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The Impact of Macroeconomic Factors on the House Prices during Liberalisation

(Impak Faktor-faktor Makroekonomi ke atas Harga Rumah Semasa Liberalisasi)

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ABSTRACT

The objective of the research is to investigate the impact of macroeconomic variables on the prices of different house types during liberalisation. This research examines the long term relationship between the respective house prices and the macroeconomic variables of interest rate, house supply, and the amount of loan approved. The methods used in this research are the Johansen Cointegration Test and VECM co-integration analysis based on Malaysian data over 1999-2012. The findings suggest that the prices of house were cointegrated regardless of the type. A higher degree of liberalisation has led to an increase of house prices. The impact, however was on the terrace, semi-detached, and high-rise houses, rather on the price of detached houses/bungalows. The policy makers may need to relook into the policy of opening up the property sector to foreigners, as the finding suggest that it has had an impact on potential local terrace buyers, who are largely low- and middle-income earners.

Keywords: House prices; Johansen test; liberalisation; macroeconomics; real estate

ABSTRAK

Objektif penyelidikan ini adalah untuk mengkaji impak pemboleh ubah makroekonomi ke atas harga bagi pelbagai jenis rumah semasa liberalisasi. Kajian ini memeriksa hubungan jangka panjang di antara harga rumah tersebut dan pemboleh ubah makroekonomi iaitu kadar bunga, penawaran rumah dan jumlah pinjaman yang diluluskan. Kaedah yang digunakan dalam kajian ini adalah ujian kointegrasi Johansen dan analisis kointegrasi VECM berdasarkan data sepanjang tahun 1999-2012. Hasil kajian menunjukkan bahawa harga rumah adalah berkointegrasi tanpa mengira jenis. Tingkat liberalisai yang tinggi telah membawa kepada kenaikan harga rumah. Walau bagaimanapun, impaknya lebih kepada rumah teres, rumah berkembar dan rumah bertingkat tinggi berbanding rumah terpisah/banglo. Pembuat dasar mungkin perlu melihat semula dasar membuka sektor perumahan kepada orang asing, kerana hasil kajian menunjukkan ia memberi kesan kepada potensi pembeli rumah teres rakyat tempatan yang kebanyakkannya berpendapatan rendah dan menengah.

Kata kunci: Harga rumah; ujian Johansen; liberalisasi; makroekonomi; hartanah

INTRODUCTION

The global housing market has steadily increased since 2000 (IMF Global Housing Watch, 2020). A country could make a significant contribution to credit growth, but at the same time warrants some concerns when its house prices grow faster than its income. Malaysia was at number 14 in real credit growth in 2019, indicating an increase in housing loans although it does not commensurate with income growth (Ema Izati 2015). House prices rose in Malaysia at the beginning of 2009 as a result of the transformation of the sector to attract significant investments into the country. The government of Najib Razak has decided to attract investors, skilled intellectuals, as well as rich and innovative players such as those with a background in science and information technology. One way to invite them is to exhibit a promising quality of life. In order to do so, Malaysia has opened up its property sector to remove certain restrictions that prevent foreigners from buying properties in the country before. In its announcement on the Comprehensive Deregulation of the FIC Guidelines, 30 June 2009, the liberalisation strategy stated that the FIC rules pertaining to the Real Estate Investment Trust (REIT) had to be abolished. Similarly, FIC approval for purchases of properties that valued less than RM20 million had to be abolished too. The Government also removed the purchase price ceiling, which means that a foreigner is no longer limited to buying a property at a minimum rate (the ceiling, however, was reinstalled in 2015).

As a result of the liberalisation of the property market, the properties in Malaysia are being hunted by foreigners, particularly from the neighbouring countries (The Edge 2013). The sector is refreshing as the demand from outsiders has usually been high-quality luxury homes. As a result, many detached houses and condominiums were built in the years ahead, especially

in urban areas such as Kuala Lumpur, Penang and Kota Kinabalu, and their prices were increasingly high. The average price of high-rise residential properties rose by 6 per cent (3.3 per cent inflation-adjusted) to MYR296,826 (US$ 68,981), and the average house prices rose by 4.1 per cent (1.4 per cent inflation-adjusted) to MYR524,260 (US$ 121,835) (JPPH 2015). However, developments in demand for luxury homes have led to an increase in the prices of normal houses in urban and suburban areas (for example, average house prices rose by 5.4% (2.7% inflation-adjusted) to MYR278,223 (US$ 64,658) during the year to Q3 2015). Not only in KL, Penang, and KK, the spillover high prices have reached other less developed areas with lower incomes than those offered by the metropolis. For example, house prices rose 7.2 per cent in Perlis, 7.2 per cent in Perak, and 6.6 per cent in Kedah, in 2015, respectively (JPPH 2015). Clearly, the liberalisation of the property market attracts foreign buyers, which has led to higher house prices than ever before. This incidence has raised a significant issue of affordability among locals, which is why the present researchers felt encouraged to conduct this study in order to examine whether macroeconomic variables, including liberalisation, affect house prices for different buyers.

The Department of Valuation and Property Services under the Ministry of Finance has classified the residential properties in Malaysia into four types. The first type is the terraces, which are popular among Malaysians. A terrace has a minimum of three bedrooms, but it could also be in the form of a double storey with four bedrooms. Terraces are usually sought by low- and middle-income earners. Semi-detached (semi-D) and detached (bungalow) house types are usually expensive for average Malaysians, but not foreigners. High demand has pushed up the prices of semi-Ds and detached houses, yet foreign buyers still see these prices as competitive compared to similar type of houses in their countries. High-rises are popular with urbanites. Urban areas that are relatively more economically dynamic have begun to witness the development of large apartments and condominiums. As the price of landed houses rose, the demographics of the housing also changed. Malaysia's housing landscape has shown that the customer segment that would previously opt for a landed house must now be satisfied with a high-rise house.

There is an increasing number of studies on macroeconomic determinants of house prices in Malaysia that include interest rates as a variable (see inter alia, Pinjaman & Kogid 2020; Wong, Lee & Koong 2019; Loh et al. 2019). The common motivation for these studies is the concern about home price ballooning, which causes problems of affordability among locals. However, past studies have not addressed the issue of house price determinants in the context of liberalisation and have used interest rates as borrowing costs rather than a representation of liberalisation. Thus, taking the reciprocal interest rates to represent liberalisation would make it possible to explore the role played by policy-makers in the property market, potentially in addressing the issue of affordability among locals.

Thus, there were gaps left by the previous studies that allowed us (i) to examine the relationship between house prices and macroeconomic variables in the context of liberalisation, and (ii) conduct a house type analysis. The rest of this paper is as follows. The previous literature is discussed in Section 2. Section 3 describes the techniques of econometric modelling and estimation. Empirical findings are described in Section 4, while Section 5 concludes the study with policy recommendations.

LITERATURE REVIEW

LIBERALISATION CONCEPT

Liberalisation refers to the easing of government regulation and the reduction of international trade and capital constraints. Liberalisation, also known as legalisation, too, applies to the removal of government sector controls (Smith 2020). The idea of economic liberalisation was adopted by the General Agreement Tariff and Trade in 1947, which encouraged free trade practice that was expanded to much of the Organisation for Economic Co-operation and Development and developing countries in the 1980s. Acceleration of practice and globalisation continued when foreign direct investment (FDI) was accepted as one of the driving forces for growth in a country. Although there have been a number of restrictions on foreign investment in the past, the elimination of many restrictions has gradually been implemented in many countries (Smith 2020).

Earlier liberalisation started with movable assets through trading activities. It then extended to include investors from a wealthier country investing either through the purchase of foreign portfolio assets in the home country, the acquisition of a substantial portion of the business (fusion and acquisition), or the establishment of facilities directly in the host country (foreign direct investment). However, it is unclear when the property market started to liberalise, but the IMF reported a sharp increase in the global real-estate index in 2002 (BIS, 2020) perhaps due to high demand. While the index decreased in 2009, the global housing market continued to increase steadily until 2019. The increase was attributed to markets providing ample supply of large, well-built assets that could be financed through solid, liquid capital markets in competitive economies that provided more or less steady supply of creditworthy tenants. Institutions could acquire these leased assets through straightforward transactions that provided acceptable valuations of the capital they had committed (O'dea 2019).

Excluding the house as a shelter, the attributes provide an incentive for institutions to invest in residential properties, but what motivates foreign property purchases? The movement may be similar to the imperialism that centralised on capitalism. Jahan and Mahmud (2015) established six foundations on which capitalism is based. The first is based on Mrozowski's (2014) notion that capitalism is a commoditisation mechanism in which everything is converted into "exchange products." This includes the private ownership of tangible and intangible assets. The second is due to the self-interest in which people behave rationally, disregarding social and political constraints for their own sake. The third is competition between firms that want to optimise the wellbeing of suppliers and customers. The fourth is that the economy sets the prices of products and wages. The fifth is the right to choose where to spend, what to make, what to consume, and where to live. The sixth is the understanding of the role of the government in protecting citizens' rights and maintaining the climate under which markets function.

Clapham (2007) argued that the globalisation issue has dominated housing policy in Britain over the last decade. This proposal is accompanied by a review of recent housing policy issues and a trace of their origins in the debate on globalisation. He enquired whether there is a better alternative to the neo-liberal approach of the recent housing policy, considering that the conventional social democratic approach is inadequate for the climate created by globalisation. Housing supply has become more market-based internationally, and these developments in the housing sector are clearly the products of economic globalisation driven by capitalist value structures (Forrest 2008).

Fernandez and Aalbars (2016) explained the emergence of financialised capitalism, that is, the concept of profit without development, and how housing has always been a key element of financialisation. Housing is funded by a variety of strategies, such as overpriced and overextended loans, mortgage securitisation, credit ratings of (potential) tenants, land use planning, property rights, private housing programmes, and affordable housing. Despite these complex analyses of housing finance and the importance of housing for financialisation, the relationship between housing and financialisation remains under-researched and under-theorised.

Will the home price determinants shift over time? Price theory claims that in a free market system, the consumer price is dictated by supply and demand. The price of the balance shall be set in such a way as to equalise the quantity to be supplied with that required. However, in practice, the price can be skewed by other factors, such as tax and other government regulations. House price studies can be divided into several clusters – dynamics (studies focusing on the growth rate of house price variables rather than level), cycle (studies focusing on the boom-bust of house prices), and residential facilities (studies focusing on property and building management aspects). Examples of the dynamics study are studies by Capozza, Hendershott, Mack, and Mack. Cycle studies include those by Cooper (2013), Bordo and Landon-Lane (2011), Ren, Xiong, and Yuan (2012) and Kannan, Rabanal, and Scott (2012). Meanwhile, Kuethe and Keeney (2012) and Richardson, Vipund, and Furbey (1974) conducted a report on residential facilities.

Although there is a substantial body of literature on house prices, especially in the current decade, no established set of price determinants has been defined. For example, Glindro, Subhanji, and Zhu (2011) analysed macroeconomics and structural impacts in order to understand the differential effects of fundamental and speculative housing bubbles. According to them, the spillover effects of housing bubbles had only a marginal change to the Asia-Pacific property growth and only a minimal damage to the banking system.

Galati, Teppa, and Alessie (2011) researched the role of micro and macro factors in the determination of house prices in the Netherlands. They used the subjective calculation of house worth by the owner of the house. Their studies had shown that house prices are closely related to household-specific and house-specific variables, including year of building, age, level of education, income, and property. The lending factors, in particular the availability of mortgages, the form of mortgage, and the cost of mortgages, play an important role. Researchers also found that long-term interest rates had an effect on how households valued their homes. In addition, there was evidence of a "well-functioning" dynamic of subjective house prices, indicating that house prices tend to converge to their long-term equilibrium value.

Malaysia's residential house prices are thought to be partially offset by business-related factors that are often used to explain Tan (non-data) commercial-industry property prices. He used economic factors (e.g. per capita income, unemployment rate, consumer price index (CPI) for durable goods), financial factors (e.g., loans and advances for housing developers, average commercial bank lending rate), and the Composite Index.

Our review of the literature suggests that many of the house price determinant studies included financial variables, such as deregulation, policy, interest rate, and mortgage rate. For example, Michalski and Ors (2012) and Landier, Mrser, and Thesmar (2013) found that interstate banking deregulation had a strong and immediate effect on banking, which immediately led to a sharp rise in house prices. Bernanke (2010) discussed the importance of monetary policy in addressing bubbles. Assigning the correct monetary policy might be critical, as some analysts had suggested that the Federal Reserve's excessive easy monetary policy had

triggered house price bubbles in the U.S. The concern was that when the eventual bubble bursts, it would be a major source of financial and economic stress (Ahearne, Ammer, Doyle, Kole, & Martin 2005; Del Nego & Otrok 2007). However, rising house prices when interest rates fell were not proof that low interest rates caused bubbles. The advocates of the strategy, however, stressed that greater use of monetary policy could prevent and regulate bubbles in house and other asset prices (Jarocinski & Smets 2008; Reifschneider & Williams 2000).

Proponents of liberalisation were actively promoting the concept of migration as drivers of economic development that favoured all. To them, liberalisation had led to some policy assumptions as to whether it was acceptable to associate economy with environmental or labour policies. The topic was generally focused on trade and financial liberalisation talks (e.g., Jarocinski & Smets (2008), which combined actual and nominal GDP and interest rate trends, discussed how the economic shock affects U.S. housing demand).

Financial liberalisation is believed to have begun in the U.S. in the early 1980s. Campbell and Hercowitz (2005) and Iacoviello and Neri (forthcoming) suggested that it began with the 1980 Monetary Control Act and Garn-St. The Rule of Germain of 1982. Both acts promoted financial innovation by removing collateral restrictions on household debt and by deregulation of the savings and loan industry. The emergence of this scenario had helped companies that had had financial problems in the past and had not been able to raise funds to access them through a high-risk debt market. As a result, more companies borrowed to fund their activities. Coupled with changes in the government policy, including the removal of interest rate caps on bank accounts, the funds available for lending had increased. Around the same time, the situation had raised the tendency to borrow.

With regard to the housing market sector, financial liberalisation has raised significant debt concerns, financial fragility, and affordability concerns. Monetary policy is a widely used reflection of financial liberalisation. The impact of monetary policy on housing were investigated, among others, by Ahearne, Ammer, Kole, and Martin (2005), Iacoviello and Minetti (2008), and Gupta, Jurgilas, and Kabundi (2010).

Gupta, Miller, and Wyk (2012) discussed, for example, how financial market liberalisation by monetary policy affected the dynamics of the U.S. home economy. They noticed that the housing market seemed more responsive to monetary policy shocks in the post-liberalisation period. The negative effect of the monetary policy shock on house prices lasted and remained important for more than two years before the liberalisation period, although prices rebound rapidly after the liberalisation period of about one year.

Favilukis, Ludvigson, and Nieuwerburgh (2011) found that the model generated significant volatility in the national house price-to-rent ratio as it fluctuated according to the state of the economy in the analysis of a two-sector general housing equilibrium model where households face restricted opportunities to insure against risks. This was also growing in response to the relaxation of credit limits and the decrease in the cost of housing transactions (financial market liberalisation). Those factors, along with a rise in foreign ownership of U.S. debt, had been adjusted to suit the real increase over the period of 2000-2006. The model also predicted a sharp decline in home prices starting in 2007, driven by economic contraction, and the presumed reversal of the liberalisation of the financial markets.

Vargas-Silva (2008) found, however, that the response of the variable housing operation to the monetary policy shock was smaller and lasted for a shorter time in the U.S. housing market. Furthermore, it found that monetary policy did not contribute to arise in GDP deflator, house prices, commodity price index, unpaid reserves and real GDP, or to a decrease in the federal funds rate over a certain period of time.

On the basis of the previous literature, there have been insufficient studies on the determinants of house prices in the context of liberalisation, particularly in developing countries. This has left a void in the awareness of housing research where the necessary research results do not exist. Based on Jahan and Mahmud (2015) and Mrozowski (2014)'s notion of capitalism as a commoditisation process, this research, in principle, believes that housing has turned into commodity instruments left to the market to determine its price. Accordingly, this research suggests that, in Malaysia, the liberalisation of the country's property market would have a positive impact on the prices of different types of houses, but of varying magnitude. According to the market theory, the price of the products is determined by the demand and supply factors; the sum of the building loan (demand) and the house supply (supply). The key contribution to this research was the study of the impact of liberalisation on different types of houses which reflect different categories of potential buyers.

METHODOLOGY

VARIABLES

The dependent variable for this study was house price while the independent variables were liberalisation, amount of loan for construction, and house supply. In order to represent house price, this study used the house price index (HPI) obtained from the National Property Information Centre (NAPIC), Malaysia. To examine the long-term relationship of the four types of houses, different HPIs were used, namely:

1. Terrace: HPI_Terrace
2. Semi-D: HPI_SemiD
3. Detached/bungalow: HPI_Detached
4. High-rise: HPI_Hi-Rise

This study applied supply and demand theory, which suggests that the equilibrium price is determined by the demand and the supply factor. Amount of loans distributed (*LOAN*) was used to represent the demand side as it indicates the easiness and openness of the country in providing loan facilities for construction, therefore creating demand for houses. Hence, the higher the amount of loan distributed for construction, the higher the house price will be. Meanwhile, the supply variable is represented by the number of housing units approved for construction (*HS*). A conventional model that follows the demand-supply framework was then extended to capture the variable of interest, i.e., liberalisation, in this study. We extended the model by including property liberalisation (*LIB*) 1/lending interest rate as the proxy.

HYPOTHESES

1. Liberalisation of the real estate policy has changed the housing market landscape. Based on the literature, liberalisation policies (including lowering interest rate) open up opportunities for property investment, consequently drive up demand for houses, then the price. This study used 1/interest rate to represent liberalisation (low interest rate represents liberalisation). The higher the liberalisation, the higher the house price.
2. We hypothesised the demand factor (amount of loans distributed for construction) to have a positive relation with HPI, as the higher the amount of loan given out, the housing developers are in a better position to create higher demand. Consequently, the high demand would push the house price further.
3. The supply of residential units is expected to have a negative relationship with house price.

Equation

Following the price theory of supply and demand, this study's equation for the house price model is as follows:

$$\ln HPI_t = \alpha + \theta_1 \ln LIB + \ln HS + \ln LOAN + e_t \quad (1)$$

where *HPI* represents house price index of different house types, *LIB* represents liberalisation, *HS* represents supply of residential units, *LOAN* represents amount of loans distributed for construction, and e is error term. All data were in the log form. The duration specified for the study was between Q1:1999 and Q4:2012 (58 observations). The quarterly house price index has been measured and compiled by the Valuation and Property Services Department (VPSD) of NAPIC since 1997. The index measures the prices of residential houses. Data for *LIB*, *HS,* and *LOAN* were extracted from Bank Negara Malaysia's (BNM) statistics.

UNIT ROOT TEST

Test for nonstationary is often described as a test for unit roots using an autoregressive model. For the purpose of consistency, this study employed three unit root tests, which are a) Augmented Dickey-Fuller or ADF test (Dickey & Fuller 1981), b) Phillip-Perror or PP test (Phillip & Perron 1988), and c) Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests. While ADF and PP tests use the existence of a unit root as the null hypothesis, KPSS unit root tests are different because y_t is assumed to be a trend stationary under the null hypothesis. The KPSS unit root tests are often used to confirm results obtained from the other two unit root tests. The results of the unit root tests will determine the type of cointegration test, i.e., if all variables are non-stationary, $I(1)$, i.e., the Johansen test will be used.

Johansen cointegration test, vector error correction model, *and long-term model*

In order to examine the possibility of our variables cointegrating in the long term, this study adopted the system-based reduced rank regression approach or also known as the Johansen vector autoregression approach (Johansen 1991; 1995). The cointegrating relationship is observed using the Johansen's Maximum Likelihood procedure among the $I(1)$ variables. When more than two variables are involved, they might form several equilibrium relationships governing the joint evolution of all the variables. This cointegration analysis determines the number of cointegrating vectors, *r*, using the maximal eigenvalue procedure as given by Johansen (1988).

For the purpose of this research, two tests were provided, namely trace and maximal eigenvalue tests. The main importance of these two tests is that both tests have no standard distribution under the null hypothesis although approximate critical values were tabulated by Oswald-Lenum (1992). Nevertheless, Johansen and Juselius (1990) suggested that the maximal eigenvalue test is more powerful than the trace test.

When there are more than two variables in the model, there is a possibility of having more than one cointegrating vector; the model might form several equilibrium relationships governing the joint evolution of all variables. In general, for *n* number of variables, a study can have up to *n - 1* cointegrating vectors. In order to observe whether these cointegrating relationships exist, we employed multivariate equation error correction approach, known as vector error correction model (VECM). If it were confirmed that our model has

a negative and significant error correction term (*ect*), we would conclude it with the long-term model.

FINDINGS

In this section, we discuss the HPI results of the different house types: terrace, semi-D, detached, and high-rise. The same independent variables were adopted for the various types.

Descriptive Analysis

Prior to discussing the relationships among all variables, the descriptive analysis for all variables in the house price model are described, namely the house price index (HPI) of Malaysia, HPI of terrace house, semi-D, detached house, and high-rise. Table 1 shows a summary of the descriptive analysis of the variables used in this study. House price indices comprised of national index, terrace index, high-rise index, detached house index, and semi-D index. On average, the high-rise price index was higher than the average Malaysian house index. The index series had right skewed distributions, indicating most values were concentrated to the left of the mean. In assessing the normality, the Kurtosis value was observed. The Kurtosis values of the house price indices were larger than 0, denoting departure from normality. This was also supported by the Jarque-Bera test, where their *p*-values were all lower than 0.05, indicating that the null hypothesis of series were normally distributed thus could be rejected. Therefore, the variables were transformed to logarithm form.

The lowest lending rate recorded was for the quarter 2012:Q4, that is, 4.7%. On average, the number of houses built yearly was 41,512 units. The highest number of units built was in 2012: Q2 (77,541). The highest amount of loan distributed was in 2011: Q3, that is, RM13,042 million.

Unit Root Tests

In this section, unit root results for all variables are presented. Three types of test were used: ADF test, PP test, and KPSS tests. Unit root tests were used to measure whether the variables (or time series) were stationary or not. Any time series data can be thought of as being generated by a stochastic or random process and a concrete set of data, which can be regarded as a (particular) realisation (i.e., a sample) of the underlying stochastic process (Gujarati 1998: p. 455).

For the ADF test, the null hypothesis is that when the variable has a unit root, thus it is not stationary. The results produced (τ) were compared against the critical Dickey-Fuller (DF) test. If the τ value was lower than the DF value, the null hypothesis of the variable containing the unit root would be rejected. Table 2 shows the result of the τ value at level and at first difference level for all variables. At level, all τ values were lower than 1% level of DF critical value, which is 3.571, indicating that these variables were not stationary at level. However, when these variables were tested at first difference level, their τ values were larger than the 1% level of DF critical value, which is 4.153. The results rejected the null hypothesis and it can be concluded that these variables are stationary at first difference, *I*(1).

Table 2 reports the result of unit root test using the PP method. Holding the same null hypothesis that the variable has a unit root, thus it is not stationary, the results reveal that all variables were stationary at first difference. In Table 2, the results indicate that all time-series were integrated of order **I** following KPSS tests. When a time series is not stationary, then time series regressions are spurious. Gujarati (1998) stated that if most of the time series were nonstationary, one would be wary of conducting regression based on time series data. He, however, suggested that even if individually that the time series variable were nonstationary, it is possible that there is still a (long-term) stable or

TABLE 1. Descriptive Analysis

	HPI MALAYSIA	HPI TERRACE	HPI SEMI-D	HPI DETACHED	HPI HI-RISE	LENDING RATE	HOUSE SUPPLY	LOAN
			(Index)			(% p.a)	(Unit)	(RM Million)
Mean	122.78	121.24	126.85	120.69	129.13	6.17	41,512	4,111
Median	117.8	116.15	123	114.5	125	6.14	39,553	3,386
Maximum	176.5	175.1	182.7	187.9	174.1	9.55	77,541	13,042
Minimum	93.4	92.7	93.4	93.8	92.3	4.7	13,127	1,431
Std. Deviation	21.83	21.1	24.69	22.72	23.72	1.05	13,470	21.15
Skewness	0.87	0.94	0.64	1.6	0.2	0.65	0.21	1.61
Kurtosis	3.01	3.16	2.5	5.12	1.76	3.52	2.67	6.9
Jarque-Bera	7	8.35	4.36	34.38	3.97	4.64	0.68	60.08
Probability	0.03	0.02	0.01	0.00	0.04	0.05	0.04	0.00
Observation	56	56	56	56	56	56	56	56

TABLE 2. Unit Root Tests *Correlation Test*

	ADF Test					Phillip Peron Test					KPSS Test				
	Level		1st Difference		*I*(0)/*I*(1)	Level		1st Difference		*I*(0)/*I*(1)	Level		1st Difference		*I*(0)/*I*(1)
	C	C&T	C	C&T		C	C&T	C	C&T		C	C&T	C	C&T	
lnHPIM	2.30	0.25	-6.40**	-6.87**	*I*(1)	2.30	0.25	-6.50**	-6.87**	*I(1)*	0.89**	0.19**	0.47	0.14	*I*(1)
	(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)	
lnTerrace	1.71	-0.17	-6.99**	-7.37	*I*(1)	1.88	-0.07	-7.06**	-7.37**	*I(1)*	0.88**	0.19**	0.40	0.15	*I*(1)
	(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)	
lnSemi-D	1.39	-0.94	-10.73**	-10.99	*I*(1)	1.69	-1.82	-10.77**	-11.12	*I(1)*	0.90**	0.16**	0.30	0.16	*I*(1)
	(1)	(0)	(0)	(0)		(1)	(0)	(0)	(0)		(1)	(0)	(0)	(0)	
lnDetached	-0.58	-3.17	-7.80**	-7.74	*I*(1)	-0.32	-3.11*	-12.57**	-12.44**	*I(1)*	0.91**	0.08	0.16	0.15**	*I*(1)
	(1)	(0)	(0)	(0)		(1)	(0)	(0)	(0)		(1)	(0)	(0)	(0)	
lnHi-Rise	1.39	-0.94	-10.73**	-10.99	*I*(1)	2.39	-0.21	-7.09**	-7.56**	*I(1)*	0.91**	0.17**	0.37	0.14	*I*(1)
	(1)	(0)	(0)	(0)		(0)	(0)	(0)	(1)		(0)	(0)	(0)	(1)	
lnLIB	-2.68	-3.19	-6.34**	-6.20	*I*(1)	-2.42	-3.29	-6.35**	-6.20**	*I(1)*	0.81**	0.19**	0.09**	0.15	*I*(1)
	(1)	(1)	(0)	(0)		(1)	(1)	(0)	(0)		(1)	(1)	(0)	(0)	
lnHS	-2.52	-2.66	-9.83**	-6.80	*I*(1)	-2.53	-2.66	-9.83**	-6.83**	*I(1)*	0.40	0.15**	0.16	0.14	*I*(1)
	(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)		(0)	(0)	(0)	(0)	
lnLoan	-2.85	-3.12	-8.00**	-7.93	*I*(1)	-2.64	-3.11	-14.79**	-13.63**	*I(1)*	0.92**	0.08	0.13**	0.18	*I*(1)
	(0)	(0)	(1)	(1)		(0)	(0)	(1)	(1)		(0)	(0)	(1)	(1)	

Note: Lag in parentheses ( ). C is constant. C&T is constant and trend. Asterisk** indicates the rejection of null hypothesis at least at 5% significant level. The rejection of null hypothesis for KPSS test is based on 95% CV for rejection of hypothesis of a unit root, which are 0.463 (constant and trend) and 0.1460 (constant and trend). H0 = stationary.

equilibrium relationship between the two. In this case, the combination of these time series is said to be cointegrated

Table 3 shows the correlation matrix between Malaysia's HPI (ln*HPIM*), liberalisation (ln*LIB*), house supply (ln*HS*), and amount of loan distributed (ln*LOAN*). As liberalisation is proxied by an inverse of interest rate, we expect that the relationship between ln*LIB* and ln*HPIM* to be positive. Early diagnosis shows that HPI Malaysia (ln*HPIM*) was positively correlated with ln*LIB*, that is, $\rho_{(\ln HPIM|\ln LIB)} = 0.90$. Negative correlation was seen between the HPIM and house supply $\rho_{(\ln HPIM|\ln HS)} = -0.25$. High positive correlation between the amount of loan distributed and the house price $\rho_{(\ln HPIM|\ln LOAN)} = 0.84$ provided an early indication that the amount of loan might have a significant influence in explaining the house price.

Although there is no specific guideline of how much coefficient is considered to contribute to a multicollinearity problem, this study took caution of coefficients that exceeded 0.70. Thus, from the same table, multicollinearity was observed between the independent variables, that is between ln*LOAN* and ln*LIB* ($\rho_{(\ln LOAN|\ln LIB)} = 0.76$). One possible answer for the high correlation between the amount of loan distributed and liberalisation was due to the liberalisation policy that attracts borrowers. We decided to include loan due to its prominent influence elaborated in theory.

Johansen Cointegration Test – House Price of Different Types

As all variables were non-stationary, the appropriate cointegration test to be used was the Johansen cointegration test to examine the possibility of the variables studied moved together in the long-run. In Table 4 (Panel A: terrace) of Table 4, the results show that there was at least one cointegrating relationship

TABLE 3. Correlation Analysis between HPIM and Independent Variables

	ln*HPIM*	ln*LIB*	ln*HS*	ln*LOAN*
ln*HPIM*	1.00			
ln*LIB*	0.90	1.00		
ln*HS*	-0.25	-0.26	1.00	
ln*LOAN*	0.84	0.76	-0.20	1.00

TABLE 4. Johansen Cointegration Results

Panel A:lnTerrace				
H_0	Trace	5% / 1% CV OL[a]	Max-Eigen	5% / 1% CV OL[a]
r = 0	48.083*	47.89/54.46	34.796**	27.07/32.24
r ≤ 1	14.287	29.56/45.65	6.268	20.97/25.52
r ≤ 2	7.019	15.41/20.04	4.667	14.07/18.63
r ≤ 3	2.352	3.76/6.65	2.900	3.76/6.65
Panel B: lnSemi-D				
r = 0	48.453*	47.89/54.46	37.298**	27.07/32.24
r ≤ 1	11.143	29.56/45.65	5.877	20.97/25.52
r ≤ 2	5.282	15.41/20.04	4.197	14.07/18.63
r ≤ 3	1.071	3.76/6.65	1.073	3.76/6.65
Panel C: lnDetached				
r = 0	48.409*	47.89/54.46	36.043**	27.07/32.24
r ≤ 1	10.368	29.56/45.65	5.836	20.97/25.52
r ≤ 2	4.531	15.41/20.04	4.482	14.07/18.63
r ≤ 3	0.048	3.76/6.65	0.048	3.76/6.65
Panel D: lnHigh-rise				
r = 0	51.589*	47.89/54.46	34.507**	27.07/32.24
r ≤ 1	17.082	29.56/45.65	12.229	20.97/25.52
r ≤ 2	4.823	15.41/20.04	3.688	14.07/18.63
r ≤ 3	1.162	3.76/6.65	1.167	3.76/6.65

between terrace price and liberalisation, house supply, and amount of loan. The trace statistic was higher than the 5% OL critical value at $r = 0$, rejecting the null hypothesis of no cointegrating relationship between variables was tested. The result was similar to Max-Eigen value where its value (34.8) was slightly higher than the 1% critical value (32.24). In Panel B (semi-D) of the same table, the result suggests that there was at least one cointegrating relationship between the semi-D price and other variables. Its trace statistics (48.5) and Max-Eigen value (37.2) were larger than the 5% and 1% critical values, respectively, and (47.9 and 32.2) at $r = 0$. Results in Panel C (detached) and D (high-rise) also show similar outcome for cointegrating relationship of detached and high-rise prices with their respective independent variables. To summarise, for each house type, its price index had at least one cointegrating relationship with ln*LIB*, ln*HS*, and ln*LOAN* variables, confirming the possible existence of long-term relationships among them.

VECM and Long-Term Relationship

To confirm the long-term existence between house price and its independent variables, we ran the VECM results for various types of price indices. The coefficients for error correction terms ECT (-1) were all negatively significant. The speed of adjustment, however, was different from type to type. The ECT (-1) estimated coefficient of terrace was -0.06 and was significant at 5% level. It indicates that 6% of the disequilibrium in terrace price was corrected in one year. The ECT (-1) estimated coefficients of the prices of semi-D, detached, and high-rise were -0.09, -0.3, and -0.2, respectively. The results imply that the disequilibrium in detached price corrected faster than other types of disequilibrium.

The goodness of fit of the specification ($R2$) regression remained moderate across the house types, that is between 28% and 59% while the standard error (s.e.) were considered small as could be seen from Panel II of Table 5. The robustness of the model was confirmed by several diagnostic tests, such as LM test (Breusch-Godfrey serial correlation test), White test (heterogeneity test), Jacque-Bera test (normality test), and Ramsey's reset test (stability test), as in Panel III of Table 5. The tests reveal that the modes had the desired economic properties. The residuals were serially uncorrelated and normally distributed.

After confirming the desired ECT, we examined whether the independent variables performed similarly in affecting the prices of different house types. As different house types have different prices, and accordingly different affordability levels, it is interesting to analyse how liberalisation, house supply, and amount of loan would affect the house prices. In Table 6, it can be seen that *LIB* affected the house prices of different types according to our hypothesis; a higher degree of liberalisation induces high house prices. For every 1% increase in *LIB*, prices of terrace and semi-D increased by 0.39%, price of detached increased by 0.06%, and price of high-rise increased by 0.42%. It can be said that among the house types, liberalisation posed similar impacts on the prices of high-rise, terrace, and semi-D. The high impact on high-rise price was expected as the demand for houses is focused on the urban and economically active areas. Although the terrace type is not the goal among foreign buyers, high liberalisation through low interest rates 'traps' potential terrace owners. They are caught in the dilemma of 'buy now or you will have to pay 20 to 30 percent more for the same house later'. In addition, with the rapid hike in house prices, these owners are concerned with the possibility of BNM tightening the monetary policy via interest rate to cool down the house price inflation. The desperation pushes the terrace price relatively higher than others.

The effects of the number of house supply on house prices were also significant across house types (except semi-D), and the effect was the largest on high-rise. Our results significantly rejected our hypothesis (i.e., higher number of house supply reduces house price) for terrace and high-rise types. For every additional unit of house supply, the prices of terrace and high-rise increased by 0.14% and 0.20%, respectively. House prices are positively affected by the amount of loan distributed, especially for semi-D, where the elasticity of amount of loan distributed with respect to its house price was 0.5. Compared to other types, semi-D and terrace prices were more elastic when there were changes in the

TABLE 6. Long-term relationship of different house types

Dep. Variable = ln*HPI_*	TERRACE	SEMI-D	DETACHED	HI-RISE
ln*LIB*	0.385*	0.389*	0.062	0.417*
	(2.25)	(2.29)	(0.83)	(2.22)
ln*HS*	0.139*	0.064	-0.091**	0.204**
	(2.28)	(1.13)	(-2.86)	(3.26)
ln*LOAN*	0.426**	0.449**	0.398**	0.391**
	(6.75)	(7.34)	(10.83)	(5.84)
C	0.500	1.133	2.559	0.109

Note: Asterisks ** and * stand for significant at 1% (2.33) and 5% (1.65) respectively. Figures in ( ) denote t-value.

TABLE 5. VECM – HPI various types

Panel I: Short-term coefficient of VECM results				
	TERRACE	SEMI-D	DETACHED	HI-RISE
ECT	-0.057* (-2.16)	-0.085** (-2.16)	-0.338* (-1.96)	-0.168** (-3.33)
$\Delta ln\text{HPI}_{t-1}$	-0.208* (-1.50)	-0.563** (-3.52)	-0.404** (-2.02)	-0.155 (-1.13)
$\Delta ln\text{HPI}_{t-2}$	-0.025 (-0.16)	-0.078** (-0.40)	-0.075 (-0.37)	-
$\Delta ln\text{HPI}_{t-3}$	-	-0.011* (-0.072)	0.144* (1.85)	-
$\Delta ln\text{LIB}_{t-1}$	0.096* (1.75)	-0.189 (-1.62)	0.225* (1.72)	0.484*** (3.24)
$\Delta ln\text{LIB}_{t-2}$	-0.118 (-1.51)	-0.132* (-1.14)	0.597*** (3.61)	-
$\Delta ln\text{LIB}_{t-3}$	-	0.199* (1.92)	-0.258* (-1.67)	-
$\Delta ln\text{HS}_{t-1}$	0.017* (1.81)	0.029*** (2.31)	0.064*** (2.73)	0.062* (1.70)
$\Delta ln\text{HS}_{t-2}$	-	-0.005 (-1.02)	0.055*** (2.74)	-
$\Delta ln\text{HS}_{t-3}$	-	-0.003** (-2.02)	0.070 (0.39)	-
$\Delta ln\text{LOAN}_{t-1}$	-0.010* (-1.79)	0.018** (2.11)	-0.010*** (-2.48)	-0.043 (-0.02)
$\Delta ln\text{LOAN}_{t-2}$	-0.002 (0.25)	0.082 (1.45)	-0.208* (-1.84)	-
$\Delta ln\text{LOAN}_{t-3}$	-	0.024*** (2.30)	-0.01 (-1.32)	-
C	0.013*** (4.46)	0.025*** (3.05)	0.027*** (4.62)	0.015** (2.01)
Panel II: Model Criteria				
R^2	0.360	0.447	0.587	0.281
Adjusted R^2	0.220	0.257	0.467	0.206
s.e equation	0.014	0.012	0.021	0.030
F-stat	4.721	2.367	2.671	3.751
Akaike AIC	-5.600	-4.987	-4.555	-4.360
Panel III: Diagnostic checking				
Normality	3.7749 [0.154]	0.9242 [0.630]	0.3361 [0.845]	0.5214 [0.771]
Serial Correlation	2.9614 (2) [0.195]	1.0913 (2) [0.376]	0.6464 (2) [0.565]	19.964 (2) [0.168]
Heterogeneity	0.5654 (1) [0.459]	1.1894 (1) [0.286]	0.3183 (2) [0.577]	2.329 (1) [0.140]
Stability	0.3014 [0.8239]	0.8909 [0.601]	0.1256 [0.774]	0.4443 [0.594]

Note: Asterisks ** and * stand for significant at 1% (2.33) and 5% (1.65) respectively. Figures in ( ) denote t-value. For the criteria, we focused on the model with the highest R2 but lowest standard error (s.e) of regression, along with AIC. For Panel III, figures in [ ] denote p-value, while figures in ( ) stand for number of lag. Jacque-Bera is the test for the normality of the residuals. Serial Correlation LM Test is the test for the autoregressive. White Test is the test for the possible heteroscedasticity in the residuals. Ramsey's RESET test is the test for functional form.

amount of loans given out. The result was perhaps due to the continuously increasing demand for these two house types. It might indicate that potential local buyers took advantage of the easiness to obtain loans and still kept their preference to buy landed houses, therefore creating a larger pool of terrace and semi-D buyers among Malaysians, causing the prices of these houses to jump higher than other types of houses.

CONCLUSION

In Malaysia's Prime Minister's announcement on 'Comprehensive Deregulation of the FIC Guidelines, 30 June 2009,' the liberalisation policy outlined the abolition of FIC regulations pertaining to the Real Estate Investment Trust (REIT) and the removal of FIC approval for acquisitions of properties of less than RM20 million. Malaysia has opened up its property sector to lift some restrictions that prohibit foreigners from buying property in the country before. Past studies did not discuss the issue of house price determinants in the sense of liberalisation and used interest rates as borrowing costs rather than as a measure of liberalisation. Therefore, there were gaps left by the previous studies that allowed us to analyse the relationship between house price and macroeconomic variables in the context of liberalisation, and house type. This study analysed the long-term relationship among house prices (of different house types), liberalisation, house supply, and amount of loan approved for construction. By employing time-series analysis, this research utilised data span between 1999 and 2012. This study employed three unit root tests (ADF, PP, and KPSS), Johansen cointegration test, and VECM.

Several conclusion can be made from the findings. First, there is a long-run cointegration between house price, amount of loan, and house supply, regardless of the house type. Second, liberalisation has impacted all house types positively with its impact on high-rise and terrace houses the highest. The high impact was expected as housing demand focuses on urban and economically active areas. Regardless that the terrace model was not the target of foreign buyers, low interest-rate liberalisation has 'trapped' potential terrace owners to buy now. Third, although it was expected that high house supply would reduce the house price, our findings suggest differently. An additional unit of house supply increased the terrace and high-rise price.

The research was not short of limitations as it was restricted by the absence of property tax values which its imposition is inconsistent. The values can be very helpful if future research sought an alternative variable to represent the tax effect. As this finding shows that liberalisation had significant impact on the terrace price, policy makers may want to prohibit foreigners (or their local proxies) from purchasing terraces by filtering the real buyers and putting the price cap. This is to assist the locals who really need these houses are able to purchase affordable homes.

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