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# **Increasing household debts and its relation to GDP, interest rate and house price: Malaysia's perspective**

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## **Abstract**

*The increase in household debts in Malaysia which has escalated to about 86% of total GDP is deemed to be at worrying stage as it may in turn trigger another financial crisis. Thus, the aim of this study is to examine the increase in household debts and its relation to GDP, interest rate and house price via time series techniques. Data collected from Datastream and monthly statistical bulletin span from 1999 to 2014 on quarterly basis. The results show that there is a cointegrating long run relation between household debt, house prices, GDP and interest rate. The analysis indicates that although household debts could not be influenced by the changes in GDP, lending rate and house price in the short run, it could be affected by house price movement in the long run. As there is a positive significant relationship between house price and household debts, it implies that, in the long run horizon, the increase in household debts is due to the increase in house price. Although both GDP and lending rate are found to be endogenous, we still believe that the movement in lending rate and GDP (as a proxy to income) may affect the household debts. Thus, extra care shall be taken by the policy maker for any decision to increase the lending rate in particular as the lending rate is deemed to be one of the macroeconomic policy instruments which may have significant influence on household income. As the lending rate is deemed endogenous, the policy maker should strengthen prudential measure in order to curb the increase in household debts. Shortening the loan tenure, tightening credit policy by implementing responsible and selective lending, higher debt service ratio, strengthening the risk management of banking institutions are amongst the measures that might facilitate the policy maker to combat the rising household debts. Additionally, as the result found that the house price is the main indicator that affects the household debt in the long horizon, the policy maker should take an initiative to control the property price in order to mitigate any bubble in asset price.*

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# **Increasing household debts and its relation to GDP, interest rate and house price: Malaysia's perspective**

## **1.0 Introduction: Motivation**

Increase in household debt<sup>3</sup> can be attributed to two factors, i.e. the decrease in the prevalence of credit rationing following the financial deregulation in 1980s and the reduction in interest rate. These have contributed to a significant easing of liquidity constraints on households. In every country, the bulk of the household debt has been in the form of mortgage or house borrowing. Why increase in household debt matter?. The increase can be worrisome factor due to the increased indebtedness heightened the sensitivity of the household sector to changes in interest rates, income and asset prices especially in the countries with mainly variable rate mortgages, where the household sector bears the risk of fluctuation in policy interest rates. Regardless of whether the households have “over-borrowed” or not, the higher household debt has important macroeconomic implications. For an instance, if the households having fluctuations in income due to high inflation rate or unemployment factors, it would result in higher aggregate debt over income ratio which means that households will be more exposed to shocks and will also remain exposed for a longer period of time in the past.

Since the 1997 Asian financial crisis, Malaysian financial sector seen to make an important development where the banking institutions in Malaysia has shifted their credit exposures to household financing from corporate businesses as part of their diversification strategy. This development has resulted in household lending become larger segment of the financial system and accounted for more than half of the banking sector's total loan exposure. The robust expansion of loans to the household sector has led to a rising household debt to GDP ratio and it has been an increasing trend since the early 2000s and as of 2013, Malaysia's household to GDP ratio is at 86.8%, one of the highest in the Asia Pacific region. Household debt to GDP ratio represents the size of the total household debt in relative to the size of the economy where the higher the ratio, the more vulnerable the economy is to shock.

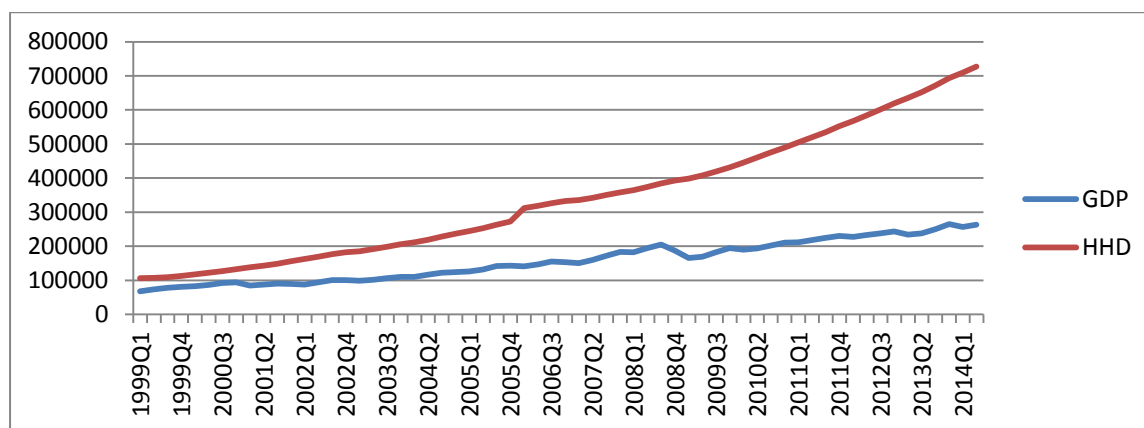
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<sup>3</sup> Household debts comprised of residential mortgage loan, hire purchase, credit card, personal consumption (personal loan) and others.

Thus, the household debt situation in Malaysia may worsen and impact economic growth in the long run if the situation is left unchecked.

Table 1.0 below depicted that the movement of household debt has outpaced the GDP growth resulting fear that the debt itself may be the platform to another financial crisis.

Table 1.0 – GDP growth and increasing household debt (Quarterly data)



(Source: Monthly statistical bulletin, BNM and Datastream)

Based on the Bank Negara statistical data (Monthly Statistical Bulletin, Bank Negara Malaysia), the bulk of the household debt comprised mainly housing loans (more than 50%), followed by financing for motor vehicles, personal loan, credit card outstanding debts and others. Thus, the probable main reason for the rise in the household debts could be due to the spiralling prices of property.

As Malaysia relies heavily on the government injection in developing the economies, where the policies and regulation from the government authorities become the pivotal role in economic standing, some measures have been implemented to mitigate the rising household debts. The measures that have been taken to combat household debts in Malaysia amongst others include cooling off measures to contain property prices which involve raising the property gains tax for the sale of house ownership which is less than 5 years to alleviate the asset price bubble by speculators. Nevertheless, the measure is seen to be inadequate in combating rising household debt situation as the household debts still in upward trend until now. What factors actually cause the rising household debts?. Is the house price be the main factor that contribute to the increased household debts as more than half is mortgage or housing loan?. Or is it due to the low interest rate regime that has been implemented by Bank Negara Malaysia since the global financial crisis that encouraged to hold more debts?.

While household sector in Malaysia is considered part of consumption of country which provides a source of additional economic stimulus, the prolonged rises in debt to income ratios may result in financial system become highly vulnerable to negative shocks, potentially resulting in a severe economic downturn. So, the question that might trigger us is what will be the policy implications of rising household debt?. Firstly, it may restrict the government's monetary policy, where the low interest rate regime currently has led to substantial increase not only in housing loans but also household debts in totality. Should government increase the interest rate via policy rate, it would add burden to households' debt servicing ability. In addition, the growth in personal consumption mostly driven by debt and not by actual income growth where it is not sustainable and will be derailed if there is any increase in interest rate. If the household debt is growing faster than the GDP, it may end up with a debt bubble unless if there is a rise in productivity, wages and household incomes. We cannot take comfort although currently the non-performing loan is hovering around 2-3% as the ratio can easily balloon when interest rates risen that may results to household insolvency.

As the level of increasing household debt accumulation is at worrying stage in Malaysia, this provides motivation to present research on the household debts and to investigate the relationship of household debt to real GDP, house price and lending rate. The main study of the research will have three research questions, namely:

- (i) Is there any strong linkages between household debts, GDP, house price and lending rate?;
- (ii) What is the main influential factor that contribute to the increased household debts?;
- (iii) Which of the selected variables are leading the increased household debts?

The structure of this paper includes eight chapters which are organised as follows. Chapter One explains the introduction that includes the issues in motivating the study, Chapter Two discusses about the main objective of this paper, Chapter Three describes on overview of the theoretical framework related to the issues while Chapter Four reviews the related previous empirical literature. Chapter 5 describes the economic methodology used in the analysis, while Chapter Six discusses on the empirical findings and results interpretation. Chapter 7 gives a summary about the paper and discusses about the policy implications. Lastly, the limitations of the study and suggestions for further research will be explained in the last Chapter, ie. Chapter 8.

## **2.0 Objectives of the Research**

Essentially, the purpose of this research is to answer all the research questions stated in the previous section as well as to also bring further to the empirical evidence on the linkages between household debts, house price, interest rate and GDP. A quarterly dataset from 1999 to 2014 (second quarter) is employed to examine the long run relation as well as short run dynamics between household debts, house price, interest rate and GDP in Malaysia. There is a limitation in collecting the sample where the dataset of house price index is only available starting from 1999 making the sample data accounted for only 62 observations (1999-Q22014). Overall, this paper intends to contribute by filling the gap in the previous literature by adding Malaysia as a sample of study.

To the best of our knowledge, studies which examined the causes of increasing debt levels in the household sector are very limited. Thus, this study is the first of its kind to build a model for Malaysian household debt using the *time series techniques* to investigate the increasing household debts in Malaysia and its relation to GDP, lending rate and house price. To my humble opinion, it has not been a study in the linkages of household debts, house price, lending rate and GDP in Malaysia using time series techniques and therefore, this is the research gap that this study seeks to address.

## **3.0 Theoretical Underpinnings**

The effect of debts and macroeconomic problems are strongly influenced by Hyman Minsky's financial instability hypothesis. The hypothesis of financial instability argued that financial crisis is endemic in capitalism because periods of economic prosperity encouraged borrowers and lender to be progressively reckless. This excess optimism creates financial bubbles and the later busts. Therefore, capitalism is prone to move from periods of financial stability to instability. Minsky's theory clarified the two sided aspects of debt-financed spending. During the boom phase of the business cycle, debt-financed household spending provides a source of additional economic stimulus. Nevertheless, if the economy experiences a prolonged debt-financed spending, the debt to income ratio will eventually rise and in worst case, may result in a highly vulnerable to negative shock which may trigger severe economic downturn. Minsky also argued that because capitalism was prone to this instability, it was necessary to use government regulation to prevent financial bubbles. Thus, the Minsky's financial instability hypothesis is to be applied to household debts in relation to GDP as there

were not much previous studies being done in this area<sup>4</sup>. The result, perhaps would be able to facilitate the regulator, in particular Central Bank of Malaysia to take necessary action in order to combat the increased debt in the household sector.

Bank lending has been closely correlated with property price in both developed and developing economies in the past decades. From a theoretical perspective, there exists potentially a two-way causality between bank lending and property prices. Property prices may influence both demand and the availability of bank credit via various wealth effects (Gerlach, et.al, 2004). This is mainly related to the role of asymmetric information in credit markets which gives rise to moral hazard or adverse selection problems.

In addition to the above theory, we also consider another theory which is life cycle hypothesis. Considering that the household income level can be approximated by GDP, this paper is also supported by the theoretical framework of the life cycle hypothesis formalized by the economists namely Irving Fisher, Rod Harrod, Albert Ando and Francis Modigliani, but were mainly initiated by the latter. This theory is basically tells that households mainly go in for large amounts of debt to smooth their consumption and for the possession of long lasting commodities, i.e houses, cars etc). The model assumes that a household can maximize utility over its lifetime subject to their budget constraints. It foresees that consumption in each period is dependent on expectations about life time income. Thus, the model assumes that the households may enter into debt in periods where their income is extremely low, mainly because they need to finance their existing consumption and will then repay these loans in periods when their income is relatively high.

Another theory that we take into consideration is the Permanent-income hypothesis developed by the economist namely Milton Friedman that explained on consumer behaviour. He argues that consumption should not depend on the current income alone. This model emphasizes that consumers use savings and borrowings to smooth their consumption in response to random and temporary changes in their incomes from year to year. We based on the above theories to examine the relationship between household debts and its relation to GDP, as a proxy of income as well as lending rate and house price. Further, we will also find out whether is there any relationship in income attributes to the increase in debts or the debts itself does not affected by the income of the household.

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<sup>4</sup> The usual research using Minsky's theory was on the impact of debt on growth and cycles usually emphasizes corporate debt as a prime source of investment fluctuations and hence output fluctuations and neglected household debts.

#### **4.0 Literature Review**

This literature review encapsulates the relevant studies pertaining to household debts in other countries, which amongst others include United States, South Africa, Australia, Hong Kong and Finland.

Gerlach and Peng (2004) studies the relationship between residential property prices and bank lending in Hong Kong. Using the variables of GDP, domestic credit, property prices, interest rate and unemployment rate, their studies found that the strong correlation between credit growth and bank lending in Hong Kong appears to be due to bank lending adjusting to property prices, rather than conversely. Thus, the co-integration analysis indicates that property prices are weakly exogenous. Moreover, the error correction model shows that property prices determine bank lending but the bank lending does not appear to influence property price.

Goodhart and Hofmann (2007) have considered the relationship between bank lending and property prices employing quarterly data over 1980-1999 and found that there are cointegrating long run relation between real property prices, loan to gdp ratio, real gdp and the real interest rate in all of the 16 developed countries including Finland. Using a set of 18 industrialized countries, they found that there is a significant two way causality between housing prices and bank lending. They also note that the two way causality between borrowing and housing prices may give rise to household borrowing and causes higher demand for housing which result in higher house price.

Observation from Cynamon and Fazzari (2008) provides a very informative discussion of household debt from a Minskyan perspective. Using dataset from 1980s to early 2000s, they found that US experienced consumption expansion accompanied by significant household debt accumulation. They argue that although this expansion provides a substantial macroeconomic stimulus, this unprecedented rise in household debt could have been planted the seeds for financial instability and a nontrivial economic downturn. Their argument is in tandem with the Minsky's theory where the debts effect is depending on the period of time. The household debt may provide a source of additional economic stimulus in shorter time period, but eventually the accumulation of debt could become excessive, generating negative impact on consumption and output level in the long run, probably due to higher debt service payment which in turn trigger vulnerability to negative shocks.

Oikarinen (2009) investigate on the two way interaction between housing prices and household borrowing in Finland. Based on a vector correction model using GDP, lending rate, real housing price and loans to gdp ratio as variables, the result revealed that there is a



strong two way interaction between housing prices and housing loans. The interaction is likely to augment boom bust cycles in the economy and increase the fragility of the financial sector. Housing price movements appear to have a notable positive impact on consumptions loans and it is also found that the housing market affects macroeconomic cycles.

Another studies done by Philbrick and Gustafsson (2010) explored the determinants of the household debt to disposable income ratio in Australia using both the long-run co-integration analysis and a short run error correction model. These authors considered the theoretical view of the Life cycle hypothesis by Modigliani. The results of the studies showed that the change in the debt ratio depends positively on house price and negatively on the interest rate.

Meng, et. al. (2011), on the other hand, explored the possible causes of increased Australian household debts via Co-integrated Vector Auto-regression model and analyse seven variables which includes GDP, interest rate, house price index (HPI), number of new dwellings, consumer price index (CPI), unemployment rate and population. It is found that interest rate, unemployment and CPI contribute to a negative influence in explaining Australia's high household debt levels whereas GDP, HPI, new dwellings and population contribute positively.

Kim (2011) investigates the impact of household debt on aggregate performance in US. Based on the estimation of vector error correction models using debts, GDP and net worth as variables, it is found that there are negative long run relationship between household debt and output which is in line with the theory of Financial Instability Hypothesis by Minsky. However, Kim disclaimed that the statement in Minsky's theory that state debt has positive effect in the short run but negative effects in the long run shall require some precaution as in reality, the explosion of household debt may not result in a financial crisis and recession. He further argued that there are other factors that may contain the effect of household debt explosion (e.g. central bank monetary policy or financial sector regulation). Nevertheless, the recent Great Recession confirmed that a possibility of a financial crisis resulting from an explosion of household debt. Loosening of credit constraints allowed households to increase their debt. The increase in credit availability was associated with financial innovation and liberalization and declining lending standards (IMF, 2012). In addition, large fall in the interest rate could induce households to spend more. Studies conducted by IMF in 2012 for United States found that when households accumulate more debt during a boom, the subsequent bust features a more sever contraction in economic activity. The finding is also consistent with Mian, Rao and Sufi (2011) for the United States.

Meniago, et. al. (2013) further investigate the cause of household debt to increase in South Africa and their results confirmed the existence of a long run cointegrating relationship between household debt and other macroeconomic determinants. Increasing household debt was found to be significantly affected by positive changes in CPI, GDP and household consumption. Whilst, house price and household savings were found to positively contribute to a rise in household debt but their relationship were found to be statistically insignificant. In addition, household borrowing was found to be significantly and insignificantly affected by negative changes in income and prime rate, respectively.

Based on empirical evidence above, there is inconclusive result of the relationship between household debts, house price, lending rate, GDP and other variables. Thus, it motivates us in conducting our research in similar areas to find out what would be the result in Malaysia perspective. Thus, our research provides a basis for a similar study regarding the household debt by taking in Malaysia as a sample country. Our research will also be based on the theories specified in the previous section and these fundamental theories play an important role in selecting our variables. Specifically, we adopt the time series technique and use long run co-integration analysis and short run error correction model to analyse the significant long and short run relationship between household debts, GDP, house price and interest rate. Data and methodology will be further explained in the next section.

## **5.0 Data and Methodology**

GDP data is only available on quarterly basis and due to GDP is used as one of our variables for our study, the dataset used is based on quarterly basis. The data begin from Quarter 1 1999 due to limitation of data availability for house price index. House price index (another variable that we used) is only available starting Q1 1999 and therefore we decided to focus our research from the Q1 1999-Q2 2014. All data of lending rate, house price index and GDP have been extracted from Data Stream database while household debt is manually taken from Monthly Statistical Bulletin, Bank Negara Malaysia. We will use time series techniques via software package of Microfit 5.1.

By using this developed time series techniques, this study will try to find out whether the household debts moves together with the other variables through the Johansen cointegration tests after examining the unit root tests and order of vector auto regression. The cointegrating estimated vectors will then be subjected to exact and over identification restrictions based on a priori information of the economy. The test of the vector error correction model(VECM) will then indicate the causal relationship between the cointegrating of household debts and GDP, lending rate and house price index. In addition, the variance

decomposition would determine the relative exogeneity and endogeneity of each variable, while the impulse response function will then map out the dynamic response path of a variable to a one period standard deviation shock to another variable. Finally the persistence profile step would estimate the speed in getting back to equilibrium when there is a system wide shock. We will explain in details on all the findings in the next section.

## **6.0 Results and Interpretations**

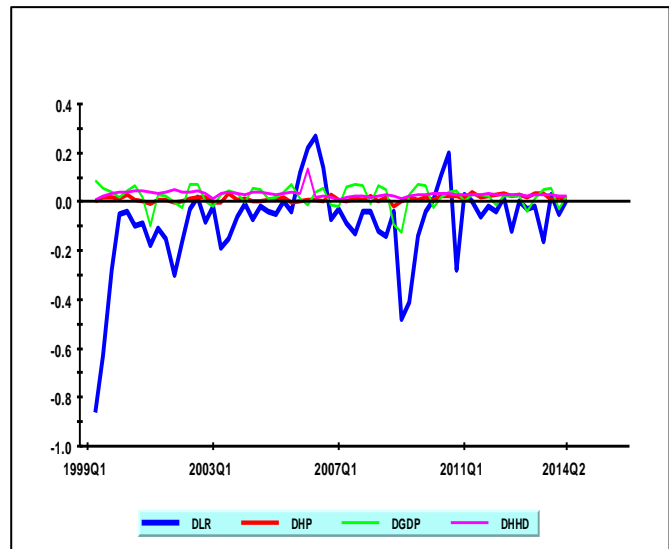
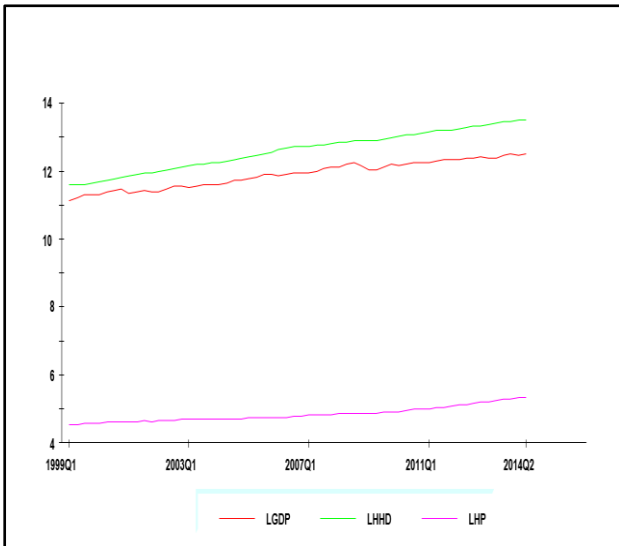
Prior to examine the selected variables, we first investigate the stationary properties of each series since this is a necessary step prior to investigating cointegration between the variables. Thereafter, cointegration will then be examined and based on the result an appropriate empirical model will be implemented to study the interrelationship between the variables.

### **6.1 UNIT ROOT TESTS**

In this section, the stationarity properties of the data are formally investigated. Thus, two types of tests will be carried out which are the Augmented Dickey Fuller (ADF) test and the Phillips Perron (PP) tests. ADF test will facilitate in correcting any autocorrelation among the variables while PP test will correct the autocorrelation and heteroscedasticity problem of the selected variables. Prior to examine via ADF and PP tests, we have to ensure the variables are in log and difference forms. The graphs of logarithmic of household debts, house price and GDP indicate upward trend exists in the variables (see Figure I (log form) and II (difference form)) below.

Figure I: Log form

Figure II : Difference form



We selected ADF and PP tests to investigate the presence of unit roots in time series which will be explained in the next section.

### 6.1.1 AUGMENTED DICKEY FULLER (ADF) TEST

ADF test is necessary step to be done as it tests the stationarity of the variables in order to avoid the spurious regression. We turn the variables to the econometric work which allows us to test the unit root in time series where we used logarithm and difference form of household debt, house price index and GDP. As for lending rate, we used the data as it is and only turned it into difference form. ADF unit root test statistics are reported in Table 2 below. All data are on quarterly basis and the results suggests that lending rate, GDP, house price index and household debt are integrated of order one. In order to ensure it is in order one  $I(1)$ , the log form of variables shall be non-stationary and the difference form of variables shall become stationary.

Elaborating further the result, null hypothesis (null hypothesis is non-stationary) of the presence of a unit root at the level form cannot be rejected as the test statistic is lesser than the 95% critical value. These variables are then transformed into their first differenced form and ADF resulted in all variables become stationary at difference form and able to reject the null hypothesis on non-stationary as the test statistics of the differenced variables are more than the 95% critical value. These resulted in all variables are integrated of  $I(1)$  series as depicted in Table 1 and conclude that there exists a unit root in the

series. Detail result of maximum lag order of five is attached in the Appendix 1A-1H.

Table 1: ADF Test

Variables	Test-statistics			
	Log form		Differenced form	
GDP	-2.6089 (T) (-3.4904)*	NS	-6.3656(C) (-2.9147)*	S
Household debts	-1.7592 (T) (-3.4904)*	NS	-6.4851(C) (-2.9147)*	S
Lending rate	-1.7335 (T) (-3.4904)*	NS	-4.4677(C) (-2.9147)*	S
House price	-0.0098615 (T) (-3.4904)*	NS	-5.6841(C) (-2.9147)*	S

Note: T and C indicate whether the test regression includes a time trend and a constant (T), only a constant (C) with a maximum lag order of five.

\*denotes 95% critical value

$H_0$  = Non stationary, NS = non-stationary, S= stationary

An alternative unit root test, PP test was also conducted to ensure the stationarity of the data series as this test uses non-parametric correction to deal with any correlation in the error terms. Similar to ADF test, the decision rule for both is the same where the null hypothesis is Non stationary.

### 6.1.2 PHILLIPS-PERRON TEST

In addition to the ADF test, the PP test was conducted to ensure the stationarity of the data series as the PP test uses non-parametric correction to deal with any correlation in the error terms. Using the PP test ensures that the higher order serial correlations in the ADF equation were handled properly. The null hypothesis for the PP test is that the variable is non-stationary.

Table 2 showed that all variables are found to be non-stationary at 95% significance level except for lending rate that found to be stationary as the p-value of 4.5634 is higher than critical value of 3.4836. The detail of the result is attached in Appendix 1I-1P.

Nevertheless, all variables turn out to be stationary at difference form with 95% significance level. Therefore overall results indicate that all variables are I(1) series under the PP test except for lending rate that showed it is stationary for both log and differenced form.

We take note of the stationary result in log form of lending rate in PP test, nevertheless, as the lending rate variable passed the ADF test, thus we decide to keep the lending rate and remained it as our variable.

Table 2: PP Test

Variables	Test-statistics			
	Log form		Differenced form	
GDP	-3.0594 (T) (-3.4836)*	NS	-7.6108(C) (-3.4849)*	S
Household debts	-0.79730 (T) (-3.4836)*	NS	-6.8112(C) (-3.4849)*	S
Lending rate	-4.5634 (T) (-3.4836)*	S	-6.4948(C) (-3.4849)*	S
House price	0.47249 (T) (-3.4836)*	NS	-7.5328(C) (-3.4849)*	S

Note: T and C indicate whether the test regression includes a time trend and a constant (T), only a constant (C) with a maximum lag order of five. \*denotes critical value at 95% level

H<sub>0</sub>= Non stationary, NS= non-stationary, S=stationary

## 6.2 DETERMINING THE ORDER OF LAGS OF THE VECTOR AUTO REGRESSION (VAR)

The analysis of the long run relationship between lending rate, GDP, house price and household debts is based on the multivariate approach to cointegration test proposed by Johansen. However, before moving to the cointegration test, we have to determine the order of the vector auto regression (VAR). Given that quarterly data are used, we assume order of the VAR(6) model would overfit the data. The result showed that AIC has a higher VAR order of 2 and SBC is zero<sup>5</sup>. Thus, as we used a quarterly data, lower VAR order of 1 might be appropriate after taking into consideration about the

<sup>5</sup> We took VAR=2 in the beginning and proceed to VECM which we found out that our focus data i.e. household debt remains to be most exogenous which impede our purpose of study, thus we decided to change to VAR=1 and proceed which the result is more relevant for the purpose of our study.

trade-off of lower and higher orders. The full result of the testing is attached in the Appendix 2A. We also did diagnostic test to for auto correlation the detail is presented in Appendix 2B(I) – 2B(IV).

### 6.3 COINTEGRATION TESTS

When the order of integration of the variables has been identified, the next step is to perform the cointegration test. For the purpose of this study, we employ the Engle Granger test as well as Johansen test to determine the cointegration of variables. As the Johansen test is suitable when dealing with multivariate time series data, thus we chose Johansen test to examine the theoretical relationship between all the variables and whether all variables are moving together in the long run.

#### 6.3.1 ENGLE GRANGER TEST FOR COINTEGRATION

We apply Engel and Granger test to examine the cointegration test and the result are shown in Appendix 3A(I). By employed Engle-Granger method, the coefficient of all the variables is found to be non-significant at 95% significance level which indicates that there is no linear relationship between the variables. The t-statistics of 3.6676 found to be lesser than the critical value of 4.2988 which indicate that the variables are non stationary and we accept the null hypothesis that there is no cointegration of the variables. However, based on the empirical evidences from the previous section, there is a cointegration between all these variables, thus, we decided to move to the next step, i.e. Johansen test to further examine whether there is any cointegration or not.

#### 6.3.2 JOHANSEN TEST FOR COINTEGRATION

Johansen test examined the null hypothesis of no cointegration in the variables against the alternative that there exist cointegration. In this regard, if cointegration is found among the variables, it implies that there is an existence of a long run relationship. We used both the trace and the maximal-eigenvalue tests to see the number of cointegration equations that exists among our variables. As reported in the Table 3, the null hypothesis of no cointegration is rejected from both test statistics. Both the Maximal Eigenvalue and trace test suggest that there exist one co-integration at 5%

significance level. The result shows that both the maximum and trace Eigenvalue statistics rejected the null hypothesis that there is no cointegration between variables ( $r=0$ ) but do not reject the null hypothesis that there is one cointegration relation between these variables. Thus, it implies that there exists a long run relationship among the variables. We note that the result of trace statistics is conflicting with Eigenvalue statistics, where it shows two cointegration, however, we prefer the result of maximum Eigenvalue where it showed one cointegration (see also Appendix 3A(II)).

**Table 3 :Johansen Test**

Null	Statistics	95% critical value
<b>Maximal EigenValue statistics</b>		
$r=0$	76.3985	31.7900
$r \leq 1$	24.2359	25.420
<b>Trace Statistics</b>		
$r=0$	120.4498	63.0
$r \leq 1$	44.0513	42.340
$r \leq 2$	19.8154	25.770

**Note:** The statistics refer to the Johansen's log-likelihood based maximal eigenvalue and trace statistics based on cointegration with unrestricted intercepts and restricted trends in the VAR with an order of 1.

#### 6.4 LONG RUN STRUCTURAL MODELLING (LRSM)

In order to make the coefficients of the cointegrating vector consistent with the theoretical and giving appropriate and meaningful information to the economy, a long run structural modeling procedure is employed. This is the stage where we test all the coefficient to ensure that all variables are theoretically related and not spurious. As we are interested in household debts as our main or focus point, we imposed a normalizing restriction of unity on the household at exact identification stage. Since the cointegrating relationship is one, we imposed an exact identifying restriction of one towards the coefficient of LHHD ( $A_2=1$ ) as it is our interested variable or focus point in our study. The output i.e. the coefficient for exact identification for each variable will then be divided with standard errors for us to identify whether the t-statistic is significant or not. The results showed that all variables are statistically



significant as all variables resulted in t-statistics of above 2 which implies that all the selected variables have significant impact on our dependent variable. Additionally, we imposed restriction on GDP in over identification to test the coefficient of variables and found that the restriction is not correct. The coefficient of variables is represented in Table 4 below and details shown in Appendix 4.

**Table 4 : LRSM and significance of variable at exact and over identification**

Variable	PANEL A	T-ratio	PANEL B
LGDP	1.0498 (0.34544)*	3.039	0.00 (None)
LHHD	1.000 (*None*)	-	1.00 (None)
LHP	0.96280 (0.20740)*	4.642	0.49825 (0.14924)*
LR	-0.18887 (0.050581)*	3.734	-0.10699 (0.031326)*
Trend	-0.075063 (0.011597)*	6.473	-0.41994 (0.0023931)*
Chi-Square	None		26.7798 (0.0000)

Note: standard errors are in parentheses

\*The output above shows exact identification (PANEL A) that all variables are significant (SE are in parenthesis) and all coefficients have the correct sign. However, the over identification with restriction on GDP =0 indicating that the restriction is not correct (with p value of 0.0000) and we proceed with Panel A for the rest of our study.

## 6.5 VECTOR ERROR CORRECTION MODEL (VECM)

LRSM examined the cointegration between variables but it does not indicate about the causality of the variables. Therefore, this model is employed to describe how the system is adjusting in each time period towards its long run equilibrium state. In addition, it tells us the direction of Granger-causality as to which variable is leading (exogeneous) and which variable is lagging (endogenous). The vector error correction technique is able to differentiate between short run and long run causality.

By looking at the significance or otherwise of the error correction coefficients (see Table 5 and appendix 5A-5D), we found that there are two exogenous variables which are household debts (LHHD) and house price (LHP) given the error correction terms that are insignificant (p-value above 5% significance level) and two endogenous variables which are lending rate (LR) and GDP as their error correction terms are significant (p-value below 5% significance level). It implies that deviation of the exogenous variables (LHHD and LHP) have a significant feedback effect on the LR and GDP which bear the burden of adjusting themselves in the short run to bring about the long- term equilibrium. Consequently, it shows that the exogenous variables (LHHD and LHP) could bring effects of the shock to other endogenous variables when they experience shocks from the market.

We take note that our focus point which is LHHD is actually one of the exogenous variables. It means, it does not affect if there is any changes in lending rate and also GDP. But it may affect when there is a movement in the house price. The strong relationship between house price and household debts are also in line with the previous study done by Oikarinen (2009) that investigates the relationship between house price and household borrowing in Finland. However, the result that shows household debts is one of the leading factor is not what we expect in beginning of the study. As the result shows that two variables are exogenous which seems to be a surprising discovery, we will further examine in the variance decomposition analysis.

Table 5: Error Correction model

<i>Dependent variables</i>	<i>dLHHD</i>	<i>dLHP</i>	<i>dLR</i>	<i>dGDP</i>
ECM (-1)	0.036057 (0.020457)	-0.012872 (0.015506)	1.4156 (0.14407)*	-0.12834 (0.05319)*
Chi-sq SC	1.3009 (0.861)	10.24151 (0.037)	8.8692 (0.070)	18.8361 (0.001)
Chi-Sq FF	0.048323 (0.826)	5.5129 (0.019)	2.8023 (0.094)	0.1934E-5 (0.999)
Chi-Sq N	2095.9 (0.000)	0.48740 (0.784)	3.9482 (0.139)	42.310 (0.00)
Chi-Sq Het	1.5792 (0.209)	0.0295961 (0.863)	0.0037830 (0.951)	0.48209 (0.487)

*Standard error are given in parenthesis. \*Indicates significance at the 5% level or less. The diagnostics are chi-squared statistics for serial correlation (SC), functional form (FF), normality (N) and heterokedasticity (Het).*

The finding which shows LHHH is exogenous may facilitate the policy maker to develop certain policy other than policy rate due to lending rate is an endogenous variable that may not impact the household debts. For an instance, despite of increasing the lending rate, the policy maker shall develop stringent credit policy such as reducing the tenure of the loans, required higher debt service ratio, selective in lending etc in order to mitigate the increase in household debts.

As LHP is also exogenous, the policy maker shall take a look at the house price and could control the property price and develop certain policy in mitigating the bubble asset of the properties in order to reduce the increase in household debts. Nevertheless, we will further discuss the results in the variance decomposition analysis to find out which exogenous variable is leading.

Besides determining the absolute exogeneity and endogeneity of variables, the vector error correction model is able to tell how long does it take for the variable to go back to long term equilibrium if the variable experiences a shock. For an instance, in the case of GDP that being a proxy of income, the coefficient of 0.128 implies that when a shock is applied to GDP, it would take average about of 13 quarters to get back into equilibrium with the other variables. In addition, the diagnostic tests of all equations of the error-correction model resulted in no normality or heteroscedasticity problem that indicates the model equation is well specified.

## 6.6 VARIANCE DECOMPOSITION ANALYSIS

The error correction model indicate the exogeneity and endogeneity of the variables, nevertheless it does not indicate which of the variables that is the most exogenous or endogenous. VDC decomposes the variance of forecast error of each variable into proportions attributable to shocks from each variable in the equation including itself. The most exogenous variable is the variable that is explained mostly by its own shocks (and not others). The variance decomposition technique is further broken down into the orthogonalized and generalized type. The results for both orthogonalized and generalized variance decomposition are attached in the Appendix

6A-6H. Based on these results, we rank the degree of exogeneity as depicted in Table 6 below (see also Appendix 6I):

**Table 6: Orthogonalized VDCs Ranking**

<b>Ranking</b>	<b>Variables</b>			
	<b>Quarter 4</b>	<b>Quarter 8</b>	<b>Quarter 16</b>	<b>Quarter 20</b>
1	<b>LHHD</b>	<b>LHHD</b>	<b>LHP</b>	<b>LHP</b>
2	LHP	LHP	LHHD	LHHD
3	GDP	GDP	GDP	GDP
4	LR	LR	LR	LR

The table above is in line with our VECM result that shows both LHHD and LHP are exogenous variables, while GDP and LR being endogenous variables. Nevertheless, we note the shortcomings of orthogonalized VDCs, which amongst others include the assumptions that when a particular variable is shocked, all other variables are switched off and it also does not produce a unique solution. It depends on the particular ordering of the variables in the VAR and the first variable in the order would report the highest percentage and would likely be specified as the most exogenous variable.

Thus, due to the shortcomings of the orthogonalised VDC, we rely our result based on the generalized VDC since it is invariant to the ordering of the variables and when a particular variable is shocked, the other variables in the system are not assumed to be switched off. In obtaining the results for the generalized VDC, we need to normalized the figure since it does not add up to 1.0 for each horizon. As stated earlier, the workings are attached in the Appendix 6I and result show does not really deviate from what we have found under Orthogonalized VDCs.

We decided to take short and long run horizon (taking 8,16,24,32,40,48 horizons) to see if there is any movement or changes of the variables from short run to long run. Table 7 reveals the ranking for all variables and we found that in the short run household debt is the most exogenous and does not affect from the change in other variables. However, we note there is a change in the long horizon where house price being the most leader. Due to the positive relationship for both household debt and house price, it implies that the increase in household debts is affected by the increase in house price. Thus, it may facilitate the policy maker to give attention to the house price increased and to mitigate any bubble properties price as it strongly connected with the household debts. The result also indicates that the lending rate is

the most endogenous and it may implies that any changes either increase or decrease of lending rate by policy maker may not affect the increased or decreased in household debts.

Intuitively and theoretically (Lifecycle and Permanent income hypothesis) portrays that changes in lending rate may affect the behaviour of household income where they may increase their debts due to lower service repayment of debts which in turns can increase their consumption. Nevertheless, we have to bear in mind that the results given could be due to some limitations of our study and we may not added some significant variables that really hit the focus variable, i.e. household debts.

**Table 7: Generalized VDCs Ranking**

<i>Ranking</i>	<i>Variables</i>			
	<i>Quarter 8</i>	<i>Quarter 16</i>	<i>Quarter 24</i>	<i>Quarter 32</i>
1	<b>LHHD</b>	<b>LHP</b>	<b>LHP</b>	<b>LHP</b>
2	LHP	LHHD	LHHD	LHHD
3	GDP	GDP	GDP	GDP
4	LR	LR	LR	LR

## 6.7 IMPULSE RESPONSE FUNCTION

Impulse Response tells the impact of shock of ONE variable on others their degree of response and how long it takes to normalize and back to equilibrium. We expect that if the leading variable is shocked, the response of weak variables will be significant. From the findings above, it states that the most exogenous in long run horizon will be house price, thus any shock in house price will impact the other variables, i.e. house hold debts, lending rate as well as GDP. Expectedly, housing prices appear to influence household debts, GDP and mostly lending rate as lending rate appears to be most endogenous.

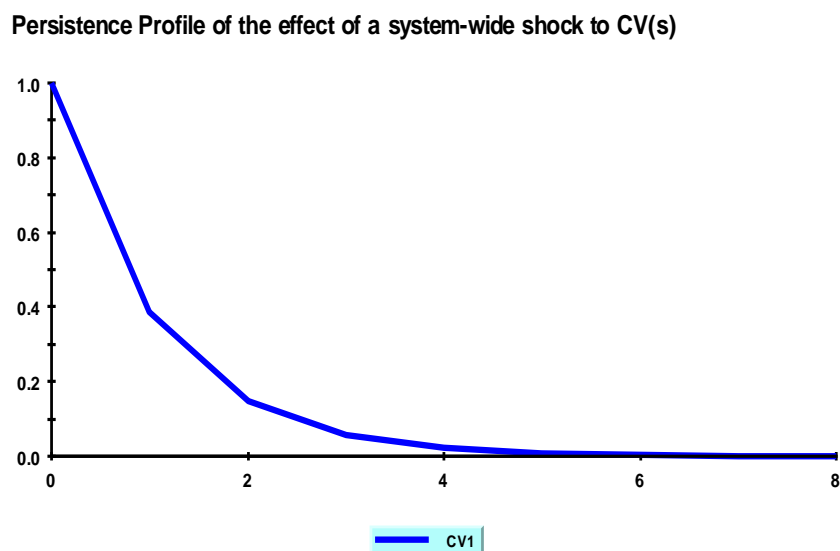
Therefore, the results of the impulse response functions essentially produce the same information as the ones in variance decomposition analysis. For further details, see appendix 7A-7D which depicted the shock for each variable.

## 6.8 PERSISTENCE PROFILE

The persistence profile estimates the speed with which the economy or the markets return to equilibrium owing to a system-wide shock on the cointegrating relations. It differs from the Impulse Response Function in terms of having a system wide shock

on the long run relationship rather than having variable specific shocks. The chart below Figure III, (see also Appendix 8I & II) shows the persistence profile for the cointegrating equation of this study. The chart indicates that it would take approximately 5 quarters (of about 1 ¼ years) for the cointegrating relationship to return to equilibrium following a system wide shock.

**Figure III**



## 7.0 Conclusions and Policy Implications

This study examines the relationship between household debts, GDP, house price and lending rate and investigates further what contribute to the increase in household debts and which of the selected variables affect the increase in household debts. Quarterly data spanning from Quarter 1 1999 to Quarter 2 2014 was used as our sample data and Johansen test is the preferred test for our cointegration testing.

The study found evidence that there exists a long-run equilibrium relationship between the household debts with other variables namely house price, GDP and lending rate. The relationship is statistically significant for all variables and we found statistically significant positive relationship between household debts and house price which implies that the increase in house price in long run will increase the household debts.

We also note that the household debt is one of the exogenous variables which entails that any change in other variables in particular lending rate and GDP may not affect the household debts. Nevertheless, the result of generalized VDCs revealed that the house price is the most leading factor to the increase in household debts in long run horizon. Other variables, GDP and lending rate remained to be endogenous variables. The lending rate remains endogenous is also in line with the previous empirical studies done by Gerlach and Peng (2004). Overall, the result suggest that any changes to the movement of GDP or lending rate may not affect household debts but movement in house price in a long run may have impacted the household debts. The result support previous empirical evidence that suggests there is a relationship between all selected variables and lending rate remains endogenous (Gerlach and Peng,2004) and studies by Meniago et.al (2013) found lending rate is insignificant towards rising household debts.

It is evidence that the increase in household debts may not affect GDP and interest rate both short and long horizon as well as house price in short horizon, the policy maker shall develop stringent prudential measure by strengthening credit policy, which amongst others include stringent debt service ratio, shorten tenure of lending, improve risk management, selective in giving out lending by adhering to responsible lending policy to curb the increase in household debts. On the other hand, the house price found to be the main contributor factor to the increase in household debts, thus, policy maker shall make an attempt to develop a policy to control the house price to smoothen the asset price bubble in the market. Failing to control the asset price bubble may impact the economy as a whole in the long run horizon.

Nevertheless, intuitively we still believe that the lending rate and GDP as a proxy of income may to some extent play a pivotal role in the development of household debts in Malaysia. Although the result found both lending rate and GDP to be endogenous, we still believe that lending rates act as official instruments that control the amount of credit extended to the private sector. Thus, care should be taken to avoid large economic shocks since shocks on this lending rate may trigger some influence in household debts income and directly impact the repayment of the debts in household sector.

## **8.0 Limitations of the Study and Future Research**

We take note of the limitation of the study where we do not include some important variables that may have significant impact to the increase in household debts. For an instance,

we exclude the unemployment rate, real household income and household savings that could have brought significant relationship to the household debts. Other than that, as we use GDP as part of our variable, the data is only available on quarterly basis that restrict the number of observations.

For future research, the potential areas that can be taken into consideration is to take unemployment rate data as well as real income and savings to be used for further research as we believe that it may have significant relationship to the household debts. The unemployment rate will be able to capture whether it has plays a pivotal role or not in affecting household debt level in Malaysia. We also would like to encourage future research to use household data in South East Asia countries and their affecting variables to compare with Malaysia.

***Disclaimer:***

***The above works represent the humble effort and limited knowledge and experience of the author. Errors, misrepresentations and flaws in argumentation and expression reflect the author's weaknesses. In the interest of the pursuit of the truth, the author welcomes any and all feedback, comments and inputs. Allah knows best.***

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