Determinants of Housing Price: Evidence from Panel Data

Nur Hafizah Ismail

School of Economics, Finance and Banking, Universiti Utara Malaysia, 06010 Sintok
Malaysia. Email: hafizahismail19@gmail.com.

Sabri Nayan

School of Economics, Finance and Banking, Universiti Utara Malaysia, 06010 Sintok,
Malaysia. Email: sabri.nayan@uum.edu.my

Abstract

Housing industry plays a vital role to a country's economy, however, increase in house prices could contribute to negative growth of economic and financial performance. It is crucial to study the determinants of house price in order to control the price volatility and to reduce the risk of potential repeated financial crisis. This paper investigates the determinants of housing prices in selected East-Asian countries: Malaysia, Singapore, Indonesia and Thailand by using pooled mean regression, over a quarterly data from 2000 to 2010. The key factors investigated were GDP, bank lending rate, unemployment rate and stock price index. All determinants were found to be significantly related to the cross-country House Price Index (HPI). East-Asian countries should adapt relevant imperative action to control house prices from escalating and to avoid financial instability due to housing bubble from happen.

1 Introduction

Real estate market has been viewed as a key point of interest for economists and researchers. In general, property prices are influenced by supply and demand of the real estate market. Sometimes, a growth in property prices could lead to a real estate bubble. Herring and Wachter (2003) and Sornette and Woodard (2010) indicate that real estate bubble seemingly fostered a financial bubble which leads to a financial crisis. According to Liow (1998), the real estate market was determined as one of the major factors that

1

caused the Asian financial crisis in many East-Asian countries. For example, house price indexes in most of the East-Asian countries such as Malaysia, Indonesia, Thailand and Singapore showed fluctuation during 1997 to 1999 Asian financial crisis. In fact, during 2008 financial sub-prime crisis, its impact on some of East-Asian countries housing market was marginal where the housing market growth was positive though rather slowly.

In many countries, some issues regarding house prices movement could attach to the volatile pricing. According to Ciarlone (2015), several factors such as interest rate and income growth have been determined as affecting housing prices. The author indicates that by understanding the effects on housing price, a country may prevent another financial crisis event. Besides that, with increased understanding on house price, a country could impose better regulation with financial authorities (Collyns, & Senhadji, 2002). In addition, King (1990) indicates that a better economic prospect for the nation would increase the demand for housing and price indexes would follow suit. A study done by Hashim (2010) has listed down several economic fundamentals that influenced the house price trends such as income growth, interest rate, stock prices, housing supply, economic activity and population growth.

Nevertheless, housing industry continues to be an important and significant investment by households. Hashim (2010) reported that house price and housing industry plays a major role to a country's economy and business cycle in term of capital market, employment and financial wealth. However, Abraham and Hendershott (1996) in contrast reported that rising house prices could contribute to negative growth of a country's economic performance which affects imbalance financial stability. Therefore, it is pertinent to study the factor determinants of house price that drive the housing market industry in order to control house price volatility and to reduce the risk of potential repeated financial crisis. This paper aims to analyze the relationship between house price and factor determinants of house price in selected East-Asian countries, namely Malaysia, Indonesia, Thailand and Singapore. According to Setboonsarng (1998) only inflation for these four ASEAN countries (Malaysia, Indonesia, Thailand and Singapore) remained within single digits or also known as moderate inflation before the financial crises occurs. The author stated that a country with moderate inflation can have disastrous cumulative effects for an economy during the financial crisis. Besides, monetary easing among these four ASEAN countries and major trade partners could lead to malinvestments which can cause to an economic crisis. The impact of inflation on housing prices is greater which implies that housing prices effectively hedge inflation. Moderate price increases may not be a risky situation, until it leads to a recession which can affect the real property market. Therefore, it is pertinent to include Malaysia, Indonesia, Thailand and Singapore in this study.

In the next section, we present related literature review. Section 3 details the empirical method that we employ in analyzing the data. The results of our analysis are presented and discussed in section 4. The final section is for conclusion and policy implication.

2   Reviews of Related Literature

Previous studies indicate that Gross Domestic Product (GDP), lending rates, unemployment rates and stock price are several variables which focus on explaining house

prices.

Real Gross Domestic Product (GDP) is widely recognized as an important economic factor determinant of house price movements (Case, Glaeser & Parker, 2000; De Wit & Van Dijk, 2003; Ong, 2013; Xu, 2017). According to Tsatsaronis and Zhu (2004), real GDP growth has information that contains direct measures of household income and housing price. Englund and Ioannides (1997) and Valadez (2015) indicate that a change in HPI will lead to a change in GDP. For example, Englund and Ioannides (1997) reported that an increase in income is expected to have a positive effect on housing demand, and consequently to the house prices. Similarly, Hii, Latif and Nasir (1999) also found that real GDP is significantly related to the house price where the house prices increases with real GDP. However, Tsatsaronis and Zhu (2004) and Ganeson and Abdul Muin (2015) found a contradict result. The authors found that GDP does not have significant relation with house price.

Lending Rate is another important factor determinant of house price volatility (Harris, 1989; Qi & Hua, 2007; Xu, 2017). Harris (1989) found that housing prices are affected by lending rates. In fact, Gaspareniene, Remeikiene and Skuka (2016) highlighted that factor of bank lending rate can be considered to have more significant impact on housing price. The authors indicate that the availability of funding is one of the key determinants of housing price level since lending rate serve as the main source of funding for acquisition of housing. Generally, lending rate could encourage household's spending and affect the house price. According to Xu (2017), increase in the lending rate will increase the house prices and this consequently will encourage an increase in household's demand of bank credit. However, Tak, Chi & Seabrooke (2003) found that high lending rates tend to add to the real burden of debt payments to the household. Follain (1982) reported that at high lending rates, the households' liquidity problems tend to reduce housing demand. Similarly, Sutton, Mihaljek and Subelyte (2017) stated that increase in lending rate induced by rising funding property costs affected housing demand and eventually can led to some drop-in house prices. Likewise, Fama and Schwert (1977) indicate that an increase in lending rate can restrain forecasting and speculation activities in the housing industry.

Several previous studies show the relationship between labor market indicator such as unemployment rate and housing prices (Abraham & Hendershott, 1996; Adams & Fuss, 2010; De Wit et al., 2013). For example, De Wit et al. (2013) found that unemployment rate negatively affects house prices. Rising in unemployment rate due to increase in non-graduation rates can have a negative effect on earnings which cause a negative relation on housing market price conditions (Stratton, 2017). According to Pinter (2018), an increase in house prices, will raise the market value of collateral assets that firms own, thereby increasing in borrowing capacity and leading to an expansion of bank credit. This will cause a reduction in job separation rates, where fall in the number of unemployed workers searching for jobs, hence pushing down on the unemployment rate. Besides that, Johnes and Hyclak (1999) reported that unemployment affects house prices and consequently, it also has an indirect effect on the size of the labor force. Thomas (1993) and McCormick (1997) found a relationship between the effects of increasing housing loan on unemployment aspect. The study focuses on the effect of decreasing unemployment and its connection to house price. Meanwhile, Jacobsen & Naug (2005) indicate that there is

no relationship between labor market indicator (such as unemployment rate) and house price.

Stock prices have significant effects on real output and to the general price level (Ibrahim, 2010). Ibrahim (2010) indicates that stock market stability is important for the housing market stability. Sutton (2002), Borio and McGuire (2004) and Lean (2012) reported that stock price movements and house price movements were correlated. The authors found that stock prices lead house prices. Kapopoulos and Siokis (2005) proposed that under the Wealth Effect mechanism, household who realizes gains in stock prices will have an increased demand for housing which lead to an increase in housing price. Meanwhile, under the Credit-Price Effect, the authors proposed that house price increases will improve the financial statement of firms and increase in the company's net value. Therefore, investors will be willing to pay a higher price for these companies, thus increase the company's stock price. However, on the other hand, Batayneh and Al-Malki (2015) found a negative relationship between stock market prices and house prices in Saudi Arabia.

3   Data and Empirical Method

This study utilizes quarterly data from 2000 to 2010 for all variables. The quarterly Housing Prices Index (HPI) measures the overall selected East-Asian countries; Malaysia, Singapore, Thailand and Indonesia price changes of houses. HPI data is sourced from the Thompson Reuters DataStream. According to Lum (2004), HPI is used to measure changes in house price, which is not caused by changes in the quality or quantity of the housing in the index. The author also indicates that any changes in house price which includes macroeconomic factors, could affect the current value of houses. Besides that, HPI enables to display the long-run trends in the selected East-Asian countries' house prices and evaluate the condition of the housing market and housing industry.

Four selected independent variables were used in the analysis, namely Gross Domestic Product, lending rate, unemployment rate and stock price index. All data used for the analysis were quarterly data from 2000 to 2010 and sourced from the Thompson Reuters DataStream.

Table 1: Variables and Measurement Units

Variables	Measurement unit
Housing Price Index (HPI)	Index points
Gross Domestic Product (GDP)	U.S. Dollars
Lending rate (Lend)	Percentage (%)
Unemployment rate (Unemploy)	Percentage (%)
Stock Price Index (SPI)	Index points

This study is using pooled mean group (PMG) regression, a technique to estimate nonstationary dynamic panels in which the parameters are heterogeneous across groups. Following Pesaran, Shin, and Smith (1997 and 1999), PMG relies on a combination of pooling and averaging of coefficients. In view of the inconsistency problem in estimating

traditional panel models, Pesaran et al. (1999) proposed the pooled mean group (PMG) model to overcome the limitation. Unlike the static panel models, the PMG model is an intermediate estimator that allows for heterogeneity of the intercept, short run coefficients and the error variance while imposing a cross-country homogeneity restrictions only on the long run coefficients irrespective of whether the included series are $I(0)$, $I(1)$ or of mixed order integration. In addition, the PMG is estimated using a maximum likelihood (ML) estimator where the error correction term (ECT) is expected to be negative and statistically significant negative if the model exhibits a usual return to long-run equilibrium. The PMG model relies on the combination of pooling and averaging of coefficients. However, the primary interest of the PMG model estimation is the speed of adjustment (error correction term) and the coefficient of the long run estimates.

Detailed discussion on the relationship between Housing Price Index (HPI) and macroeconomic determinants are explained in the basic form of the model as in Equation (1);

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots + \beta_k X_k + \varepsilon \tag{1}$$

Where Y is the House Price Index and X_1 through X_k represent the macroeconomic determinants such as gross domestic product, lending rate, unemployment rate and stock price index. Meanwhile, β_j refers to the weight or coefficient for each of the X's.

Basu and Thibodeau (1998) proposed that a semi-log functional form can correct for the heteroscedasticity problem between the housing price and the residuals. Therefore, the final log functional form for cross-country HPI model can be estimated using Equation (2);

$$LHPI = \beta_0 + \beta_1 LGDP_{it} + \beta_2 LLEND_{it} + \beta_3 LUNEMPLOY_{it} + \beta_4 LSPI_{it} + \varepsilon_{it} \tag{2}$$

Where;

$LHPI$	= House Price Index
$LGDP_{it}$	= Gross Domestic Product of country i at quarter period t
$LLEND_{it}$	= Lending rate of country i at quarter period t
$LUNEMPLOY_{it}$	= Unemployment rate of country i at quarter period t
$LSPI_{it}$	= Stock Price Index of country i at quarter period t

4 Result and Discussions

The unit root test is conducted on all variables involved in this study to check if they are stationary. Panel Unit Root tests (using Levin, Lin and Chu and Im, Pesaran and Shin) are computed as in Table 2 and Table 3. The results indicate that all variables of interest in this study are integrated of order one, $I(1)$.

5

Table 2: Panel Unit Root Test

	Levin, Lin and Chu			
	I(0)		I(1)	
Variables	Constant	Constant & Trend	Constant	Constant & Trend
HPI	-8.733***	-7.868***	-9.202***	-7.730***
GDP	-10.228***	-8.777***	-10.526***	-8.713***
LEND	-8.011***	-7.078***	-8.766***	-7.149***
UNEMPLOY	-5.645***	-6.282***	-8.293***	-7.381***
SPI	-6.582***	-5.222***	-7.215***	-5.755***

Note: the asterisk ** and *** indicate rejection of the null hypothesis at 1% and 5% levels of significance respectively.

Table 3: Panel Unit Root Test

	Im, Pesaran and Shin			
	I(0)		I(1)	
Variables	Constant	Constant & Trend	Constant	Constant & Trend
HPI	-3.486**	-3.529**	-3.676**	-3.645**
GDP	-3.551**	-3.545**	-3.504**	-3.437**
LEND	-3.209**	-3.309**	-3.537**	-3.530**
UNEMPLOY	-2.802**	-3.451**	-3.640**	-3.559**
SPI	-3.122**	-3.120**	-3.221**	-3.031**

Note: the asterisk ** and *** indicate rejection of the null hypothesis at 1% and 5% levels of significance respectively.

Table 4: Multicollinearity Test (Variance Inflation Factor, VIF)

Variable	VIF	1/VIF
SPI	5.67	0.176285
UNEMPLOY	5.02	0.199026
GDP	3.00	0.333317
LEND	2.61	0.383133
Mean VIF		4.08

Table 5: Correlation Test

	HPI	GDP	LEND	UNEMPLOY	SPI
HPI	1.000000	-0.192780	-0.256303	0.233454	0.014835
GDP	-0.192780	1.000000	0.622182	-0.071527	0.474478
LEND	-0.256303	0.622182	1.000000	-0.549429	-0.150072
UNEMPLOY	0.233454	-0.071527	-0.549429	1.000000	0.807929
SPI	0.014835	0.474478	-0.150072	0.807929	1.000000

The main objective of this study is to analyze the relationship between house price and factor determinants of house price in selected East-Asian countries, namely Malaysia, Indonesia, Thailand and Singapore. Therefore, the estimation result of this study is as in Table 6.

Table 6: Estimation Results

Variable	Coefficient	St. Error
Constant	1.413202***	0.2745019
Gross Domestic Product	0.1157036***	0.0231345
Lending Rate	0.0284396***	0.0044964
Unemployment Rate	0.0342823***	0.0077929
Stock Price Index	0.2008166***	0.0146787
Error Correction term	-0.8328444***	0.1636919
Number of observations	48	
Number of groups	4	
Observation per group:		
Min	12	
Avg	12.0	
Max	12	
Log Likelihood	158.241	

Based on the result in Table 6, the error-correction term was negative and significant, which indicates the presence of long-run adjustments. The coefficient of 0.8328 suggests that house price converged toward equilibrium 83 per cent in one quarter through house price themselves. It implies that it took more than approximately one quarter ($1/0.8328=1.2$) to eliminate the disequilibrium. Although this shows that house price volatility is not a major issue since 83 per cent of disequilibrium is corrected within one quarter, however, low volatility of house price can influence the buyers to make quick decision about their choice to buy a house, as there is a reasonable possibility of price increase in the short term. As the house price grows, this will cause fears of another Asian Financial Crisis that sends prices tumbling after the bubble bursts (Cheong & Ngui, 2019).

Coefficient of Gross Domestic Product (GDP) is positive and statistically significant. This indicates that an increase in economic activities in selected East-Asian countries such as Malaysia, Singapore and Thailand drive the demand of houses and thus, increasing the house prices. When the GDP is increasing, it signals that a country's economic is growing well (Dietz, 2015). This will create more jobs opportunities to the citizen and generate income level rises, which promote better standard living of household. An increase in income is expected to have a positive effect on housing demand. This might cause the property developer to develop more houses as the demand of houses increases, consequently house price. This result is consistent with Adams and Fuss (2008) and Liew and Haron (2013) who proposed that a high gross domestic product brought up the house prices. However, during the financial crisis 2008, the economic growth of the developed nations in including East-Asian countries dropped to 0.8 percent compared to 2.5 percent in 2007 (Yip, Wong & Lim, 2017). For example, in Malaysia, according to Bank Negara Malaysia (2010), real gross domestic product (GDP) growth in 2008 was 4.6 percent down from 6.3 percent in 2007 which illustrates the adverse effects of bubbles, resulting a decline in real estate market value.

Besides that, coefficient of lending rate is also positive and statistically significant. This shows that lending rate is positively correlated with housing price. For example, in Singapore, when the lending rate is increasing, the financing cost is also increasing,

7

however, only small capital can be used in the construction projects of house. Therefore, as a result, the supply of housing decreases and the housing price increases. This result is consistent with Guo and Wu (2013) and Haron and Liew (2013). The authors reported that as the demand for housing is increasing with limited number of supplies, this will affect the house price to rise. During financial crisis 1997-1998 and economic downturn, many East-Asian countries experienced negative growth in construction activity. For example, in Thailand, banks became more cautious in lending to risky developer in housing industry due to bankruptcies of some financial institution. In addition, reduced in consumer confidence towards banks during financial crises have an effect on bank lending, which shows the decline in consumer borrowing. As the demand for property declined and limited supply for housing project will lower the house price.

Coefficient of unemployment rate shows positive and statistically significant result that is different with the theory. The possible explanation for this contradicts result is because of the housing market environment in the selected East-Asian countries have no obvious correlation in house prices and unemployment rate. Cohen and Karpaviciute (2017) assumed that unemployment situation could have a positive effect on disposable income which causes household to move to more economical but also more expensive housing.

Interestingly, coefficient of stock price index is positive and statistically significant. This indicates that as the stock price increases, it stimulates with the increase in financial wealth which could foster investment in housing industry. Thus, this will encourage higher demand for housing and higher house prices such as in Malaysia and Indonesia. In other words, there is a transfer of wealth from the stock market to the housing market due to the profits gained from investments in stocks market are reinvested in housing industry. This result is consistent with Lean (2012), Lim and Nugraheni (2017), Pillaiyan (2015), who found that there was a stronger correlation between house prices and the stock market performance. However, during financial crisis 1997-1998, there was a significantly decreased in Indonesia stock price and caused collapse of entire stock market, consequently followed by 0.08% declined in the housing price in Indonesia (Lim and Nugraheni, 2017).

5 Conclusion and Policy Implication

This paper investigates the factor determinants of house price from the macroeconomic variables perspectives, namely Gross Domestic Product (GDP), lending rate, unemployment rate and stock price index. The empirical results have shown that all microeconomic variables significantly affect house price. This is in line with previous empirical work done by Dietz (2015), Haron and Liew (2013) and Pillaiyan (2015). An increase in the GDP, lending rate, unemployment rate and stock price index will cause the house price rise. The result also suggests that GDP, lending rate and stock price index effect on house price is consistent with the economic theory, however, only unemployment rate has contradicted result with the theory. East-Asian countries should play a vital role to control house prices from escalating. Therefore, prudent action should be taken by Malaysia, Indonesia, Singapore and Thailand in order to avoid financial instability due to housing bubble from happen.

8

References

Abraham, J.M. & Hendershott, P. (1996). Bubbles in metropolitan housing markets. *Journal of Housing Research*, 199-208.

Adams, Z. & Fuss, R. (2010). Macroeconomic determinants of international housing markets. *Journal of Housing Economics*, 19(1), 38-50.

Bank Negara Malaysia. (2010). *Key Economic and Financial Statistics*. Annual report 2009. Putrajaya: Percetakan Nasional Malaysia

Basu, S. & Thibodeau, T.G. (1998). Analysis of spatial autocorrelation in house prices. *Journal of Real Estate Finance and Economics*, 17(1), 61-85.

Batayneh, K. & Al-Malki, A. (2015). The relationship between house prices and stock prices in Saudi Arabia: An empirical analysis. *International Journal of Economics and Finance*, 7(2), 156-167

Borio, C., & McGuire, P. (2004). *Twin peaks in equity and housing prices?* BIS Quarterly Review, March, 79-93.

Case, K.E., Glaeser, E.L., & Parker, J.A. (2000). Real estate and the macroeconomy. *Brookings Papers on Economic Activity*, 2, 119-162.

Ciarlone, A. (2015). House price cycles in emerging economies. *Studies in Economics and Finance*, 32(1), 17-52.

Cheong, C.W.H., & Ngui, L.L.H. (2019). On Malaysian house price growth: The effects of market sentiment. *Asian Journal of Finance and Accounting*, 10(2), 167-191.

Cohen, V. & Karpaviciute, L. (2017). The analysis of the determinants of housing prices. *Independent Journal of Management and Production*, 8(1).

Collyns, C. & Senhadji, A. (2002). Lending booms, real estate bubbles, and the Asian crisis. IMF Working Paper, 02/20.

De Wit, E.R., Englund, P., & Francke, M.K. (2013). Price and transaction volume in the Dutch housing market. *Regional Science and Urban Economics*, 43, 220-241.

De Wit, I. & Van Dijk, R. (2003). The global determinants of direct office real estate return. *Journal of Real Estate Finance & Economics*, 26(1), 27-45.

Dietz, R. (2015). *Good Signs for Housing in 2015*. Retrieved on January 14, 2015 from http://www.usnews.com/opinion/economicintelligence/2015/01/14/housing-market-showing-signs-of-a-good-2015

Englund, P. & Ioannides, Y.M. (1997). House price dynamics: An international empirical perspective. *Journal of Housing Economics*, 6(2), 119-136.

Fama, E.F. & Schwert, G.W. (1977). Asset returns and inflation. *Journal of Financial Economics*, 5, 115-46.

Follain, J.R (1982). Does inflation affect real behavior: The case of housing. *Southern Economic Journal*, 48(3), 570-582.

Ganeson, C & Abdul Muin, I.M. (2015). An Analysis of the Factors Affecting House Prices in Malaysia – An Econometric Approach. Paper presented at Conference Proceedings of Social Sciences Postgraduate International Seminar (SSPIS). School of Social Sciences, Pulau Pinang, Malaysia, 224-235.

Gasparėnienė, L., Remeikienė R. & Skuka, A. (2016). Assessment of the impact of macroeconomic factors on housing price level: Lithuanian case. *Intellectual Economics*, 10, 122-127.

Guo, M., & Wu, Q. (2013). The empirical analysis of affecting factors of Shanghai housing prices. *International Journal of Business and Social Science*. 4(14)

Haron, N.A., & Liew, C. (2013). Factors influencing the rise of house price in Klang Valley. *International Journal of Research in Engineering and Technolog*, 2(10), 261-272.

Harris, J. (1989). The effect of real rate of interest on housing price. *Journal of Real Estate Finance and Economics*, 2 (1), 47-60.

Hashim, Z. A. (2010). House price and affordability in housing in Malaysia. *Akademika*, 18, 37-46

Herring, R. & Wachter, S. (2003). Bubbles in Real Estate Markets. Paper presented for the Federal Reserve Bank of Chicago and World Bank Group's Conference in Chicago on April 22-24, 2002

Hii, J.H.W., Latif, I.A. & Nasir, M.A. (1999), Lead-lag relationship between housing and gross domestic product in Sarawak. *The International Real Estate Society Conference*, 26-30.

Ibrahim, M:H. (2010) House price-stock price relations in Thailand: An empirical analysis. *International Journal of Housing Markets and Analysis*, 3(1), 69-82.

Jacobsen, D.H., & Naug, B.E. (2005). What drives house prices? *Norges Bank. Economic Bulletin*. 76(1), 29.

Johnes, G., & Hyclak, T. (1999). House prices and regional labor markets. *The Annals of Regional Science*, 33(1), 33-49.

Kapopoulos, & Siokis. (2005). Stock and real estate prices in Greece: Wealth versus credit price effect. *Applied Economics Letters*, 125-128.

King, M. (1990). Is the U.K. balance of payments sustainable? *Economic Policy*. 5, 348–95

Lean. (2012). Wealth effect or credit-price effect? Evidence from Malaysia. *Procedia Economics and Finance*, 1, 259-268.

Liew, C. & Haron, N.A. (2013). Factors influencing the rise of house price in Klang Valley. *International Journal of Research in Engineering and Technology*, 2(10), 261-272.

Lim, C., & Nugraheni, S. (2017). Loan-to-value ratio and housing price cycle: Empirical evidence from Indonesia. *Jurnal Ekonomi Pembangunan*, 18 (2), 225-238

Liow, K.H. (1998). Relationship between Singapore property stock and real estate returns. *Journal of Real Estate and Construction*, 8, 1-16.

Lum, S.K. (2004). Property price indices in the Commonwealth: Construction methodologies and problems. *Journal of Property Investment & Finance*, 22(1), 25-54.

McCormick, B. (1997). Regional unemployment and labour mobility in the UK. *European Economic Review*, 41(3), 581-589.

Ong, T.S. (2013) Factors affecting the price of housing in Malaysia. *Journal of Emerging Issues in Economics, Finance and Banking*, 1(5), 414-429.

Pesaran, M.H., Shin, Y., & Smith, R.P. (1997). Estimating long-run relationships in dynamic heterogeneous panels. DAE Working Papers Amalgamated Series 9721

Pesaran, M.H., Shin, Y., & Smith, R.P. (1999). Pooled mean group estimation of dynamic

heterogeneous panels. *Journal of the American Statistical Association, 94,* 621–634.

Pillaiyan, S. (2015). Macroeconomic drivers of house prices in Malaysia. *Canadian Social Science*, 11(9), 119-130.

Pinter, G. (2018). House Prices and Job Losses. *The Economic Journal,* 129(618), 991-1013

Qi, L. & Hua, C. (2007). Property prices and bank lending in China. *Journal of Asian Economics,* 18(1), 63-75.

Setboonsarng, S. (1998). *ASEAN Economic Co-Operation Adjusting to the Crisis.* Southeast Asian Affairs. Retrieved on June 15, 2019 from https://asean.org/asean-economic-co-operation-adjusting-to-the-crisis-by-suthad-setboonsarng/

Sornette, D., & Woodard, R. (2010). Financial Bubbles, Real Estate bubbles, Derivative Bubbles, and the Financial and Economic Crisis. Paper presented in the Proceedings of APFA7 (Applications of Physics in Financial Analysis), "New Approaches to the Analysis of Large-Scale Business and Economic Data," Misako Takayasu, Tsutomu Watanabe and Hideki Takayasu, eds., Springer (2010).

Stratton, L.S. (2017). Housing Prices, Unemployment Rates, Disadvantage, and Progress toward a Degree. Discussion Paper Series, No. 10941. Retrieved on June 9, 2019 from http://ftp.iza.org/dp10941.pdf

Sutton, G.D. (2002). *Explaining changes in house prices.* BIS Quarterly Review, September, 46-55.

Sutton, G.D., Mihaljek, D. & Subelyte, A. (2017). Interest rates and house prices in the United States and around the world. BIS Working Papers, No 665. Retrieved on June 10, 2019 from https://www.bis.org/publ/work665.pdf

Tak, Y.J.W., Chi, M.E.H., & Seabrooke, W. (2003). The impact of interest rates upon housing prices: an empirical study of Hong Kong's market. *Property Management*, 21(2), 153-170.

Thomas, A. (1993). The influence of wages and house prices on British interregional migration decisions. *Applied Economics,* 25(9), 1261-1268.

Tsatsaronis, K & Zhu, H. (2004). *What drives housing price dynamics: Cross-country evidence.* BIS Quarterly Review, March.

Valadez, R.M. (2015). The housing bubble and the GDP: A correlation perspective. *Journal of Case Research in Business and Economics*, 1-18

Xu, T. (2017). The relationship between interest rates, income, GDP growth and house prices. *Research in Economics and Management,* 2(1), 30-37.

Yip, C.Y., Wong, W.C., Lim, H.E. (2017). Buble detection in the Malaysian housing market. *Malaysian Journal of Economic Studies,* 54(2), 203-222