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Household Indebtedness: Economic Determinants of the Malaysian Residential Properties Nonperforming Loans

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ABSTRACT

As of December 2017, the Malaysian household debt relative to gross domestic product stood at nearly 85%, of which half of them were the residential housing loans. When the level of household indebtedness reaches high, it posts a negative impact on both households and financial institutions in the event of adverse external shock. Hence, there is a need for a deeper understanding of the default risk factors for residential properties. This paper unveiled the determinants of the Malaysian banks' residential properties nonperforming loans (NPLs) using the Autoregressive Distributed Modelling (ARDL) framework. In the sample period of 2006 to 2017, households bore inflation risk whereby a reduction in the household income adjusted for inflation affected their debt repayment obligation. Besides that, households were found vulnerable during the period of unemployment therefore would be more likely to default when they lost their future income. Further, a negative global crude oil shock and a higher overnight policy rate worsened the level of purchase of residential properties NPLs. Finally, the global financial stress index showed no significant impact, indicating the Malaysian households were less affected by external financial shock in the given context.

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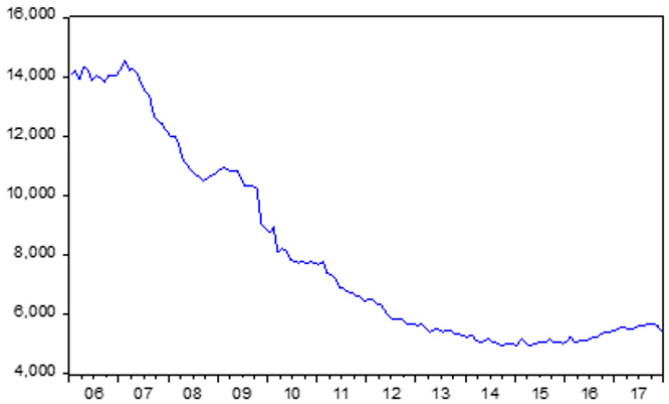
INTRODUCTION

The purchase of residential properties loan forms the lion's share of approximately 52% of total household debts, as of 2017. Being the third main reason for bankruptcy, mortgage debt defaults remain the largest component of household Non-Performing Loans (NPLs). Many Malaysians believe that owning or investing in properties is an important financial goal. Most of the banks offer 80%-90% house financing and the new maximum home loan period is 35 years instead of 45 years. In the case of a mortgage, banks require some sort of collateral that the borrower is obliged to pay back with a predetermined payment (principal as well as interest imposed).

Household debt default is a problem that should not be ignored as it hinders economic growth in the long run (Lombardi et al., 2017). Thus, this study attempted to determine the potential determinants of the main component of the Malaysian household nonperforming loans (NPLs), i.e. NPL for the purchase of residential properties. According to the latest classification of Nonperforming Loans (NPLs) for substandard, bad and doubtful debts published by Bank Negara Malaysia (BNM) in 2015, a loan is considered as impaired *"where the principal or interest/ profit or both of the loan/financing is past due for more than 90 days or 3 months"*.

Figure 1 shows the purchase of residential properties NPLs (RM million) from 2006 to the end of 2017 is trending downward with few hikes during 2008 and 2015. In Malaysia, the median annual household income is almost five times lower than the median house price, renders increasing in borrowings. To facilitate homeownership due to alarming mispriced house and household affordability, Malaysian banks are given flexibility in assessing borrowers' eligibility on their financial circumstances by determining their income source and debt service ratio level[1](Tan, 2018) despite that the defaults are moderate. Thus, this raises the concern of the rise in banks' NPLs.

1 The usual debt service ratio is capped at 60%.



Source: Monthly Statistical Bulletin, BNM (2018)

Figure 1. NPL for the purchase of residential properties (RM million), January 2006-December 2017

Review of Literature

Adverse macro shocks like abrupt changes in income flow, cost of living, cost of borrowing, unemployment, and other unforeseen external occasions are expected to interrupt the households in maintaining their debts at the same level. Specifically, households with thinner financial margin are more vulnerable (Nordin et al., 2018) and subsequently put the banks at threat for formations of more bad loans.

Suggested in the past literature, unemployment has predictive power on household NPLs where the relationship between these variables is positive. Households with debts are more likely to face illiquidity during unemployment as it tightens households' financial constraints, therefore, expected to increase the risk of NPLs (See Beck et al., 2015; Castro, 2013; Messai & Jouni, 2013).

Identified by previous studies, income is a proxy variable to determine borrowers' wealth and ability of debt repayment (Alfaro & Gallardo, 2012; Bonilla, 2012; Dinh & Kleimeier, 2007). Nominal debt repayment value remains the same but the real debt value is greater if borrowers' income doesn't rise with the living cost (Klein, 2013; Nkusu, 2011; Skarica, 2013), leveraging in higher NPLs level. Therefore, the expectation of greater real income improves the availability of cash flow, in turn, reduces the probability of default.

Banks' income and profitability are generated through interest via the lending function at the same time they bear credit risk since households' indebtedness are sensitive to the fluctuation of the cost of borrowing, especially for loan types with variable interest rates (Louzis et al., 2012; Zaman & Meunier, 2017), e.g. housing loans. Positive changes in interest rate deteriorate borrowers' repayment capacity leads to accumulations of bad loans (Adebola et al., 2011; Beck et al., 2015).

A dim global outlook and commodity price shock had attributed hard times to the emerging economies. Negative commodity price shocks impede the commodity exporters' revenue thereby constraint the consumption of households and firms which can lead to default. Idris and Nayan (2016) indicated crude oil price appreciates tended to improve the wealth position of borrowers and lower the chances of default. There are more closing down of business units as a result of the reduced fiscal revenue due to lower consumption of unemployed economic units, at the same time this leads to low availability of cash flows of hence leading to default. As supported by Callen et al. (2015), Hesse and Poghosyan (2009), Miyajima (2016), and Lopez-Murphy and Villafuerte (2010), commodity (oil) price shocks are procyclical and provide a feedback loop on the banks' balance sheet. The outbreak of global financial uncertainties exacerbates external demand in turn lower real economic activity in the export-dependent countries. This impact depresses the firms followed by the domestic market condition, giving rise to the household indebtedness cycle (Debelle, 2004).

In Malaysia, there were several studies conducted on credit risk. The evidence of Adebola et al. (2011) pointed out NPLs in Malaysia Islamic banking system response to any change in lending rate, industrial production, and inflation rate, especially in the long run. Janvisloo and Muhammad (2013) explained that credit risk in Malaysia's commercial banking system was affected by GDP growth and domestic credit growth in a negative direction and while the lending rate and inflation rate positively affecting the NPL ratio. Similarly, Waemustafa and Sukri (2015) found inflation rate was significant to credit risk for Malaysian conventional banks.

This study contributes to enhancing the available literature on Malaysian credit risk factors. Particularly, the study draws close monitoring of the factors of home financing impairment as this loan type is by far the largest cause of household indebtedness. Also, this study features joint implications of the macroeconomic distress and incorporating the microeconomics variable, i.e. household income adjusted for inflation, as one of the leading indicators for credit risk of the banking system. On the other hand, as Malaysia is one of the oil-producing countries and trade-dependent, the study assesses the impact of crude oil price and global risk (stress index) on the NPLs. Practically, to maintain asset quality of the banking system and household resilience, banks may view these available risk strategies and their respective impacts in policymaking. For instance in setting loan loss provision, this study reveals valuable quantitative econometric relations, particularly by placing greater emphasis on certain macro inefficiency.

The structure of this paper is designed as follows. Section 2 provides data descriptions and research methodology. Section 3 presents and discusses empirical results while this paper concludes the empirical findings in Section 4.

MATERIALS AND METHOD

Data and Sample

This study analysed the macro determinants of Malaysian residential housing nonperforming loans (NPLs) using the Autoregressive Distributed Lags approach (ARDL) in the period of 2006 to 2017 by monthly observations, covering the period of Global Financial Crises occurred in 2008-2009, commodity (oil) price shock in 2015. NPLs (in RM million) on the purchase of residential properties ("PRNPL") servjng as an endogenous variable was examined corresponding to the chosen exogenous determinants that were global crude oil price, global financial stress index, household income adjusted for inflation, overnight policy rate and unemployment rate. All these variables were expressed in natural logarithm (LN) except for global financial stress index are shown in Figure 1. The hypothesised coefficient signs are tabulated in Table 1.

Research Model

The presence of a cointegrating relationship between the variables can be determined using the ARDL bound testing approach

Table 1

The expected relationship between explanatory variables and the purchase of residential properties NPLs

Explanatory Variables	Type of Indicators /Source	Description/Unit	Expected Relationship with NPLs
Crude Oil Price (OIL)	Global commodity price/ *International Monetary Fund*	Crude Oil (petroleum), simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh/ RM per Barrel	Negative
Median Household Income Adjusted for Inflation (INC)	Domestic Microeconomic/ *The central Bank of Malaysia (BNM) Monthly Statistical Bulletin, Department of Statistics Malaysia*	Total income received (accrued) by members of the household, both in cash or in kinds which occurs repeatedly within the reference period/ Interpolated, RM	Negative
Overnight Policy Rate (OPR)	Monetary Policy/ *The central Bank of Malaysia (BNM) Monthly Statistical Bulletin*	Target rate for the day-to-day liquidity operations of the BNM. An interest rate at which a depository institution lends immediately available funds (balances within the central bank) to another depository institution overnight/ %	Positive
Unemployment Rate (UNE)	Domestic Macroeconomic/ *Department of Statistics Malaysia*	Total labour force that is unemployed but actively seeking employment and willing to work/Seasonally Adjusted %	Positive
Global Financial Stress Index (GFSI)	Global financial shock/ *Louis Federal Reserve Banks*	The degree of financial stress in the markets and is constructed from 18 weekly data series: seven interest rate series, six yield spreads and five other indicators/ Index	Positive

Source: BNM Monthly Statistical Bulletin, St. Louis Federal Reserve Banks, Department of Statistics Malaysia (2018)

to cointegration (Pesaran & Pesaran, 1997; Pesaran et al., 2001). This approach offers advantages that don't require the same integrated order in all the variables under study, free from autocorrelation when it is augmented by the appropriate lag structure in both the dependent and independent variables and robust in small sample size. Unlike the conventional Johansen approach, the restrictions on the number of lags can be applied to each variable separately in an ARDL method (Pesaran & Shin, 1999; Pesaran et al., 2001). Once a cointegrating relationship is found established in the model, an error correction model can be derived to reveal the short-run impact of the given variables with a long-run equilibrium using an error correction term without dropping long-run information (Pesaran & Shin, 1999).

To this end, this study considered an ARDL (p,q_1,…,q_k) model

$$Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{j=1}^{k} \sum_{l_j=0}^{q_j} a_{j,l_j} X_{j,t-l_j} + \varepsilon_t \quad [1]$$

Where Y_t is the dependent variable, p is the number of lags of the dependent variable Y_t, q is the number of lags of the k explanatory variable X_1, X_2…, X_k , β_0, β_i and $a_{j,lj}$), and are the constant term, coefficients associated with lags of Y_t and coefficients associated with the lags of k explanatory variable $X_{j,t}$ for j=1,2,…,k, respectively, and is a random disturbance term.

Applying ARDL bound testing cointegration approach, construct a conditional error correction form of Equation [1]

$$\Delta Y_t = \beta_0^* + \rho Y_{t-1} + \sum_{j=1}^{k} \pi_j X_{j,t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{l_j=0}^{q_j-1} \theta_{j,l_j} \Delta X_{j,t-l_j} + \varepsilon_t \quad [2]$$

where Δ denotes the first difference operator and ε_t is the white noise residuals. To investigate the presence of a level (or long run) relationship between the variables in the model, it is hypothesised as H_0: $\rho=\pi_1=\pi_2=\pi_3=...=\pi_k=0$ (No cointegration) against the existence of long run cointegration. Two sets of critical values are computed by Pesaran et al. (2001) for a given significance level. The null hypothesis is rejected if the calculated F statistics exceeds the upper bound critical values. The null hypothesis is not rejected if the calculated F statistic is below the lower bound critical value. If the F-statistic falls in between the lower and upper bounds then the test becomes inconclusive.

If the long run relationship is found, by rewriting equation [2], the cointegrating regression form of an ARDL model is

$$\Delta Y_t = \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{k} \sum_{l_j=0}^{q_j-1} \theta_{j,l_j} \Delta X_{j,t-l_j} + \lambda ECT_{t-1} + \epsilon_t \quad [3]$$

where $ECT_t = Y_t - \frac{\beta_0^*}{\rho} - \sum_{j=1}^{k} \frac{\pi_j}{\rho} X_{j,t}$. The coefficient λ reveals the speed of Y adjust to equilibrium after a shock in X. The significant negative sign of error correction term ECT, shows that the model moves towards the stable position in the long run. Based on the context, the conditional error correction and cointegration regression form of ARDL (p, q_1, q_2,…, q_5) representation to

examine the relationships between the NPLs for purchase of residential properties and the determinants is specified as

$$\Delta LNPRNPL_t = \beta_0^* + \rho LNPRNPL_{t-1} + \pi_1 GFSI_{t-1} + \pi_2 LNINC_{t-1} + \pi_3 LNOIL_{t-1} + \pi_4 LNOPR_{t-1} + \pi_5 LNUNE_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta LNPRNPL_{t-i} + \sum_{l_1=0}^{q_1-1} \theta_{1,l_1} \Delta GFSI_{t-l_1} + \sum_{l_2=0}^{q_2-1} \theta_{2,l_2} \Delta LNINC_{t-l_2} + \sum_{l_3=0}^{q_3-1} \theta_{3,l_3} \Delta LNOIL_{t-l_3} + \sum_{l_4=0}^{q_4-1} \theta_{4,l_4} \Delta LNOPR_{t-l_4} + \sum_{l_5=0}^{q_5-1} \theta_{5,l_5} \Delta LNUNE_{t-l_5} + \varepsilon_t \quad [4]$$

Rewriting this equation as

$$\Delta LNPRNPL_t = \sum_{i=1}^{p-1} \gamma_i \Delta LNPRNPL_{t-i} + \sum_{l_1=0}^{q_1-1} \theta_{1,l_1} \Delta GFSI_{t-l_1} + \sum_{l_2=0}^{q_2-1} \theta_{2,l_2} \Delta LNINC_{t-l_2} + \sum_{l_3=0}^{q_3-1} \theta_{3,l_3} \Delta LNOIL_{t-l_3} + \sum_{l_4=0}^{q_4-1} \theta_{4,l_4} \Delta LNOPR_{t-l_4} \sum_{l_5=0}^{q_5-1} \theta_{5,l_5} \Delta LNUNE_{t-l_5} + \lambda ECT_t + \varepsilon_t \quad [5]$$

where,

$$ECT_t = LNPRNPL_t - \left(\frac{\pi_1}{\rho} GFSI_t + \frac{\pi_2}{\rho} LNINC_t + \frac{\pi_3}{\rho} LNOIL_t + \frac{\pi_4}{\rho} LNOPR_t + \frac{\pi_5}{\rho} LNUNE_t + \frac{\beta_0^*}{\rho}\right)$$

the cointegrating relationship when PRNPL and its determinants are cointegrated.

PRNPL: NPLs for Purchase of residential properties

GFSI: Global financial stress index

INC: Household income adjusted for inflation

OIL: Crude oil price

OPR: Overnight policy rate

UNE: Unemployment rate

RESULTS AND DISCUSSION

Figure 2 shows the trend of these variables of interest. Concerning the explanatory variables, global crude oil prices wandered up and down and hit the highest at RM430.78 per barrel in July 2008 while the lowest in January 2016. Household income adjusted for inflation increased gradually throughout the sample period, with few occasional slumps due to the impact of high price costs. The overnight policy rate (OPR) which could affect the lending rates had been adjusted several times in order to cushion the uncertainties in the global and domestic market conditions. As seen, the highest OPR marked 3.5% in April 2006 while the lowest OPR recorded 2.00% in 2009 February and remained for 12 months. The global financial stress index which reflects the overview of the global economic condition experienced a contraction in late 2008. Unemployment fluctuated in little variation between 2.8% -lowest in 2014 Q3 and 3.8%-highest in 2009Q3, in the post-global financial crisis period.

The unit root test was performed on the variables in the level and first differenced form, using the standard Augmented Dickey Fuller (ADF) tested with the trend and without trend term. For comparison purposes, Philip Perron (PP) test was conducted and similar findings were concluded.

Table 2 reports that, at all significance levels (1%, 5%, and 10%), the null hypothesis of the differenced series contains unit root is rejected and concludes that none of the tested variables is I(2). In this regard, the ARDL model is a valid methodology in analysing the variables.

The optimal lag structure of the ARDL model was chosen based on AIC focus on

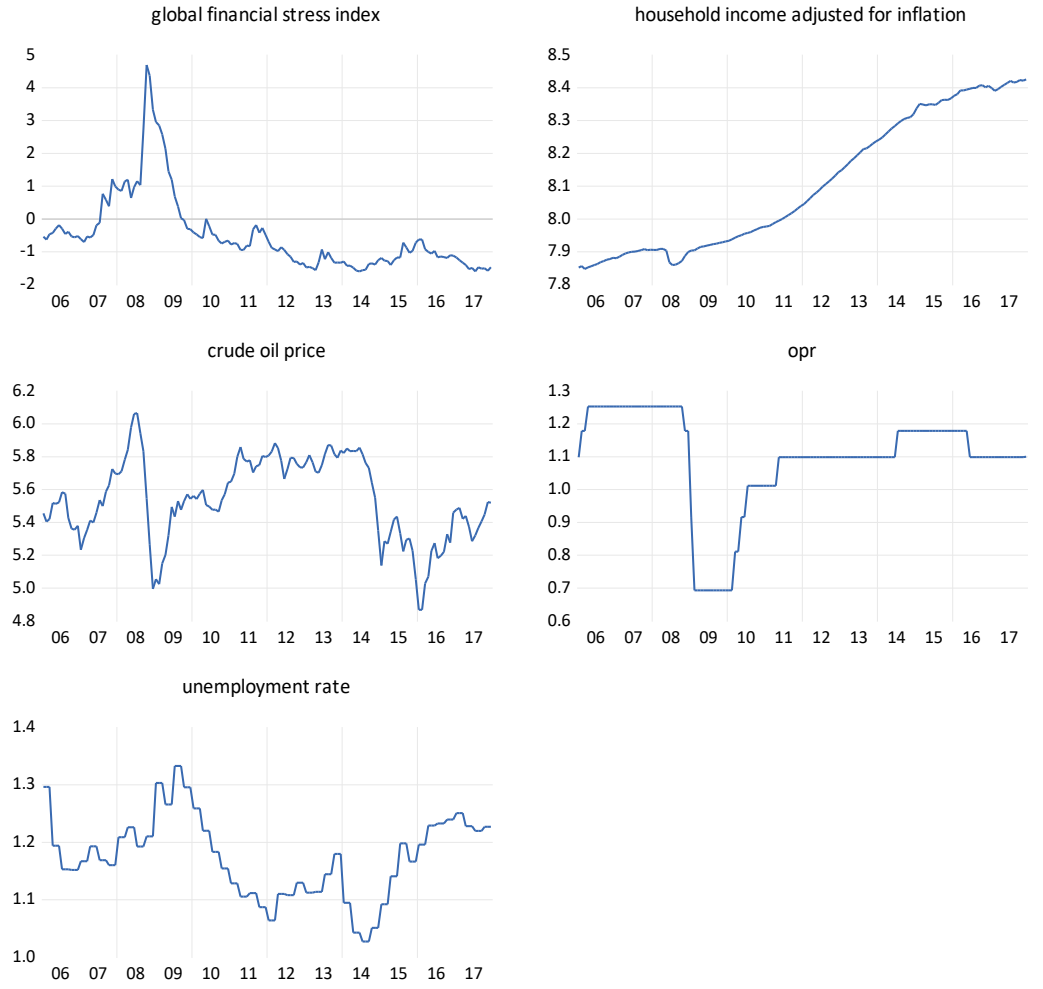


Figure 2. The Malaysian NPLs for purchase of residential properties and its determinants

the best order of lags without underfitting the model. Derived from an ARDL specification, the equilibrating relationship was further extracted using ARDL bound to cointegration approach (Pesaran & Shin, 1999; Pesaran et al., 2001) and speed for adjustment was estimated if cointegration exists.

A key assumption for ARDL bound to cointegration approach is the residuals from the model are free from autocorrelation and heteroscedasticity. As per Table 3, residuals of each ARDL model were found to be serially uncorrelated and homoscedastic at 5% significance level. The coefficients of the specified ARDL model was shown stable and no presence of structural breaks over the sample period, according to the CUSUM plot as per Figure 3. The final specified model is ARDL (3, 0, 0, 0, 5, 7).

Table 2
Unit Root Tests

	ADF without trend		ADF with Trend		PP without trend		PP with trend	
	Level	First	Level	First	Level	First	Level	First
GFSI	-2.040	-8.7680***	-2.866	-8.7488***	-1.767	-9.1678***	-2.412	-9.2549***
LNINC	-0.592	-6.9668***	-1.922	-7.0532***	-0.685	-7.0079***	-1.824	-7.1014***
LNOIL	-3.0044**	-8.1301***	-3.097	-8.1052***	-2.629	-8.2040***	-2.692	-8.1799***
LNOPR	-2.003	-8.7778***	-1.992	-8.7509***	-2.045	-8.9300***	-2.041	-8.8990***
LNUNE	-2.193	-11.8386***	-2.003	-11.9131***	-2.362	-11.8471***	-2.173	-11.9261***
PRNPL	-1.926	-12.7809***	-0.304	-13.2854***	-1.763	-13.0822***	-0.127	-13.2730***

Note: Asterisks ***,**,* indicated statistically significant at 1%, 5% and 10%. Critical value based on MacKinnon (1996) for ADF test and PP test.

Table 3

Diagnostics Tests

	p-values
Serial Correlation: Breusch-Godfrey LM Test	0.986
Heteroskedasticity :White Test:	0.103

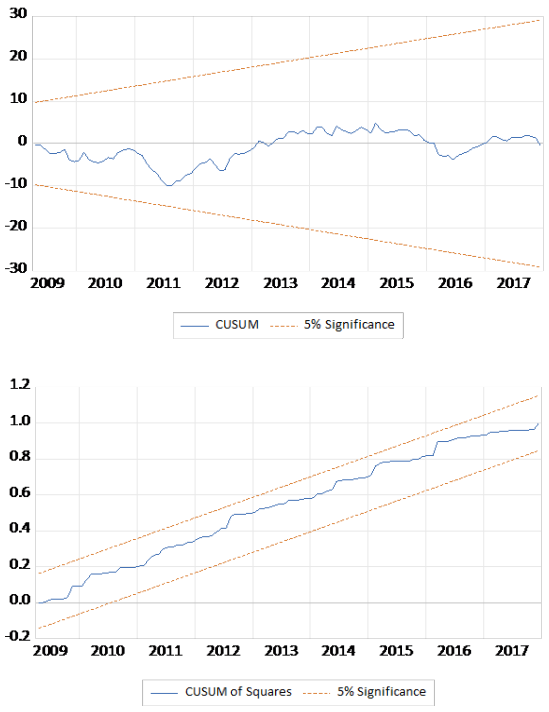


Figure 3. CUSUM plots

Next, to test the presence of cointegration, bound test for cointegration was performed under the null hypothesis of H_0: $\rho = \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = 0$ (no long-run relationship between the levels of variables) against the existence of long run cointegration. F-statistics (see Table 4) exceeds the upper bound critical values; therefore, the null hypothesis is rejected at a 1% significance level. This provides evidence of long run relationships exists between this NPL category

and the selected indicators, i.e. global stress index, household income adjusted for inflation, crude oil price, overnight policy rate, and unemployment rate.

Table 4
ARDL Cointegration bound test

Null Hypothesis: No levels relationship			
F-statistic	Significance level	I(0)	I(1)
8.322169	10%	2.08	3
	5%	2.39	3.38
	2.50%	2.7	3.73
	1%	3.06	4.15

Table 5 indicates the estimation of restricted error correction model and the coefficients of the lagged error correction term, ECT(-1) is negatively and statistically significant at 1%, hence, confirming the presence of long run relationship among the variables. The speed of adjustment to long run equilibrium specified that about 5% of the disequilibrium in *t-1* period was corrected monthly by the changes of NPLs. Focussing on the long run dynamics reported in the panel I of Table 5, note that ceteris paribus, for a 1% increase in household income adjusted for inflation and crude oil price led to negative changes in NPLs for purchase of properties level by 1.10% and 0.63%, respectively. Similarly, positive coefficients of overnight policy rate and unemployment rate were estimated and suggested 1% increase in overnight policy rate increased the mortgage NPLs level by 1.58% whereas a percentage increase in unemployment rate resulted in a rise in the level of purchase of property debt default by 2.03%, all else were being equal. There is significant evidence of long run impact of all indicators except for the global financial stress index on the mortgage NPLs.

Panel II discussed the short run impact. To test for the short run causality, a joint F-test was used to test the sum of lagged coefficients of each independent variable. There's a short run causality that ran from the OPR to the changes NPLs for the purchase of residential properties. Similarly, short term shock on unemployment was transmitted to the changes in mortgage NPLs. The short term change of lagged NPLs on current NPLs was expected to be negative as NPLs tended to decrease when it increased in the previous month, due to write-off (Sorge & Virolainen, 2006). In the short term, higher interest rates reduced NPLs since higher interest rates usually discourage d lending (Žiković et al., 2015). On the other hand, Philip curves explain Low unemployment often leads to a higher inflation rate, reducing the real income of unprotected borrowers thus leading to an increase of the credit risk ratio in the short-run. The short term impact of these indicators on the residential housing NPLs is relatively small.

Notably, global financial illiquidity does not significantly impact Malaysian households' resilience in both the short

and long run when taking other domestic economic factors and monetary policy into account. The effect of global crisis like the one that happened in 2008 was not as bad as the 1997-98 Asian Financial Crises as the first-mentioned was emanated externally while the latter had severely affected the regional economies internally.

Table 5

ARDL modelling: Long run and cointegrating relationship

Selected Model : ARDL (3,0,0,0,5,7)			
Panel I: Long Run Coefficients			
GFSI	-0.0577	(0.1354)	
LNINC	-1.1033	(0.0080)	***
LNOIL	-0.6305	(0.0211)	**
LNOPR	1.5797	(0.0000)	***
LNUNE	2.0308	(0.0041)	***
C	17.0005	(0.0000)	***
Panel II: Cointegrating Relationship			
ΔPRNPL(-1)	-0.30707	(0.0008)	***
ΔPRNPL(-2)	-0.13617	(0.1353)	
ΔGFSI	-0.00284	(0.8547)	
ΔLNINC	-0.05376	(0.9019)	
ΔLNOIL	-0.03098	(0.5949)	
ΔLNOPR	-0.09023	(0.0782)	*
ΔLNOPR(-1)	-0.06576	(0.2593)	
ΔLNOPR(-2)	-0.00609	(0.9107)	
ΔLNOPR(-3)	-0.15109	(0.0063)	***
ΔLNOPR(-4)	-0.105	(0.0523)	*
ΔLNUNE	-0.02515	(0.7792)	
ΔLNUNE(-1)	-0.04917	(0.581)	
ΔLNUNE(-2)	0.05608	(0.5158)	
ΔLNUNE(-3)	-0.14602	(0.0955)	*
ΔLNUNE(-4)	-0.30112	(0.0004)	***
ΔLNUNE(-5)	-0.11905	(0.1706)	
ΔLNUNE(-6)	-0.1469	(0.0469)	**
ECT(-1)	-0.04918	(0.0000)	***

Note: p-values are in parentheses

A simple rule of thumb of Okuns' Law suggests that unemployment is negatively associated with economic growth. This study validated that the economic cycle posted a significant effect on household capability in paying off their debt. The household sector was facing greater financial sustainability to maintain mortgage payment due to slowdown in economic activities, therefore more impaired loans were formed.

The deterioration of this macroeconomic indicator was proxied by the business cycle indicator, unemployment rate. In line with past studies, the rise in the unemployment rate was found to increase the probability of default (Agarwal & Liu, 2003; Beck et al., 2015; Bellotti & Crook, 2009; Castro, 2013; Messai & Jouni, 2013).

One factor that explains the rise of the residential housing NPLs is the overnight policy rate. A rise in the lending rates is the effort of rein in excessive consumptions and demands. Borrowers who had accumulated debts before the policy adjustment bore increased debt burden subsequently triggering default in the long run if there was a positive shock in borrowing cost. In addition, households that hold a mortgage with a variable interest rate are more sensitive to a change in policy rate compared to those with a fixed mortgage rate (Campbell & Cocco, 2015). With higher interest rates, interest payments on the loan will be more expensive, therefore affecting repayment capacity, which is similar to the existing findings (Collins & Wanjau, 2011; Dash & Kabra, 2010; Ghani, 2010).

Supported by Alfaro and Gallardo (2012), Campbell and Cocco (2015), and Rinaldi and Sanchis-Arellano (2006), income growth is related to the probability of default. Banks generally restrict loan eligibility based on debt to income ratio. This implies that the low nominal income itself will not lead to household default, but unexpected macroeconomic implication amplifies the effect of low income. In the study, household income adjusted for inflation was significant in explaining mortgage default. While more than half of the income was used for serving debt, greater current real income enabled the household to meet repayment obligation thus reducing the formation of impaired loans. Instead, household default rises if the nominal household income is squeezed by high living costs (Nkusu, 2011) as the borrowers have no sufficient discretionary income, resulting in higher levels of NPLs.

Crude oil price provides additional information to the economic condition of the oil export-dependent countries. Weak prices of a key export commodity lower the country's fiscal position, firms' revenue, and in turn causes a negative chain effect to the domestic market. Hence, as expected, the crude oil price was negatively affecting the NPLs. These findings are in line with the study conducted by International Monetary Fund [IMF] (2015), Idris and Nayan (2016), and Kinda et al. (2016).

In principle, the financial accelerator mechanism (Bernanke et al., 1998) amplifies the macroeconomic implications of the credit market. High level of household indebtedness is often led by fuelled economic conditions and low-interest-rate environments. In turn, this leads to stronger aggregate demand and favourable labour market. However, over time, high household indebtedness warns the higher fragility of the household (Jappelli et al., 2013), as such, households are prone to default even for a mild shock. Given that all the borrowers have similar repayment ability, that is having no more than 60% debt to

income ratio, a negative shock, however, has a pro-cyclical effect on the repayment capacity. The external shock, particularly oil price slump, put the Malaysian economy skidding. This deteriorates the domestic business sentiment and further transmits the negative impact to households via unemployment and slow income growth. While income is significantly related to the housing NPLs, when price growth outpaced the income growth, households with reduced real income may find difficulties in serving debt. For collateral lending like houses that appreciate values in the long run, household debt repayment expects sufficient current and future real income to sustain a longer tenure of housing loan, which is congruent with Post Keynesian Theory of Consumption. Moreover, a tightened monetary policy to fight inflationary pressure like adjustment in the policy rate will make household difficulties more acute.

CONCLUSION

Despite the fact that the level of Malaysian nonperforming loans (NPLs) for purchase of residential properties decreases gradually, however, the default in this loan category remains the largest share of the household loan default. In times of household unsustainability (due to micro/ macroeconomic factors, the banks are at risk of nonprofitable foreclosure and will have a contagion effect on the economy. This study investigated the explanatory powers of macro determinants of Malaysian nonperforming loans (NPLs) for purchase of residential properties using Autoregressive Distributed Lags (ARDL), in the period of January 2006 to December 2017. ARDL bound test revealed cointegration existed between the NPLs for the purchase of residential properties and the variables chosen. The CUSUM tests indicated the stability of the estimated parameters.

The study explained NPLs for purchase of residential properties was significantly affected by the external factor which was the crude oil price volatility while attributed by the domestic macroeconomic factors of NPLs, those are household income adjusted for inflation, monetary policy, and unemployment rates. As such, in the area of policy implications, the central bank needs to consistently conduct of both micro and macro-stress tests of loans against the suggested determinants in order to reduce the risk of credit vulnerability. Besides reviewing borrowers' net disposable income, this study suggests banks to closely monitor these macroeconomic positions with respect to their quantitative impact for mortgage underwriting. For future research, the analysis can determine whether there is a bi-directional feedback effect between NPLs and the economic determinants. Further, this work can be extended to explore NPLs and macroeconomic linkage in an asymmetry framework.

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