HOUSEHOLD CONSUMPTION AND ECONOMIC GROWTH: COINTEGRATION AND CAUSALITY ANALYSIS FOR MALAYSIA

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Abstract

This paper investigates empirically the causal relationship between household consumption and economic growth in Malaysia over the period 1961-2009. To analyze the causal relationship between household consumption and economic growth, the Johansen cointegration test; Vector Error Correction Model (VECM) and Granger causality test was used. The results found that, these two variables are cointegrated and there is existence of short run and long run relationship. The Granger causality test suggests that there is bidirectional Granger causality among these variables. The study concludes that household consumption is important for economic growth in Malaysia. Moreover, economic growth in Malaysia has an impact on its household consumption.

Keywords: Household Consumption, Economic Growth, VECM, Granger Causality

Introduction

Economic growth can be defined as a constructive change in the level of production of goods and services by a country over a certain period of time. It is determined and conventionally measured by the increase of Gross Domestic Product (GDP) of a country over a year. Consequently, economic growth is interconnected with the expansion of real GDP per capita in a country. Economic growth in one's country is not only regarded as a route towards productive capacity but on top of that, it enhances the quality of life.

Economic growth leads to major enhancement in standard of living, expanding existing markets and opening new ones. And if it does, the economic growth will certainly reduce poverty even without an outright redistribution of wealth. The economic growth of one country and how it affects one and another is also a vital indicator to initiate any business opportunities. So it is highly important for the government to monitor and examine the transactions in various sectors in order to develop the economic growth in a country. Figure 1 shows Malaysia economic growth from the year 1961 to 2009.

Malaysia is a growing and relatively open state-oriented market economy. The state plays a significant but declining role in heading economic activities through macroeconomic plans. In 2007, Malaysia's economy was the 3rd largest economy in South East Asia and 29th largest economy in the world by purchasing power parity with gross domestic product for 2007 estimated to be RM1140 billion with a growth rate of 5% to 7% since 2007. In 2008, GDP per capita (PPP) of Malaysia stands at RM45,344, ranking it 48th in the world and 3rd in Southeast Asia (after Singapore and Brunei). In fact in 2009, the nominal GDP was RM661,394 billion, and the nominal per capita GDP was RM25,820.

Malaysia has a consistent record of economic growth in GDP over the period 1960-2009, averaging an annual rate of about 7 percent. Due to open economy, externalities have had a major impact from time to time including the oil crises of the 1970s, the downturn in the electronics industry in the mid 1980s, the Asian financial crisis of 1997 and the specially, global financial crisis in 2008. Stands of living of majority of the population were transformed over 30-year period with the level of GDP per capita in 2009 being about four times that of 1980. The boom in the economy was uninterrupted from 1988 to 1996 when the economy grew by between 7 and 10 percent per annum.

Froyen (2005) indicates that GDP consists of several factors which are consumption, investment, government spending and net exports. Nevertheless, most of the studies rely on determinants of economic growth towards investment factors (Ozturk et al., 2007; Dritsaki et al., 2004; Chakraborty et al., 2002; Mello, 1997, 1999; Ericsson, 2001; Nair et al., 2001; Tsai, 1994; Artken, et al., 1999; Asiedu, 2002; Borenstein, 1998), net export (Samad, 2011; Ahmad et al., 1991; Bahmani et al. 1991; Balassa, 1978; Chow, 1987; Darrat, 1987; Ghatak, et al., 1997; Jung et al. 1985; and Khan, et al., 1993) and government spending (Kolluri, 2000;
Heller, 1990; Perotti, 2002; Wahab, 2004; Robert 1990; Abdullah 2000; Ranjan et al. 2000; Liu et al., 2008 and Loizides et al., 2005). Household consumption factor is the least to ever been analyzed though consumption is the largest component of GDP, comprising until between 60 and 70 percent of GDP. Even if it is being studied thoroughly, it may precisely focus more on energy consumption. Hence, this research will ponder closely on the household consumption factor within the context of Malaysia.

Household consumption is the market value of all goods and services, including durable products such as cars, washing machines, and home computers, purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also comprises of payments and fees to governments to obtain permits and licenses (World Bank, 2011). Here, household consumption includes the expenditures of nonprofit institutions serving households, even when reported separately by the country. Figure 2 illustrates the value of household consumption in Malaysia from year 1961-2009 which generally, shows an increase of consumption figure each year. The value of household consumption had decreased for certain years especially during country’s economic crisis in year 1986 and 1998.

![Graph: Malaysia Household Consumption, 1961-2009](image)

The aim of this paper is to investigate the causal relationship between household consumption and economic growth (measured as real growth rate) in Malaysia using cointegration and Vector Error Correction models. The outline of the paper is structured as follow: Section 2 highlights on the empirical literature review done on household consumption and economic growth; Section 3 justifies the data and methodology; Section 4 presents the results and interpretation and finally Section 5 draws a significant conclusion on the topic discussed.

**Literature Review**

Kogid et al. (2010) investigated the factors that stimulate and maintain the economic growth in Malaysia from the year 1970-2007. This study uses cointegration analysis and the causality approach by Johansen and ECM to analyze the relationship between economic growth and determinant factors. The results show the existence of long run cointegration and multiple short run causal relationship between economic growth and determinant factors. However, individual test indicates that only consumption expenditure and export cause economic growth. This study concludes that consumption expenditure and export play important roles as determinant factors to economic growth.

Palley (2002) in his study proposed the shifting paradigm from export led growth strategy to one that emphasize domestic demand as the export led growth strategies which embodies many weaknesses. The export led growth strategy had failed in falling the economic crisis of Mexico 1994, Asia 1997, Russia 1998, and Brazil 1999. The response of government in the crisis hit countries in Asia that was attempting to switch from export led growth to a more domestic demand led growth.

Chioma (2009) in his study investigated the causal relationship between gross domestic product and personal consumption expenditure of Nigeria using data from 1994-2007. A non-significant value of 0.0514 was obtained as a slope coefficient indicating that an increase in gross domestic product had no significant effect on the personal consumption expenditure in Nigeria. This was further supported by the value of the coefficient of determination which was only 0.035 implying that the gross domestic product only explained about 3.5% of the personal consumption expenditure of Nigeria.

Guisan (2004) discovered the bilateral causality between Private Consumption and GDP in USA and Mexico during the period 1960-2002, analyzed and compared Granger’s test, a modified version of Granger’s test, cointegration, TSLS and Hausman’s causality test. The main conclusion is that the modified version of Granger’s test performs better than the unmodified version, and also better than cointegration, to accept lagged causality in the consumption equation. Besides that, Hausman’s test is very often more useful to distinguish between bilateral and unilateral contemporaneous causality than TSLS. The study concludes that there is a high degree of causal dependence of Private Consumption on GDP and a lower dependence in the case of the reverse relation.

Guisan (2001) presented a critical review of cointegration in his paper, emphasizing some limitations of this approach to testing causal relations in Econometrics. The study tests the relation between Private Consumption and Gross Domestic Product in 25 OECD countries, during the period 1960-97 and the results confirm the above mentioned limitations of cointegration tests. The most extreme case is that of UK where, in one of the applications, the usual tests lead to rejection of cointegration between British Private Consumption and British GDP and acceptance of cointegration between British Private Consumption with GDP of all the other countries. Regarding cointegration we should take into account two important
In Malaysia, there are some studies which examined the relationship between electricity consumption and economic growth, for example Yoo (2006), Tang (2008), Ang (2008) and Chandran et al. (2010). The empirical findings seem to illustrate mixed evidence of energy-income causality in Malaysia. Yoo (2006) and Tang (2008) found unidirectional causality running from electricity consumption and economic growth. Ang (2008) on the other hand, found unidirectional causality running from economic growth to electricity consumption. Chandran et al. (2010) additionally, also found the causality running from electricity consumption on economic growth.

Mallick (2009) examined whether energy used drives economic growth or vice versa in Indian context during 1970-71 to 2004-05. Utilizing Granger causality test, the study suggested that it is the economic growth that fuels more demand for both crude oil and electricity consumption and it is the only growth of coal consumption that drives economic growth. When the influence of different components of energy on major two components of economic growth are investigated with the same causality test, none of the energy components found to be significantly affecting the two components of economic growth viz. private consumption and investment.

Data and Methodology

This chapter employs several econometrics methods, such as unit root test; cointegration test; Vector Error Correction Model and causality test to examine the existence of cointegrating relationship between Malaysia economic growth and household consumption from period 1961 to 2009. The variable of economic growth is measured by the real growth rate whereas the variable of household consumption (HC) is measured by the final household consumption in Malaysia. The data that is used in this analysis is annual and obtained from Department of Statistics Malaysia.

The models assume that Malaysian economic growth is determined by the household consumption. To test this hypothesis, a simple econometric model can be expressed as,

\[ GDP_t = \alpha + \beta H C_t + \epsilon_t \]

(1)

where GDP is real growth rate in the year t, \( \alpha \) is a constant, \( \beta \) is slope coefficient and \( \epsilon \) is error term.

Several econometrics tests are carried out to analyze the regression model. In the first step of the estimation process, the study examines the stationarity properties of the data series. In stationarity time series, shocks will be temporary and over time, their effects will be eliminated as the series revert to their long run mean values. On the contrary, non-stationarity series will contain permanent components (Asteriou, 2006). In fact, most of the economic variables show a trend and therefore, most cases are non-stationary. These non-stationary time series can easily lead the Ordinary Least Square (OLS) regression to incorrect or spurious conclusions. Thus, a key way to test for non-stationarity is to test for the existence of unit root. The present study employed a standard stationarity test namely, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test. Dickey and Fuller (1981) suggested a unit root test based on the following regression,

\[ \Delta y_t = \mu + \beta_1 y_{t-1} + \delta y_{t-1} + \epsilon_t \]

(2)

where \( \Delta \) is linear trend, \( \mu \) is intercept, \( \beta \) and \( \delta \) are slope coefficients, and \( \epsilon \) is an error term.

In those cases where the error terms are serially correlated, the method has to be modified. The simplest way to do that is to add many lags of dependent variable \( \Delta y_t \) to equation (2) in order to ensure that \( \epsilon \) appears as white noise. This test for stationarity is known as the ADF test. The ADF test is based on the following regression,

\[ \Delta y_t = \mu + \beta_1 y_{t-1} + \delta y_{t-1} + \gamma \Delta y_{t-1} + \epsilon_t \]

(3)

where \( \beta \), \( \delta \) and \( \gamma \) are slope coefficients, and \( \epsilon \) is an error term.

The null hypothesis is that \( \delta = 0 \). This means that a unit roots exist in \( \gamma_t \). If the null hypothesis is rejected, then \( \gamma_t \) is stationary. The current analysis also uses the Phillips-Perron (PP) test to analyze the stationarity (Phillips and Perron, 1988). The PP test is based on equation (3) but it uses the modified Dickey-Fuller statistics. The PP test could be more robust in the presence of autocorrelation in the data sets.

Secondly, a cointegration test was performed to determine the nature of the long run relationship. Cointegration test has employed to analyze whether the pairs of variables are cointegrated or move jointly. An important prerequisite for the existence of a cointegrating relationship between the variables is that they have the
order of integration. This means that if a variable is an integrated of order \(d\), the variables should also be an integrated of \(d\). The testing of hypothesis is null non-co-integration against the alternative hypothesis, which means the presence of cointegration. The pioneering work in cointegration analysis was done by Engle and Granger (1987). Subsequently, Stock and Watson (1988) extended the research.

In this study, the presence of cointegration is tested between these variables using the Error Correction Model (ECM). The ECM detects the long run cointegration relationship in the following form:

\[
\Delta Y_t = \alpha_0 + \beta_1 \Delta X_{t-1} + \pi_1 \Delta X_t + \epsilon_t
\]

This model will include both long run and short run information where \(\beta_1\) is the impact multiplier (the short run effect) and \(\pi\) is the feedback effect (adjustment effect and shows number of disequilibrium being corrected). The \(\beta_1\) in the equation \(\epsilon_t = \gamma - \beta_1 Y_{t-1} \Delta X_{t-1}\) however includes the long run response.

The coefficient of Error Correction Model includes information about whether the past values of variables affect the current value of the variables under study. The size and statistical significance of the cointegrating vector of the Error Correction Model measures the tendencies of each variable to return to equilibrium. For example, \(\pi\) in equation (4) is statistically significant which means that \(\gamma\) responds to disequilibrium in its relation with cointegrated variables. According to Choudhry (1995), even if the cointegrating equation is not statistically significant, Granger Causality can still exist as long as \(\pi\) is significantly different from zero. The short run dynamics are captured through individual co-efficients of the different terms. We carefully choose the appropriate lag length of each regressor based on Akaike Information Criterion (AIC).

Finally, the Granger-causality test is run in this study to analyze the causality between Malaysia household consumption and economic growth. The Granger causality test with lag length of \(k\) is based on the following equation (Granger, 1969):

\[
GDP_t = \alpha_0 + \alpha_1 GDP_{t-1} + \ldots + \alpha_k GDP_{t-k} + \beta_1 HC_{t-1} + \ldots + \beta_k HC_{t-k} + \epsilon_t
\]

\[
HC_t = \alpha_0 + \alpha_1 GDP_{t-1} + \ldots + \alpha_k GDP_{t-k} + \beta_1 HC_{t-1} + \ldots + \beta_k GDP_{t-k} + \epsilon_t
\]

As a testing criterion the probability was used. With the probability the hypothesis of statistical significance of specific groups of explanatory variables was tested for each separate function.

<table>
<thead>
<tr>
<th>Table 1: Augmented Dickey-Fuller and Phillips Perron Unit Root Test at Levels and First Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>GDP</td>
</tr>
<tr>
<td>HC</td>
</tr>
<tr>
<td>Critical Value</td>
</tr>
</tbody>
</table>

Notes:
- a. The null hypothesis of the series is non-stationary. The (*) indicates the rejection of null hypothesis at 5 per cent significance level for model with a linear trend and intercept.
- b. The denotation: GDP = Growth Domestic Product and HC = Household Consumption

The lag length of the level vector autoregression system has been determined by minimizing the Akaike (1969) Information Criterion (AIC). Table 2 reports the cointegration result. Both Max-Eigen and Trace test suggest that there is one cointegrating equation emerged. This indicates that household consumption and economic growth are cointegrated.
Table 2: Johansen Maximum Likelihood Cointegration Tests

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternative Hypothesis</th>
<th>Max-Eigen</th>
<th>95% CV</th>
<th>Trace</th>
<th>95% CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>r = 0</td>
<td>r = 1</td>
<td>25.52161 *</td>
<td>14.07</td>
<td>26.1286 *</td>
<td>15.41</td>
</tr>
<tr>
<td>r ≤ 0</td>
<td>r = 2</td>
<td>0.606938</td>
<td>3.76</td>
<td>0.60694</td>
<td>3.76</td>
</tr>
</tbody>
</table>

Notes:
- a. r is the co-integrating vector, CV is critical value at 5% level
- * denotes rejection of the null hypothesis at 5% level of significant

The empirical results of the estimated error correction models are presented in Table 3. The results show that bi-directional causality exists between economic growth and household consumption in the case of Malaysia. This is based on the statistical significance of the error correction coefficient of the error correction terms. According to Jones and Joufiatain (1991), the error correction terms represent the long run impact of one variable while the changes of the lagged independent variable describe the short run causal impact. The results presented in Table 3 provide evidence on long run import from household consumption to economic growth as well as from economic growth to household consumption.

Table 3: Error Correction Model

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>DGDP</th>
<th>DHC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECT</td>
<td>-0.295463</td>
<td>-650.6893</td>
</tr>
<tr>
<td></td>
<td>(0.07617)</td>
<td>(139.718)</td>
</tr>
<tr>
<td>[-3.87910]</td>
<td>[-4.65715]</td>
<td></td>
</tr>
<tr>
<td>D(GDP(-1))</td>
<td>-0.050352</td>
<td>873.6592</td>
</tr>
<tr>
<td></td>
<td>(0.13763)</td>
<td>(252.467)</td>
</tr>
<tr>
<td>[-0.36584]</td>
<td>[ 3.46049]</td>
<td></td>
</tr>
<tr>
<td>D(PC(-1))</td>
<td>-0.000389</td>
<td>-0.030078</td>
</tr>
<tr>
<td></td>
<td>(9.905)</td>
<td>(0.16442)</td>
</tr>
<tr>
<td>[-4.33891]</td>
<td>[-0.18293]</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2.693136</td>
<td>7356.445</td>
</tr>
<tr>
<td></td>
<td>(0.82237)</td>
<td>(1508.51)</td>
</tr>
<tr>
<td>[ 3.27486]</td>
<td>[ 4.87664]</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- a. The denotation: GDP - Growth Domestic Product and HC - Household Consumption
- b. Figure in parenthesis is standard error and figure in [ ] is t-statistics

The results of the Granger-causality test are reported in Table 4. The Chi-squared for eq (1) is 18.82612 and probability is 0.0000, which is statistically significant at the 5% level. The indication is that the null hypothesis that HC does not cause Granger GDP can be rejected. For eq(2), the Chi-squared and probability is 11.97499 and 0.0005, which is significant at the 5% level. This implies that the null hypothesis that GDP does not Granger cause HC also can be rejected. Therefore, we can conclude that HC Granger causes economic growth and vice versa in the Malaysia economy during the period studied.

Table 4: Granger Causality Tests

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Chi-squared</th>
<th>Probability</th>
<th>Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC does not Granger cause GDP</td>
<td>18.82612</td>
<td>0.0000</td>
<td>1</td>
</tr>
<tr>
<td>GDP does not Granger cause HC</td>
<td>11.97499</td>
<td>0.0005</td>
<td>2</td>
</tr>
</tbody>
</table>

Conclusion

The main objective of this study is to investigate empirically the causal relationship between household consumption and economic growth for Malaysia over the period 1961-2009 using time series data. Several econometrics tests were carried out to determine whether a meaningful relationship between two variables in both: short run and long run exist. Johansen cointegration test analysis was used to lead to a long run equilibrium relationship among these variables. Then the methodology of Error Correction model was applied to estimate the short run and long run relationship. The selected cointegrated vector gave the appropriate error correction term, which proved the significant t-statistics that shows the existence of long run and short run relationship between these two variables. Granger causality test found that there is bidirectional relationship between variable with direction from HC to GDP and GDP to HC. Consequently, economic growth in Malaysia has an impact on its household consumption. The study concludes that household consumption is important for economic growth in Malaysia. These findings signal to the government and policy maker to design an appropriate fiscal and monetary policy in order to stimulate the household consumption in the short run and long run. As these done, the economy will grow and standard living of Malaysian will improve.

References


