Empirical Analysis on the Factors Affecting Economic Sustainable Development Path in Malaysia: An Autoregressive Distributed Lag Cointegration Approach

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ABSTRACT

Through its latest economic model, Malaysia has outlined “sustainability” as the key element to achieve the Vision 2020 – to become a high-income nation by year 2020. This study analyzed the possible factors affecting sustainable development path in Malaysia using the adjusted net savings (ANS) indicator; as projected by World Bank from 1990s. We firstly conducted the “structural break-unit root tests” to assume stationarity of series with the possible presence of economic shocks during the period of 1972-2011. For model estimation, we applied the autoregressive distributed lag technique to find the cointegration between money supply ($LFIN$), nonrenewable natural resource (fuels, ores and metals) exports ($LNR$), trade openness ($LTRD$) and urban population ($LURB$) with ANS values ($LANS$). In the short-run, $LFIN$ and $LTRD$ have significant negative impact on $LANS$ while in long-run, $LNR$ and $LURB$ tend to have significant negative impact on economic sustainability in Malaysia.

Keywords: Adjusted Net Savings, Economic Sustainable Development Path, Structural Break, Malaysia  
JEL Classifications: O47, Q01, C32

1. INTRODUCTION

Gross domestic product (GDP) as the indicator for measuring economic growth; was originally posited in basic growth model by Solow (1956). The model denoted a production equation that incorporates capital and labor as the input functions. The application of GDP to indicate economic growth, however, is being on debate for over past decades for its capability in measuring the actual “growth” and “sustainability.” The objective to achieve economic growth alone has slowly becoming an obsolete target, where countries are now in focus to pursue sustainability in economic development. Hence, the objective is to ensure “sustainable development” (SD); to maintain a strong path of economic development over a period of time that a country could ever survive.

1.1. Defining and Measuring SD

Worldwide definition of SD is from Brundtland et al. (1987) that stated SD as “…. development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” In short, the main condition to achieve SD is to maintain social welfare across generations, sustaining non-declining utility and consumption level. Several indicators of SD have been developed since 1989 (Dietz and Neumayer, 2004). Among them, the indicator of “adjusted net savings” (ANS) was firstly introduced by Pearce and Atkinson (1993) and later adopted by the World Bank to measure the economic sustainability path of a country. ANS is simply made on the concept of ‘greening’ the national account – by including all forms of capital – natural capital and environment; and together with social capital – represented with human capital. Through maximizing utility of consumption, several adjustments were made on gross national product to produce a measure of net national savings; and subsequently added with investment made on education and further deducted with natural resources depreciation and environmental degradation. As projected by the bank, ANS is therefore simply measured as:
ANS = Net investment in produced capital + investment in human capital – net depreciation in natural capital (renewable/non-renewable resources and environment)/GNI

(1)

Or

ANS = (NNS + ED − ∑R_{n,i} − ENV)/GNI

(2)

Whereby, NNS is net national savings, ED is investment made on education, ∑R_{n,i} is total rents on natural resources (represents depletion of natural resources i) and ENV is environmental damage (CO_2 damage). ANS is normally expressed as a percentage of gross national income (GNI). ANS above zero might suggest an economy to be on a sustainable path, while negative value may imply otherwise. Since 1997, the World Bank has published the cross-country estimates of ANS and the database is available in World Development Indicator’s Report (WDI) beginning from 1999.

1.2. Economic SD Path in Malaysia

After more than half a century from its formation; achieving SD is now a priority to Malaysia. The World Bank’s ANS estimates for Malaysia in Figure 1 have shown that, the country obtained a significantly positive and high rate of ANS at the average around 15% of its GNI during 1970 until 2010. While facing some shocks along the economic cycle, the Malaysian economy however, survived and seems to be maintained above minimum sustainability line recommended by the World Bank (which is above zero). Hence, it would be an interesting task for researchers to identify the factors and reasons to the survival of these economic shocks.

2. LITERATURE REVIEW

Preliminary suggestions for the calculation of sustainability was proposed by Pearce and Atkinson (1993) which accounted for the concept of SD. Hamilton et al. (1997) and Pearce and Atkinson (1998) suggested that savings is an investment made to ensure adequate level of capital reserves to the future generations with the condition that current level consumption utility is maximized. Since then, numerous studies have been conducted in either to improve the measurement or to redefine it, such as by Bolt et al. (2002) and further inspired authors across nations to developed their own calculation for ANS, such as by Dossmagambet (2010), Ferreira and Moro (2010) and more recently from Malaysia (Jamal et al., 2012). These studies proposed more comprehensive measurement to ANS, as the one projected by the World Bank is said to be neglecting some important element underlying the calculations – The role of private sector’s investment in education and other in-depth issues particularly in resource-based and oil-producing economies. A preliminary attempt to identify relationship between growing population and ANS was conducted by Hamilton (2000) and followed by Arrow et al. (2003). It is based upon assumption that population growth would influence savings rate, as in Herzog (2012). Other relevant studies on determinants of ANS were on natural resources (Boos, 2011) and environmental factors (Asici, 2011). For Malaysia, there were relatively few studies on its specific time-series analysis as compared to its inclusion with other development economies. The latest by Jamal et al. (2014), analyzed the link between economic growth, foreign investment and sustainability in Malaysia.

3. ECONOMETRICAL METHODOLOGY

Most databases are sourced from WDI report published by the World Bank, national estimates by Statistical Department of Malaysia and others. Limitation in data availability has restricted the analysis to be conducted only from 1972 until 2011, comprising of 39 observations.

3.1. Dependent Variables- ANS

ANS are the serial data constructed by the World Bank. For this study, we included the private sector’s current expenditures on education – covering total salary and wages paid to private academic institutions. Constant 2005 US dollars are used to reflect price changes overtime and data were transformed into their natural logarithm.

Figure 1: Adjusted net savings and its components, Malaysia (1970-2010)
3.2. Independent Variables
- Money supply (LFIN): Is a total money supply (M2) as a percentage of GNI and then converted into natural logs value (constant 2005 US$)
- Nonrenewable natural resources exports (LNR): Total non-renewable commodity exports of total merchandise exports - such as mineral fuels, ores and metals. The value is in natural logarithm of constant 2005 US$
- Trade openness (LNRD): Sum of exports and imports of goods and services measured as a share of GDP, value in natural logarithm of 2005 US$
- Urban population (LURB): It is the growing population in urban area data from UN’s Population Division, measured annually at mid-year (in number of people) in logs.

3.3. Model Specification
We posited several potential variables (namely LFIN, LNR, LTRD and LURB) that would affect economic SD path in Malaysia (LANS). The empirical model of LANS is written as:

\[ LANS: f (LFIN, LNR, LTRD, LURB) \]

From here, we estimated the model for economic SD path in Malaysia as proxied by LANS with its proposed determinants as:

\[ LANS = \beta_0 + \beta_1 LFIN_t + \beta_2 LNR_t + \beta_3 LTRD_t + \beta_4 LURB_t + \varepsilon_t \]

Whereby: \( \beta_1, \beta_2, \beta_3, \beta_4 > 0 \).

4. EMPIRICAL ANALYSIS
Here we applied the autoregressive distributed lag (ARDL) bounds testing method with structural break to find the possible short-run and long-run relationship among the variables.

Table 1: Bounds test result

<table>
<thead>
<tr>
<th>Critical value</th>
<th>F-statistics</th>
<th>4.619</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower bound</td>
<td>Upper bound</td>
</tr>
<tr>
<td>1%</td>
<td>3.74</td>
<td>5.06</td>
</tr>
<tr>
<td>2.5%</td>
<td>3.25</td>
<td>4.49*</td>
</tr>
<tr>
<td>5%</td>
<td>2.86</td>
<td>4.01</td>
</tr>
</tbody>
</table>

*Based on Narayan and Saud (2005)

Table 2: Estimation result

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Model 1: Long-run elasticities</th>
<th>Standard error</th>
<th>Model 2: Short-run elasticities (ECM)</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFIN</td>
<td>-0.516 (−1.332)</td>
<td>0.388</td>
<td>( \Delta LFIN )</td>
<td>-0.214 (-1.315)</td>
</tr>
<tr>
<td>LNR</td>
<td>-0.754 (−2.834)**</td>
<td>0.266</td>
<td>( \Delta LNR )</td>
<td>-0.313 (−2.386)**</td>
</tr>
<tr>
<td>LTRD</td>
<td>-1.168 (−1.692)</td>
<td>0.690</td>
<td>( \Delta LTRD )</td>
<td>-0.485 (-2.095)**</td>
</tr>
<tr>
<td>LURB</td>
<td>6.201 (3.266)**</td>
<td>1.899</td>
<td>( \Delta LURB )</td>
<td>14.100 (1.436)</td>
</tr>
<tr>
<td>C</td>
<td>24.866 (3.822)</td>
<td>6.506</td>
<td>ECT (−1)</td>
<td>-0.415 (-3.613)**</td>
</tr>
</tbody>
</table>

Model criteria/ goodness-of-fit

R²=0.980; Adjusted R²=0.976; Wald F-statistics=261.704***; DW-Statistics=2.14

Diagnostic checking

LM=1.263 (0.22); H₀: There is no serial correlation
White heteroscedasticity=1.234 (0.292, 0.740); H₀: There is no heteroscedasticity
JB=1.020 (0.601); H₀: The residuals are normally distributed

***Denotes significance at 1% level, Number in parenthesis indicates t-ratio value, Estimated long-run coefficients using ARDL approach, ARDL (1,0,0,0,1) selected based on schwartz bayesian criterion (Dependent variable: LANS), ECM representation based on ARDL (1,0,0,0,1) selected based on schwartz information criterion (Dependent variable: LANS). LM: Serial correlation (Breusch-Godfrey Serial correlation LM test), Heteroscedasticity: Breusch-Pagan-Godfrey test, JB: Jarque-Bera normality test, Numbers in parenthesis indicated p probability value. ECM: Error correction model, ARDL: Autoregressive distributed lag, ANS: Adjusted net savings
5. CONCLUDING REMARKS

This study had estimated the impact of money supply, non-renewable natural resources (fuels, ores, and metals) exports, trade openness and urban population towards economic SD path in Malaysia. We used the indicator of ANS as the proxy for economic SD of Malaysia. Nonrenewable natural resources and urban population in the long-run have significant negative impact on ANS while in the short-run, only nonrenewable resources and trade openness have similar negative impact on sustainability. We took careful measure by applying unit root test with structural break; in order to avoid errors in interpreting the stationarity features of series should be there any shocks or disturbance. The findings seem consistent with previous literatures and theories which suggest that prolong and unconditional natural resource extraction may deteriorate economic sustainability. Economic sustainability in Malaysia is also sensitive to increase in urban population in the long-run while trade openness in the short-run will directly reduce sustainability potential in the short-run. In order to improve the economic performance and achieve sustainability, government should undertake effective macroeconomic policies given these alarming and critical factors. Therefore, effective policies should also be complemented with good efficient governance as to ensure strong and stable growth for future generations.

REFERENCES