



FORECASTING LOW COST HOUSING DEMAND IN MALAYSIA: COMPARISON BETWEEN ANN AND ARIMA METHOD

N.Y Zainun¹, M.S Mohd Sallehudin²

¹Department of Building and Construction, Universiti Tun Hussein Onn Malaysia, Batu Pahat Johor.

²Department of Building and Construction, Universiti Tun Hussein Onn Malaysia, Batu Pahat Johor

ABSTRACT

One of Malaysia's longstanding development objectives is the provision of affordable housing for Malaysian, with a focus on lower-income groups. It is very crucial to predict low-cost housing demand to match the demand and supply so that the government can plan the allocation of low cost housing based on the demand. Thus the aim of this study is to forecast low-cost housing demand in Johor, Malaysia using ARIMA model. Time series data on low-cost housing demand have been converted to Ln before develop the model. Three ARIMA model were used; ARIMA (1,0,1); ARIMA (1,0,0) and ARIMA (2,0,0). The performance of models was validated using Mean Absolute Percentage Error (MAPE). The results show that ARIMA (1,0,1) is the best model with MAPE value 3.9%. It can be conclude that ARIMA method can forecast low cost housing demand in Johor slightly better than ANN.

KEYWORDS

Low-cost housing demand; ARIMA; ANN



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INTRODUCTION

Among the key challenges in construction industry sector faces are matching supply of and demand for affordable housing [1]. Low cost housing built is intended to provide housing that is affordable for low earners in rural and suburban areas. Low cost housing can be defined as a development projects sold at the price set by the government that is between RM25, 000 to RM42, 000 [2]. The target groups for this project are households with monthly income of between RM500 to RM750 [3].

The main objective of national housing policy is to provide adequate housing and affordable for Malaysians, especially for those with low incomes through Malaysia plans prior to now [4]. However, there is mismatched data between the supply and demand for low-cost housing in Malaysia [5]. In some places, the supplies of low cost housing are exceeding compare to demand and lead to wastage of construction and of course has an impact on the cost and economic aspects. While in other areas the demand is exceeding supply provided, which supplies low-cost houses are insufficient, especially in urban areas [6]. Therefore, an alternative approaches need to be done to resolve these issues. In this study, ARIMA model known as the Box-Jenkins time series is used because it has good accuracy for the short term forecasting. Provide examples of relevant academic disciplines for this journal: E.g., History; Education; Sociology; Psychology; Cultural Studies;

SCOPE AND LIMITATION OF STUDY

This study will forecast low cost housing demand in Johor, Malaysia only. Previous time series data from [6] will be used to forecast low-cost housing demand in Johor using ARIMA. The results will be compared with ANN forecasting results analyzed by [6].

METHODOLOGY

The time series data were changed to Ln then analyzed using ARIMA software adopted from SPSS 20.0. Results were validated using MAPE where actual and forecasted data were compared to determine the accuracy of the method. Finally, the MAPE value will be compared with ANN method to establish the performance of both methods.

RESULTS AND DISCUSSION

Table 1 shows the monthly time series data on low cost housing demand in Johor from January 2000 to January 2007.

Table 1: Time series data on low cost housing demand

Bulan Tahun	Jan	Feb	Mac	Apr	Mei	Jun	Jul	Ogs	Sep	Okt	Nov	Dis	Jumlah
2000	90	272	360	325	360	405	497	488	334	474	472	530	4607
2001	419	485	572	661	1005	544	544	434	318	550	555	356	6443
2002	614	343	546	416	566	529	445	544	398	415	482	209	5507
2003	404	477	424	312	299	414	365	498	280	269	211	264	4217
2004	262	299	283	230	235	303	533	233	215	227	246	303	3369
2005	243	182	230	205	232	180	188	166	209	196	121	210	2362
2006	170	140	223	174	190	199	275	308	259	134	197	197	2466
2007	157												157
Jumlah	2359	2198	2638	2323	2887	2574	2847	2671	2013	2265	2284	2069	29128

Figure 1: Housing demand (Ln)

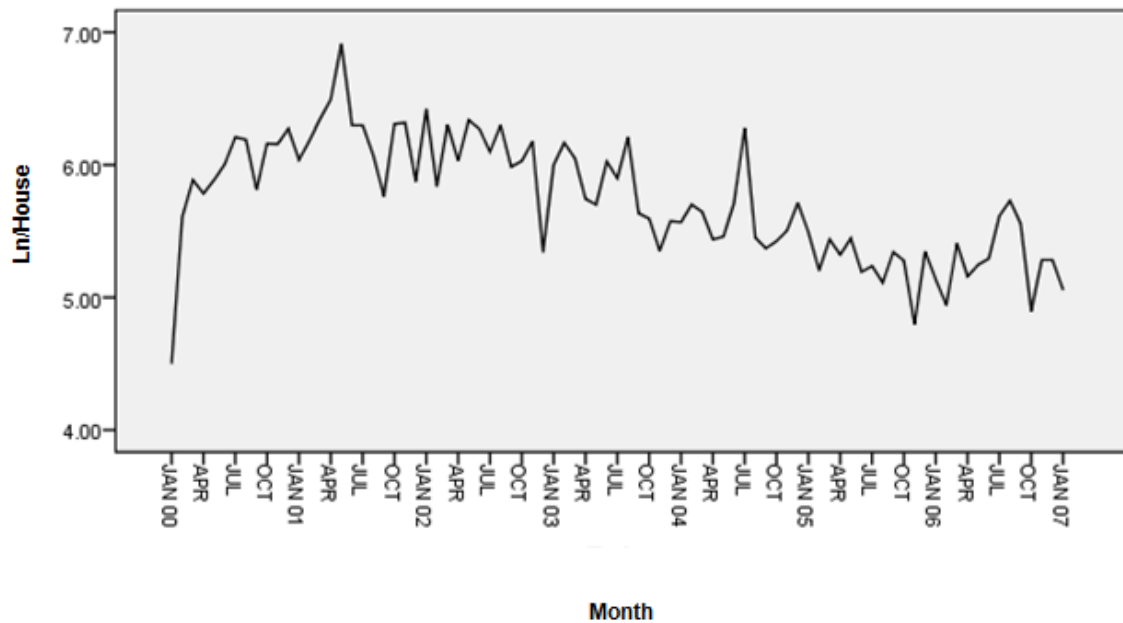


Figure 1: Housing demand (Ln)

Figure 1 are time series housing demand in Ln. Data were change to Ln to get idea for p,d,q value for model ARIMA (p,d,q) x (P,D,Q). From the p,d,q value, significant calculations for each parameters were done to determine the best model. In this study, three model were used; ARIMA (1,0,1); ARIMA (1,0,0) and ARIMA (2,0,0). ARIMA model produced the lowest value Akaike Information Criterion (AIC) and Schwarz Criterion (SC) is the best model.

Table 2: Value for AIC and SC for each model

Model	AIC	SC
ARIMA (1,0,1)	0.0178	0.2288
ARIMA (1,0,0)	0.0370	0.2499
ARIMA (2,0,0)	0.0656	0.2239

Table 2 views the AIC and SC value for each ARIMA model. It can be seen that model ARIMA (1,0,1) is the best compare to ARIMA (1,0,0) and ARIMA (2,0,0).

Table 3: Comparison forecasting value between tentative models

Month	Actual Data	ARIMA (1,0,1)	ARIMA (1,0,0)	ARIMA (2,0,0)
September 2006	5.56	5.54	5.68	5.71
Oktober 2006	4.90	5.54	5.62	5.58
November 2006	5.28	5.31	5.23	5.09
Disember 2006	5.28	5.31	5.23	5.38
Januari 2007	5.06	5.31	5.23	5.39
MAPE	-	3.90	4.42	5.72

Table 3 is the comparison forecasting value between tentative models ARIMA. It shows that ARIMA (1,0,1) have the lowest MAPE with 3.9%.

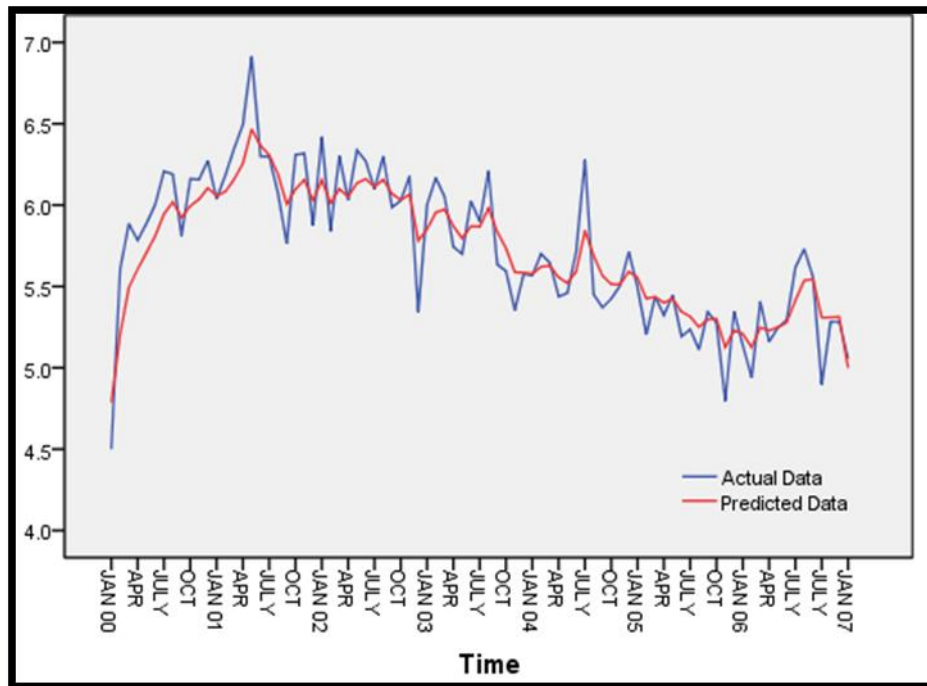


Figure 2: Low cost housing demand in Johor

Figure 2 plots the comparison between actual and predicted data of low cost housing demand in Johor using ARIMA (1,0,1) from January 2000 to January 2007.

Table 4: The actual data and forecast data using ARIMA (1,0,1) method

Time series	Actual	Forecasted	Actual – Forecasted	Percentage Error
June 2006	199	191	8	4.02
July 2006	275	196	79	28.73
August 06	308	124	84	27.27
September 06	259	255	4	1.54
MAPE				15.39

Table 4 shows the actual and forecasted data from June 2000 to September 2006 using ARIMA (1,0,1) method. From the calculations, MAPE value obtained was 15.39%.

Table 5: The actual and forecasted data using ANN

Time series	Actual	Forecasted	Actual – Forecasted	Percentage Error
September 2006	259	201	58	22.40
October 2006	134	188	54	40.02
November 2006	197	177	20	10.15
December 2006	197	170	27	13.71
January 2007	157	165	8	5.10
MAPE				18.28

Table 5 shows the actual and forecasted from September 2006 until January 2007 using ANN method. From the calculations, MAPE value obtained was 18.28%.

Table 4: Comparison between ARIMA and ANN model

	ARIMA	ANN	Differences
MAPE	15.39%	18.28%	2.89%

Predictive ability is very good if the MAPE is less than 10% while MAPE less than 20% is good [7]. Table 4 shows the comparison of MAPE value for ARIMA and ANN method. The results show that both MAPE value for ARIMA and ANN less than 20%.

CONCLUSION

It can be conclude that both models can forecast low-cost housing demand in Johor quite good. However ARIMA perform slightly better than ANN with 2.9% different. It is recommend further study should be done to reduce the error of performance since the results generated are able to assist the construction of low-cost housing scheme in terms of the accuracy of necessity based on actual demand. Subsequently there would be a minimal possibility of the procurement of either under-construction or over construction of low cost houses particularly in the state of Johor.

REFERENCES

- [1] The Tenth Malaysia Plan, (2011-2015). Economic Planning Unit, Prime Minister's Department, Putrajaya Malaysia 2010.
- [2] Ministry of Housing and Local Government Malaysia (2002). "Guidelines for the Implementation of the New Price of Low Cost Housing (Amendment) Act 2002".
- [3] Rosadah Bt. Mahamud and Khadijah Bt. Hussein (2002). "Studies On Potential Medium Income Group in Own Homes In Area Johor Bahru". UniversityTechnology Malaysia. Vote Upp: 71,693.
- [4] The Ninth Malaysia Plan (2006-2010). "Chapter 21 Providing Housing and Urban Services Quality".Prime Minister's Department, Putrajaya Malaysia 2006.
- [5] SyafieeShuid (2004), "Low Medium Cost Housing In Malaysia: Issues And Challenges", Department of Urban and Regional Planning, International Islamic University Malaysia.
- [6] Noor Yasmin Zainun (2012) "Computerized Forecasting Model to Forecast Low-Cost Housing Demand in Urban Area in Malaysia using Artificial Neural Networks (ANN). PhD thesis. Loughborough University, U.K.
- [7] Sobri Harun (1999) "Forecasting and Simulation of Net Inflows for Reservoir Operation and Management", PhD thesis.UniversityTechnology Malaysia, Skudai, Malaysia.Bowman, M., Debray, S. K., and Peterson, L. L. 1993. Reasoning about naming systems.



Noor Yasmin Zainun, Ph.D is a senior lecturer in Faculty of Civil & Environmental Engineering, Universiti Tun Hussein Onn Malaysia (UTHM). Yasmin graduated in bachelor engineering in University Technology Malaysia and persue master engineering from the same university. After that she further her Ph.D in Loughborough University, UK. She had won gold medal and special prize in ITEX 2004, best award and gold medal in MTE 2015 and currently had patented a product named SWID Web.