative j
ARIMA	Auto Regression Integrated Moving Average
CFO	Certificates of Fitness for Occupation
CNY	Chinese Renminbi
CP	Choice Probabilities
DES	Double Exponential Smoothing
DESP	Double Exponential Smoothing Predictor
EPF	Employees Provident Fund
EKF	Extended Kalman Predictor
EPU	Economic Planning Unit
EUR	Euro
FD	First Differenced
GBP	British Pound

GDP	Gross Domestic Product
HC	High Cost
IBM SPSS	International Business Machines: Statistically Package for Social Science
IC	Identity card
JPY	Japanese Yen
KF	Kalman-Filter
KPKT	Ministry of Urban Wellbeing, Housing and Local Government
KWP	Kementerian Wilayah Persekutuan
LC	Low Cost
LMC	Low Medium Cost
LPHS	Lembaga Perumahan dan Hartanah Selangor
Mi ²	square miles
MyHome	Skim Rumah Mampu Milik Swasta
MAE	Mean Absolute Error
MC	Medium Cost
MAPE	Mean Absolute Percentage Error
MNL	Multinomial Logit
NAPIC	National Property Information Centre
NHBA	National House Buyers Association
PBR	Program Bantuan Rakyat
PKNS	Perbadanan Kemajuan Negeri Selangor
PPA1M	Program Perumahan Penjawat Awam 1 Malaysia
PPR	Program Perumahan Rakyat
PR1MA	Skim Perumahan Rakyat 1 Malaysia
RM	Ringgit Malaysia
RME	Root Mean Error
RMR1M	Rumah Mesra Rakyat 1 Malaysia
RMSE	Root Mean Square Error
RUMAWIP	Rumah Mampu Milik Wilayah Persekutuan



RIR	Rumah Idaman Rakyat
RON	Romania Leu
RUB	Russian Ruble
SPNB	Syarikat Perumahan Negara Berhad
TCFO	Temporary Certificates of Fitness for Occupation
USD	United States Dollar



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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Housing is the most crucial element in social living. Therefore, the leaders are constantly striving to improve living standards by assessing the needs and affordability (Rahma, 2010; Nasir and Abdullah, 2014). It is in line with the goal of National Housing Policy to provide an adequate, comfortable, quality and affordable housing to enhance the sustainability of the quality of people's life (National Housing Department, 2013).

Demand for housing is defined as the number of houses needed to be one dwelling per household (Hansen *et. al.*, 2013). However, housing demand is also described as a market driven concept and related to choice probability by household towards the type and number of houses based on their priority and affordability (Heath, 2014; Holmans, 2013).

Nowadays, housing problem is a major concern to various strata of society around the world (Zairul, 2013). Through Tenth Malaysia Plan (2010), a sufficient affordable housing will be provided and ensure that the house and the neighborhood is safe, healthy and comfortable to be in line with the country's socio-economic status (Ministry of Education, 2010).

Housing in Malaysia is divided into four categories, namely low cost housing, low medium cost housing, medium cost housing and high cost housing (National Housing Department, 2013). Basically, under Malaysia 5 Year National Plan, it only introduces a low cost housing, medium cost housing and high cost housing categories.

However, during the Seventh Malaysia Plan (1996-2000) government for the first time introduced the category of low medium cost housing (Economic Planning Unit, 2000). Shuid (2004) reported that previously, it was classified under medium cost housing category but due to increasing demand for this category, the government takes an action to introduce this new housing category.

According to Zain (2012), the government faced critical issue on providing an affordable housing currently for lower income group. These groups have limit for choice probability for a quality house and they also do not have many options to rent or buy an affordable house in the city due to financial constraints. During Tenth Malaysia Plan (2010), the government takes an action in implementation of *Program Perumahan Rakyat* (PPR) to address the increasing demand for affordable housing among the lower income group, especially in urban areas. Hence, a provision of comfortable houses with adequate infrastructure and basic amenities in suitable locations were developed. Besides, the *Program Bantuan Rumah* (PBR) also was implemented to provide a comfortable home in the rural areas, especially for hardcore poor households.

During Eleventh Malaysia Plan (2016), demand for affordable housing by lower income group will remain implemented with the support of government initiatives such as the 1 Malaysia People's Housing (PR1MA), *Rumah Idaman Rakyat* and *Rumah Mesra Rakyat*. The government still focuses on increasing supply of housing to ensure that affordable housing is available for B40 households which was the group with 40 percent lowest income. Besides, housing policy for B40 household will emphasize on the quality and maintenance. The government also continues to provide housing that equipped with basic facilities through the construction of settlements integrated under *Program Bantuan Rumah* (PBR) for poor household in rural areas. Meanwhile, the *Program Perumahan Rakyat* (PPR) also continues to be provided for poor households in the urban areas (Eleventh Malaysia Plan, 2016).

In 1996, the government has included low medium cost category during the Seventh Malaysia Plan. The government also has been targets 350 000 units to be implements but unfortunately end of the period, only 20.7% which is 72,582 from the target units were built (Economic Plan Unit, 2000). It shows a clear miss-match between

the supply and demand of low medium cost housing in Malaysia because no specific planning and design guidelines is provided (Shuid, 2004).

Currently, middle income group were considered not qualified for the low cost housing and yet, cannot afford to buy even the medium cost housing because of the high price (Rahmad, 2016; Ismail *et. al.*, 2016). It was in line with Anuar (2014), who argue that the issue for medium cost housing is the high selling price because since year 2007 the house prices was rose uncontrollably. Meanwhile, high cost housing reached over than 1 million ringgit, especially in urban areas such as Iskandar Malaysia and developers are shifting their focus to build more luxury properties rather than affordable housing because of profits earned from foreign buyers (Rachel, 2016).

Malaysians continue to look at affordability and rising house prices as a major concern. This study will develop a prediction model on housing demand in Selangor based on 4 categories of housing to overcome the issue.

1.2 Problem Statement

Housing market in Malaysia continues to drive growth in property market but the issue of mismatched between demand and supply in the affordable housing market has caused the housing market become imbalanced (Rameli *et. al.*, 2006 and Ramli *et. al.*, 2016). The equilibrium of housing supply and demand is very important to ensure the stability of the economy that contributes to increase the Gross Domestic Product (GDP) (Alias *et. al.*, 2016).

Malaysia faces a major problem of economic recession due to oversupply unit in housing market caused by the Asian financial crisis that occurred in 1997 and persisted until early 1999 (Hashim, 2010; Thomas, 2009; and Rameli *et. al.*, 2006). According to Mahamud and Salleh (2004), oversupply referred to the residential property unsold within nine months from the vacant possession date. However Datuk Chua Tee Yong, Deputy Finance Minister (2016) defined that overhang units as properties that are completed and issued with Certificate of Completion and Compliance (CCC), but remain unsold despite having been put on the market for at least nine months and the

total of Malaysia's housing overhang units is 11 316 and these were worth RM 5.9 billion in the end of 2015 (Au, 2016).

Selangor is one of the developing states that recorded high overhang residential after Johor and Penang (Au, 2016). According to Rao (2016), Selangor has the most significant decrease in residential property market recorded 12.8% drop from previous year and 12 101 units of houses were sold compared to 14 771 units sold in the previous corresponding period. Meanwhile, as reported in Property Overhang Q3 2016 by NAPIC, the number of overhang residential units in Selangor recorded 1 651 units.

This scenario shows that the housing construction is not in line with the demand. Furthermore, Hong (2010) argues that the overhang residential units do not meet the housing needs and do not attract target market. Thus, it is important for a developer to know what the market really wants so that the housing market in Selangor developed well.

The expectation of this study is to offset the implementation for all housing categories in line with the demand. Therefore, the demand for each category of houses in Selangor will determine and predict.

1.3 Objectives of Study

The aim of this study is to develop a prediction model for each categories of housing demand in Selangor. Therefore the study will be conducted based on the following objectives:

- a. Determine and establish total housing demand based on four categories housing in Selangor.
- b. Develop housing demand prediction model based on four categories of housing in Selangor.
- c. Validate housing demand prediction model using Mean Absolute Percentage Error (MAPE).

1.4 Scope and Limitation of Study

The scope of this study covers the demand for 4 categories of housing, namely low-cost, low medium cost, medium cost and high cost housing in Selangor. The total housing demand calculated by referring the 2 percent sample tapping from the Population and Housing Census of Malaysia in 2010. Then, the questionnaires were constructed based on housing demand indicators from literature review. After that, the total of sample data were calculated using Morgan Table based on population in Selangor and it were distributed to 415 respondents for each district around Selangor. Housing demand will analyze using Multinomial Logit (MNL) because the data collected are multivariate category. Thus, the demand validated using Mean Absolute Percentage Error (MAPE) because this method is suitable for time series data.

1.5 Significant of Study

This study will develop an effective prediction model on housing demand in Selangor which would be a good blend line to the housing sector in Malaysia to overcome the problems of housing demand.

An accurate prediction will be an important baseline in the planning and decision making for the organization. Inaccurate prediction will have a negative impact on the organization in terms of losses such as cost, time, energy and materials. Hence, the prediction model should be provided in advance to identify the performance for the planning and management (Yassin *et al.*, 2011).

In the nutshell, the requirements of this study is very important and the expected finding have significant potential for the various parties involved in determining the housing demand in Selangor including Syarikat Perumahan Negara Berhad (SPNB), the Economic Planning Unit (EPU) and National Property Information Centre (NAPIC). This is in line with the government's objectives in the Eleventh Malaysia Plan (2016), which is to provide an adequate and quality affordable housing to meet the needs due to growing population by balancing demand and supply on housing (Economic Planning Unit, 2016).

1.6 Thesis layout

This study were divided into five chapters and described into related topic. Current and previous issues will be mutually linked to ensure the elaboration of the objectives, scope, methodology, data and result were achieved successfully.

Chapter 1 discusses the purpose of this study which is the background of study and problem statement. It is important to bring out the objective, understand the problem, determine the scope and briefly explain the importance of this study.

Chapter 2 contains a literature review on housing issue and housing development market in Selangor. The housing issue will be clearly explained so that the study could be conducted to address the issues. Sources of information obtained from various reference materials such as journals, thesis, newspapers and magazines.

Chapter 3 describes the methodology of the study with a figure of flow chart. The flow chart describes the proses of model development for housing prediction in Selangor. This chapter discusses the procedures by phases in data collection, data analysis and model developing in achieving the objectives.

Chapters 4 discuss the data analysis. Data from Census 2010 were used to determine headship rate meanwhile, data from Quick Population Info were used to project the population. Data from questionnaires were analyzed using MNL to develop CP Model. Next, the prediction of total housing demand for all housing categories were determined and validated using MAPE.

Chapter 5 is the conclusion and discussion. In accomplishing this study, the objectives will be successful achieved and were be summarized in this chapter. Few suggestions will be presented as a measure to improve this research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses an overview from previous study and related theory which are relevant to this study. The intention of this chapter is to elaborate the housing issues in Selangor and find out the effective method in predicting the housing demand to overcome the issues.

2.2 Housing Demand

Demand for housing is defined as the number of houses needed to be one dwelling per household (Hansen *et al.*, 2013). According to Holmans (2013), housing demand described as a market driven concept and related to choice probability by household towards the type and number of houses based on their priority and affordability. However, demand does not take place only when one has the desire or ability alone because both the demand and capacity conditions must exist for the occurrence of demand (Budi, 2009).

The context of housing demand in this study will adapt the definition of housing demand by Heath (2014) as a choosing the type and number of houses by households to be occupied on a priority basis and the affordability.

However in Selangor, the highest demand of housing among the people occurs in the city because of its strategic location and proximity to public transportation systems.

In 2015, nine project of "*Rumah Selangorku*" has got planning permission involving 11,833 housing units. Five of the projects have been launched and involving 7 005 units of an affordable housing (Mokhtar and Nazlan, 2015).

2.3 Housing in Selangor

Maslow's theory (1954) states that home is a place of refuge and a second-level requirements that must be accomplished for safety before the needs of the higher levels are met (Wan Abd Aziz *et al.*, 2010). Home is a basic need and also as a personal and a family needs (Zulkepli, 2011). Meanwhile, according to Housing Census Report (1991), definition of housing means a dwelling which is separate and independent and aims to occupy by a household. However, there is also a housing unit that occupied by more than one household (Rusli, 2006).

In Selangor, affordable housing was monitored by The Selangor Housing and Property Board (LPHS) and approved by Selangor State Development Corporation (PKNS) (State Government of Selangor, 2018). LPHS have introduced an initiative in developing a new concept in affordable housing project to increase the group of low income and middle income in having affordable homes in Selangor (Sahib, 2015). To address the demand, Selangor State Development Corporation (PKNS) which is a subsidiary company of the Selangor State government has launched almost 2 000 units of affordable housing in Selangor named *Rumah Selangorku*.

According to the Manager of PKNS Public Relations, Ishak Hashim (2015), who state that the corporation has launched a project in Bukit Botak, Antara Gapi in Hulu Selangor, Section 3 in Bandar Baru Bangi, Section U12 in Shah Alam and Section 5 in Kota Puteri where a total of 1 546 units were already occupied while 431 units are still under construction (Hazwan, 2015). However, until October of 2015, 30 950 units has been approved in Selangor which 1 774 houses had been completed, while 4 782 units were under construction, and 24 304 units were approved by the Members of State (Jamaluddin *et al.*, 2016).

Since the Third Malaysia Plan (1976-1980), a special attention in developing housing especially for low income group was implemented by the government in urban

and rural areas (Economic Planning Unit, 1976). During Eighth Malaysia Plan (2001-2005), the focus for housing development is to provide adequate, affordable, good quality and can be owned or rented by people of various income levels (Economic Planning Unit, 2005). Then, in Tenth Malaysia Plan (2011-2015) the focus for housing development turns to affordable housing until to the Eleventh Malaysia Plan (Economic Planning Unit, 2015).

2.3.1 Categories of Housing

The new concept of Affordable Home in Selangor provided greater comfort either in terms of size, design or communities (Selangor Housing and Real Property Board, 2014). The emergence of this new concept is due to several factors as follows;

- i. Significant price gap between low cost houses and houses offered on the market.
- ii. Lack of choice particularly in the medium-cost category.
- iii. Low and middle income group's incapability of owning a property.
- iv. Existing confined designs and insufficient facilities, especially in low-cost housing developments

According to LPHS (2017) in Selangor Affordable Housing Policy, the government is re-branding affordable home for low medium and medium cost housing to „*Rumah Selangorku*“. The price per unit of home within RM42, 000 to RM250, 000 depending on the nature, floor area, location and other facilities available. For „*Rumah Selangorku*“, there also have 4 types of house namely Type A, Type B, Type C and Type D.

Table 2.1: Housing Categories based on Price per unit for Rumah Selangorku (LPHS, 2017)

Category	Type	Price
Low Cost	A	RM 42, 000
Low Medium Cost	B	RM 100, 000 – RM 250,000 Pricing is subject to the approval of Executive Councillor
	C	
Medium Cost	D	
High Cost	-	Exceed RM 250, 000

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