DECOMPOSITION AND FACTOR INFLUENCING RESIDENTIAL PROPERTY IN MALAYSIA USING DYNAMIC REGRESSION

[1]MOHD AZLAN ABDUL MAJID, [2]MUHAMAD KHODRI KHOLIB JATI, [3]SUZANA HASSAN

Faculty of Business Management, Universiti Teknologi MARA (Johor)
Email: mohda164@johor.uitm.edu.my, khodri338@johor.uitm.edu.my,suzan218@johor.uitm.edu.my

Abstract— This paper examines the decomposition and factors influence residential property in Malaysia. There have a lot detail study about Malaysia property price, satisfaction and preference Teck Hong (2008, 2010, 2012), Abdul Ghani (2008) & Abdul Mohit et. al (2010) but there has no detail study in property using dynamic analysis with general macro perspective. So, we developed simple dynamic model and study about housing price were influence by income (Gross national income (GNI) & Money (m1)), and economic problem (inflation & unemployment) in Malaysia in 1988 to2014 using quarterly data. These study focus on how the relationship, reaction and stability property price model. Earlier hypotheses, we hope that incomes have positive relationship and economic problem have negative correlation with residential property price in Malaysia. This paper also found that the new empirical evidence and theorem development with creation of D-CURVE theorem based on statistical evidence. Its shows that partially support both for income and economic impact in Malaysian property price. The implications of this study will impact industry, decision making and consumer in form of general overview residential property price in Malaysia.

Index Terms— residential property; Malaysian property; D-curve; income impact theorem; economic impact theorem

I. INTRODUCTION

Residential property! From the dawn of times, the major question before the first major civilization occurs in the world of human must be shelter. From tent to sophisticated building the important of "home" to vital in history of man. Until present and future, the major question of shelter evolves to become the major question in human life. This paper intent to answers some question among ocean of problem why the behavior of residential property in Malaysia but using different angle such as dynamic time series and macro analysis. We study about housing price were influence by income (Gross national income & Money (m1)), and economic problem (inflation & unemployment) in Malaysia in 1988 to 2014 using quarterly data.

Previous study rally more in primary and survey technique such as *ols (ordinary least square), wls (weighted least square), pls (partial least square)* and descriptive analysis to determine behavior of study and more focus on preference, satisfaction perspectives and so on in Malaysian cases. Tech Hong (2008, 2010 &2012) reflect more study in using theses technique. The major problem is how residential property behaves in Malaysia? So the gaps quite strait forward. We focus using dynamic model to study behavior of Malaysian residential property price because a lot of research studies using static model.
There exist two major objectives in this study:
1.1 To know how relationship and stability residential property in Malaysia.
1.2 To ascertain *income* or *economic problem* impact to residential property in Malaysia.

II. LITERATURE

Most of the related literature examines regarding satisfaction perspectives towards housing price rather than Gross National Income. As refer to Australian Bureau of Statistics (ABS), (2011) concluded that changing in housing values are a leading determinant of household consumption expenditure, consumer confidence, employment and growth. This is because when the housing price rise in value, household wealthier will spurring consumer confidence, spending, and employment growth.

According to Pettinger (2013), the demand for housing is dependent upon income in which with higher economic growth and rising incomes people will able to spend more on house. Besides, it can be concludes that falling incomes will mean people can't afford to buy and those who lose their job may fall behind in their mortgage payments. In term of other factors, housing price is affected by the credit supply because housing purchased is financed by borrowing where borrowing depends on nominal interest rates which in turn may be influenced monetary policy.

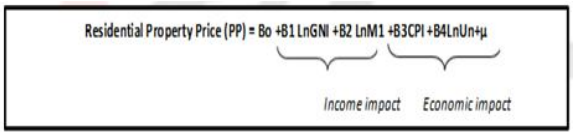
Furthermore, Yu and Lee (2010) show that the money supply, corporate bond returns, and the number of building construction permits and orders received for building construction are essential explanatory variables for the instability of housing price especially in Korea.This paper introduces dynamic regression to determine the decomposition and factors influencing residential property.

III. METHODOLOGY

We used secondary data from International Monetary Fund (IMF), World Bank, Department of Statistic Malaysia, Thomson (DataStream), NAPIC (National Property Information Center) Malaysia and EIU (Economist Intelligent Unit) from 1988 to 2014 in quarterly data form. We need long and completed sequence of data because we using old time series techniques such as unit root test, Johansen co integration test and Vector Error Correction Model (VECM). Even this technique inferior rather than latest econometric estimates but its sufficient in this study. Who needs "Ferrari" when the market just around the corner?

We also found difficulties in incomplete and non-standardized data among different sources. To solve this, we improvised using latest estimation technique to standardize all the data. Even this is time consuming and complex process we finally get nearly novelty of the data. We use one data (IMF) as proxy, and others data as sequence to improvise our estimation. Simple layman explanations like Global Position System (GPS). When we want to go forward we know that the path is in front of us but not certain (lack of info), so we take 5 satellite (others data resources) to determine the path (data).

First we build simple econometric model that shows relationship between Residential Property Price correlated with income (Gross National Income (GNI) & Money (m1)) and economic problem (inflation or Consumer Price Index (CPI) & unemployment (Un)). So the model:



We use Residential Property Price (PP) because to general form of property price in all Malaysia. It contains all residential property such as terraces, high rise, detach and semi detach house. We also use GNI and not GDP (Gross Domestic Product) to determined *income* in Malaysia. Not to forget, we also use Money Supply (m1) as variables because it has direct relationship money and income[1]. Nevertheless, common CPI being used to capture inflation problem and Unemployment was determined by actual value unemployment in Malaysia.

Second we test the data using Unit Root Test (URT) to determine whether each variable has stationary or non-stationary properties in times series analysis. Identifying the unit root properties is important to avoid inauthentic estimates in the model (error terms are not normally distributed; they have nonzero means and non-constant variances). URT is a static data test. If data are free of unit roots and autocorrelation problems at this level, the OLS method can be applied. The unit root problem can be solved by differentiating the problem n times. Conducting tests, such as multivariate co integration, necessitates data that are stationary in at least first difference I(1).To further elucidate URT, we begin with

$$Y_t = \rho Y_{t-1} + \mu_t,$$

where $-1 < \rho < 1$, and μ_t is the white noise error term. If the ρ value = 1, then unit roots (non stationary) exist. To solve this problem, we add the previous lag value and subtract it with Y_{t-1}, yielding

$$Y_t - Y_{t-1} = (\rho - 1) Y_{t-1} + \mu_t, \text{ simplified to}$$

$$\Delta Y_t = \delta Y_{t-1} + \mu_t, \quad (1)$$

where Δ is the first difference and $\delta = (\rho - 1)$ (δY_{t-1} = stationary, μ_t = non stationary). This equation indicates that when $\delta = 0$, $\rho = 1$, Y_t is non stationary. The hypotheses below can be generated [applied in the augmented Dickey–Fuller (ADF) and Phillips – Perron (PP) tests]:

Ho: non stationary ($\delta = 0$, $\rho = 1$) $\Delta Y_t = \mu_t$,

Hi: stationary ($\delta < 0$ or $\delta = -1$ $\rho = 0$), $\Delta Y_t + \delta Y_{t-1} = \mu_t$.

1=money supply indicates that fiat money and current deposit that measure actual liquidity money that reflect income and purchasing power. Researcher do not use Purchasing Power Parity (PPP) because want to focusing measure in micro perspectives in income determinant

Third we test using Johansen Co integration Test (JCT). When all data present no problems (i.e. contain no unit root problems), JCT can be carried out. The general idea of this test is to determine the long-term relationship between variables. The existence of co integration indicates stable long-term equilibrium in a model, and all variables converge to a single equilibrium. In this study, however, at least two co integration factors should be found before VECM is initiated. The co integration factor in this work indicates the following:

$$\textit{Income impact} = PP - (GNI + M1 + CPI + UN), \quad (2)$$

$$\textit{Economics impact} = PP - (GNI + M1 + CPI + UN, \quad (3)$$

JCT uses two test statistics: trace statistic and maximum Eigen value. These tests statistics require

significance at the 1% and 5% levels. The models of JCT are:

Maximum Eigen value:

$$\lambda_{\max}(r,r+1) = -T\sum \ln(1-\lambda_{I-I}), \quad (4)$$

Trace statistic:

$$\lambda_{TRACE}(r) = -T\sum \ln(I-\lambda_t), \quad (5)$$

where λ_I = characteristic root estimate value derived from matrix Π

r = cointegration factor

T = observation

Ho: No cointegration exists (i.e. the model does not exhibit a long-term relationship).

Hi: Cointegration exists (i.e. the model exhibits a long-term relationship).

If both the aforementioned test statistics> critical values (1% or 5% significant level), JCT rejects Ho, indicating co integration with at least one factor.

Lastly we use Vector Error Correction Model (VECM) to determine the existence of short-term relationships in models. It is also used to investigate *dynamic* relationships and in combination with GCT.

The model is expressed as follows:

$$\Delta PP_t = \alpha_0 + \alpha_1 \Delta GNI_t + \alpha_2 \mu_{t-1} + \varepsilon_t, \quad (6)$$

where μ_{t-1} is the error term that depends on the previous period, ε denotes the residual in the current period, and Δ represents the first difference operator.

$\alpha_2 \mu_{t-1}$ = ECT $_{t-1}$ (previous error correction term)

For example, if the value of Δ GNI $_t$ = 0, μ_{t-1}>0, Δ PP $_t$ >0 indicates a value above the equilibrium point. Thus, α_2 should be< 0 to compensate for the μ_{t-1} value. This value takes effect in the succeeding period, thereby decreasing the overall value of $\alpha_2 \mu_t$ = ECT $_t$ and restoring ΔPP $_{t+1}$ to the equilibrium point. VECM is a dynamic model because in each period, it attempts to regain equilibrium by its error term in the previous period if certain forces that cause disequilibrium exist. This approach is called error correction modeling because error terms are corrected until a single stable equilibrium is achieved. This point is the most important issue in this study because the model that VECM generates will either ***support or reject*** the *income impact* and *economic impact* theories and can be used to determine the ***stability*** of the model.

IV. ANALYSIS

Tables 1: Unit Root Test

	AUGMENTED DICKEY FULLER (ADF)				PHILLIP PERRON (PP)			
	LEVEL		FIRST DIFFERENCES		LEVEL		FIRST DIFFRENCES	
	INTERCEPT	TREND AND INTERCEPT	INTERCEPT	TREND AND INTERCEPT	INTERCEPT	TREND AND INTERCEPT	INTERCEPT	TREND AND INTERCEPT
MALAYSIA n=108 optimal lag =11								
PP	-7.963018	-9.853820	-7.532346 (***)	-7.497696 (***)	-8.454128	-9.858091	-92.43372 (***)	-96.74863 (***)
LnGDP	0.055131	-3.141431	-5.479849 (***)	-5.467451 (***)	-1.96135	-9.315105	-23.93530 (***)	-24.39760 (***)
LnM1	-0.423270	-2.378024	-3.852024 (***)	-3.827274 (**)	-0.901573	-2.570728	-11.80444 (***)	-11.80164 (***)
CPI	0.189592	-2.153758	-9.987949 (***)	9.950458 (***)	0.377819	-2.930663	-9.825542 (***)	-9.769633 (***)
LnUNEMPLOYMENT	-3.141793	-3.172497	-9.757511 (***)	-9.761670 (***)	-3.482925	-3.464731	-10.97727 (***)	-10.96521 (***)
Note: Using pure logarithm (Ln) for variables to minimize residual.	Note: For ADF test first is t-probabilities statistic value. All of the variables using AIC automatic choosing lags from e-view computer program				Note: For PP test, first is t-probabilistic statistic value.			

Tables 2: Johensen Cointergration Test

HYPOTHESES	EIGEN VALUE	TRACE STATISTIC	CRITICAL VALUE (5%)	CRITICAL VALUE (1%)	MAX-EIGEN VALUE	CRITICAL VALUE (5%)	CRITICAL VALUE (1%)
MALAYSIA = lags 6							
Ho : r = 0	0.346182	93.21593	68.52	76.07	42.91754	33.46	38.77
Ho : r ≤ 1	0.251642	50.29839	47.21	54.46	29.27724	27.07	32.24
Ho : r ≤ 2	0.110460	21.02115	29.68	35.65	11.82213	20.97	25.52
Ho : r ≤ 3	0.086933	9.199020	15.41	20.04	9.185536	14.07	18.63
Ho : r ≤ 4	0.000133	0.013483	3.76	6.65	0.013483	3.76	6.65

*Note: Lags determine after testing with Correlogram test and it free from autocorrelation problem (testing with each variables residual). r indicates the number hypotheses of cointegration factor(r=0 means 1 cointegration, r=2 means at least two cointegration factor). * means 5% and ** means 1% significant level (α). Data also using AIC criterion. Also use Osterwald-Lenum lags criterion.*

Tables 3: VECM Result

ECTt	MALAYSIA	PPt= +1435.947 – 423.1747 LnGDPt + 207.0255LnM1
		[5.72907]*** [-3.43355]***
- 0.882813		+ 72.09883 LnUnemployment t + 7.541231 LnCPIt + μ
		[-4.9984]*** [-2.83796]***

Note: First is model generates by same Johansen optimal lag, and second the bracket value is t-statistic value. For first ECTt value means accelerates and deaccelerates dynamic equilibrium, Second the bracket is t value statistic. All testing using d.f. 120 which two tail: 10% = +/-1.658: 5% = +/- 1.980: and 1% +/- 2.617

Tables 1, shows the unit root test of ADF and PP for Malaysia. All of the output indicates that at level I (0), t-statistic > t-probabilistic (1%,5%,10%) value means reject Hi (data contain unit roots). But after first difference I (1), t-statistic < t-probabilistic value means reject Ho (data free from unit roots problem). The output shows strong stationary value and stand

alone with I (1) stationary, so inaccurate if continue ARDL or orthodox least square technique.

A table 2 shows the result of long run co integration test. Malaysian output indicates that exist weak two co integration factors at 5% and strong one co integration factors at 1% Nevertheless, it's enough to fulfill two idea that in the model exist two relationship theorem that***; income impact*** and ***economics impa***ct to property price in Malaysia.

Tables 3 shows the VECM and ECTt result. First we found that in the model exist stable short run dynamic equilibrium which the model intent to deaccelerates in -0.88 point time, means if something happened like economics shock or e.t.c., the model intent to equilibrium again around nearly 1 quarter time which is 3 and half month in Malaysia cases. Simplify, if something happened in Malaysia (Export decrease = examples), the market will rebound only in 3 and half month.

Second this model shows that all the variables are significant event at 1% significant level but the final hypotheses is varied between earlier hypotheses. We found that GDP has negative relationship to Property Price (PP) (reject the theory) and M1 has positive relationship to PP (support the theory). As conclude we ***partially support income impact factor theorem***.

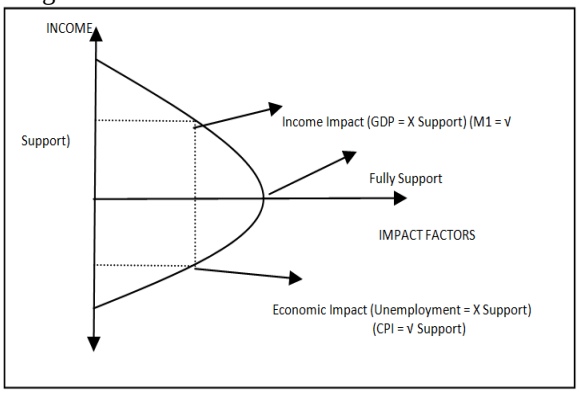
We also found that unemployment has positive relationship to Property Price (PP) (reject the theory) and CPI has positive relationship to PP (support the theory). As second conclude we ***partially support economic impact factor theorem***.

Final result states that we found partially conclusive evidence about orthodox theorem correlation between income, economic and property.

V. THEOREM DEVELOPMENT

Even as partially conclusive evidence being found, this also can created new idea and curve based on ECM output. Based on Malaysian output we created D-Curve.

Diagram 1: D-CURVE



As previous diagram, D-Curve idea generates by ECM output. X axis indicates the impact factor theorem that measure support the orthodox theorem. Y axis positive shows income impact region, and Y axis negative shows negative indicates economic impact region.

Second, the orthodox theorem state that GDP have positive relationship with property price and also M1 have positive correlation with property price. This correlation indicates *income impact theorem.* Simplify more income (GDP) and money (M1) will force uptrend the property price in Malaysia.

The orthodox theorem also stress that unemployment have negative correlation with property price but, CPI have negative relationship with property price. This correlation indicates *economy impact theorem.* Simplify more unemployment created people with no money and forcing property price downtrend while CPI created more excessive indicator that market profitable enough that will intent to influence the market in uptrend.

We found that all the output differ with the original orthodox theorem. We also found that it's *partially support* both of income and economics impact factors theorem. Means GDP have negative relationship with property price *(not support)* while M1 shows direct relationship with property price in Malaysia *(support).* For this, we agreed that for Malaysian cases its ***partially support income impact theorem***.

We also found that unemployment have positive relationship with property price *(not support)* while CPI have positive relationship with property price (support). And we agreed that for Malaysian cases also its ***partially support economics impact theorem.***

VI. RECOMMENDATION

As to concluded, further study is a must because this idea only generates from simplify econometric modeling. As output end, we suggest that in the market in Malaysian cases shows that monetary policy can influence in positive manner to property price, while GDP (through fiscal policy) have *backfire* effect to property price in Malaysia. We also suggest that unemployment have positive impact to property price in Malaysia that also contribute by knowledge worker in Malaysia that even property price increase these knowledge worker found difficult to find a job because Malaysia still rely on non-skill worker as engine of growth. Lastly we also concluded that inflation still have positive impact to Malaysian cases, that reflect that monetary or fiscal policy still have orthodox result to the system.

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