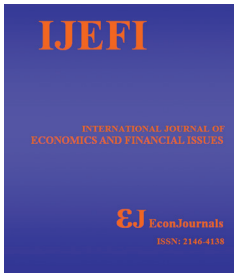


International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2016, 6(S6) 67-70.

Special Issue for "IPN Conferences , May 2016"

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

Faridah Pardi[1], Abdol Samad Nawi[2]

[1]Department of Economics, Faculty of Business and Management, Universiti Teknologi MARA, Selangor, Malaysia,
[2]Department of Economics, Faculty of Business and Management, Universiti Teknologi MARA, Selangor, Malaysia.
*Email: faridah405@melaka.uitm.edu.my

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 deduced 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

$$ANS = (NNS + ED - \sum R_{n,i} - ENV)/GNI \quad (2)$$

Whereby, *NNS* is net national savings, *ED* is investment made on education, $\sum R_{n,i}$ 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 Dosmagambet (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.

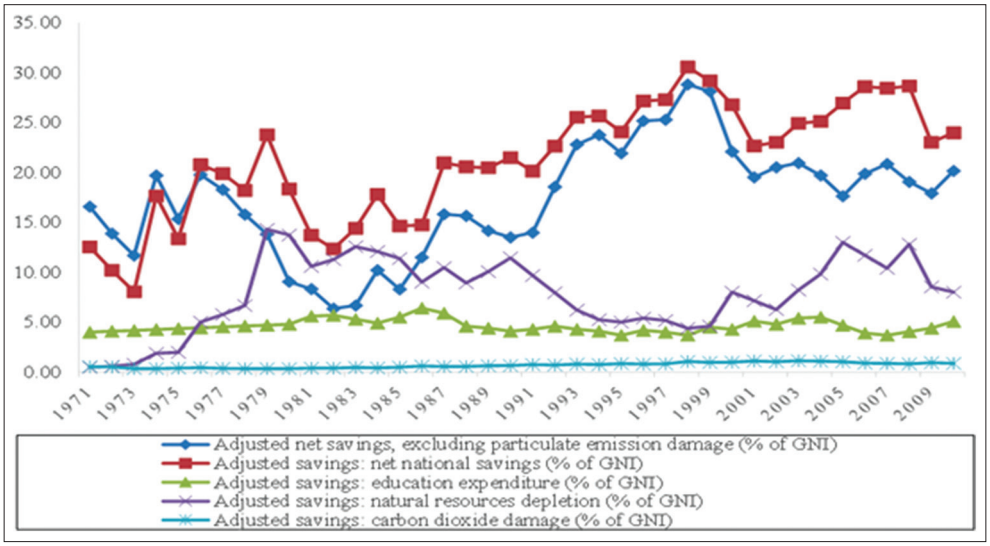
3. ECONOMETRICAL METHODOLOGY

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)



Source: World Development Indicator Report (various years)

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 (*LNTRD*): 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:

$$LANS: f(LFIN, LNR, LTRD, LURB) \quad (3)$$

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

$$LANS = \beta_0 + \beta_1 LFIN_t + \beta_2 LNR_t + \beta_3 LTRD_t + \beta_4 LURB_t + \varepsilon_t \quad (4)$$

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

Critical value	F-statistics	4.619
	Lower bound	Upper bound
1%	3.74	5.06
2.5%	3.25	4.49*
5%	2.86	4.01

*Based on Narayan and Saud (2005)

4.1. Unit Root Tests with Structural Break

We firstly conducted unit root tests to check the stationarity of each series following augmented Dickey–Fuller unit root tests. Differing from previous studies, we took a step to consider structural break in our series. This is to avoid the erroneous non-rejection of non-stationary variables where structural breaks might be present. For this study we applied the innovative outlier model which assumes structural changes to occur gradually along the period. The results of the tests are reported in Table 1. From here we found that *LANS*, *LFIN*, *LNR* and *LTRD* are stationary at their first differenced; while *LURB* are found to be stationary at level. The time breaks for each variable were automatically chosen when we run this test. We noted that 1984, 1989, 1991, 1995, 1997 and 2000 were the breakpoints that may be due to economic shocks.

4.2. ARDL Approach to Cointegration

In order to find the long-run relationship among the series, we applied the bounds testing approach, as developed in Narayan and Saud (2005). From the ARDL bounds test, we rejected the null hypothesis of no long-run cointegration at 2.5% level of significance (Table 1). Since long-run relationship exists between the hypothesized variables, we then proceed to estimate the short-run and long-run co-integrating form based on ARDL method.

We presented the result of estimation in Table 2. In the long-run ARDL estimation, nonrenewable natural resources (fuels, ores and metals) exports and urban population have significant negative influence to ANS. While in the short-run, natural resources and trade openness have significant negative impact on sustainability. The error-correction term (−1) value in this short-run model indicates the speed of adjustment towards long-run equilibrium, implying that adjustment of deviation from the long-run equilibrium will be at almost 42% each year. From diagnostic check we found negative existence of serial correlation or heteroscedasticity.

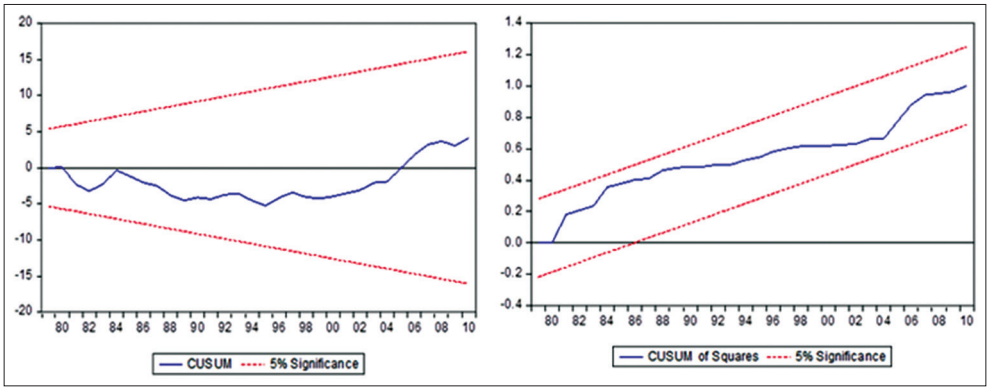
Finally, we examined the structural stability of conditional error correction model in our analysis by using the cumulative sum (CUSUM) and CUSUM of squares (CUSUMSQ) on the recursive residuals. Both recursive residuals estimates lie within the 5% critical bands, as displayed in Figure 2.

Table 2: Estimation result

Model 1: Long-run elasticities			Model 2: Short-run elasticities (ECM)		
Regressor	Coefficient	Standard error	Regressor	Coefficient	Standard error
LFIN	−0.516 (−1.332)	0.388	Δ*LFIN*	−0.214 (−1.315)	0.163
LNR	−0.754 (−2.834)***	0.266	Δ*LNR*	−0.313 (−2.386)***	0.131
LTRD	−1.168 (−1.692)	0.690	Δ*LTRD*	−0.485 (−2.095) ***	0.231
LURB	6.201 (3.266)***	1.899	Δ*LURB*	14.100 (1.436)	10.445
C	24.866 (3.822)	6.506	ECT (−1)	−0.415 (−3.613)***	0.115
Model criteria/goodness-of-fit					
R^2=0.980; Adjusted R^2=0.976; Wald F-statistics=261.704***; DW-Statistics=2.14					
Diagnostic checking					
LM=1.263 (0.22); H_0: There is no serial correlation White heteroscedasticity=1.234 (0.292, 0.740); H_0: There is no heteroscedasticity JB=1.020 (0.601); H_0: 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 χ^2 probability value. ECM: Error correction model, ARDL: Autoregressive distributed lag, ANS: Adjusted net savings

Figure 2: Plots of cumulative sum (CUSUM) and CUSUM of squares



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

Arrow, K.J., Dasgupta, P., Mäler, K.G. (2003), The genuine savings criterion and the value of population. Economic Theory, 21, 217-225.

Asici, A.A. (2011), Economic growth and its impact on environment: A panel data analysis. Munich Personal RePEc Archive. 24, 324-333.

Bolt, K., Matete, M., Clemens, M. (2002), Manual for calculating adjusted net savings. Environment Department World Bank, (2002), 1-23.

Boos, A. (2011), The theoretical relationship between the resource curse hypothesis and genuine savings. p59.

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., de Botero, M.M. (1987), Our Common Future (\"Brundtland report\"). Available from: http://www.bne-portal.de/fileadmin/unesco/de/Downloads/Hintergrundmaterial_international/Brundtlandbericht.File.pdf?linklisted=2812.

Dietz, S., Neumayer, E. (2004), Genuine savings: A critical analysis of its policy-guiding value. Internatoinal Journal of Environment and Sustainable Development, 3, 276-292.

Dosmagambet, Y. (2010), Calculating genuine saving for Kazakhstan. Journal of Economic and Environmental Studies, 10, 271-282.

Ferreira, S., Moro, M. (2010), Constructing Genuine Savings Indicators for Ireland, 1995-2005. Stirling Economics Discussion Paper 2010-10. p542-553.

Hamilton, K. (2000), Sustaining Economic Welfare: Estimating Changes in Wealth per Capita. Paper Presented at the 26th General Conference of the International Association for Research on Income and Wealth, Cracow, Poland. p3-5.

Hamilton, K., Atkinson, G., Pearce, D. (1997), Genuine Savings as an indicator of sustainability. The Centre for Social and Economic Research on the Global Environment (CSERGE) Working Paper. p3-8.

Herzog, R.W. (2012), A dynamic panel model of GDP growth, saving, age dependency, and trade openness. International Review of Applied Economics, 1-25.

Jamal, O., Roby, F., Jafari, Y. (2012), Genuine savings for Malaysia: What does it tell? International Journal of Management Studies, 19, 151-174.

Jamal, O., Yaghoob, J., Tamat, S. (2014), Economic growth, foreign direct investment, macroeconomic condition and sustainability in Malaysia. Applied Econometrics and International Development, 14, 1-11.

Narayan, P.K., Saud, A. (2005), An empirical investigation of the determinants of Oman's national savings. Economics Bulletin, 3(51), 1-7.

Pearce, D., Atkinson, G. (1998), The concept of sustainable development: An evaluation of its usefulness ten years after Brundtland. Revue Suisse d Economie Politique et de Statistique, 134, 251-270.

Pearce, D.W., Atkinson, G.D. (1993), Capital theory and the measurement of sustainable development: An indicator of "Weak" sustainability. Ecological Economics, 8, 103-108.

Solow, R.M. (1956), A contribution to the theory of economic growth. Quarterly Journal of Economics, 70, 65-94.