Does saving stimulate growth? the case of Malaysia

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Abstract

In the 21th century, Malaysia became one of the fastest growing economies in Southeast Asian region and has been ranked as the third highest savings rate economy in the Newly Industrializing Economies (NIEs). This impressive performance has attracted the economists and international's attention which demands some explanation. However, in empirical side, the savings-led growth notion is still inconclusive for the Malaysian economy. The debate really centres on 'which causes which'. This paper is an attempt to re-investigate the issue that prevails. By using the econometric approach of ARDL and extended data of 47 years which can be considered as 'fresh data', the study concludes that there is a uni-directional causality existing between savings and growth, where savings lead to growth, and not the other way around. Thus, this finding becomes additional empirical evidence that supports the previous literature of savings-led growth. The policy for promoting savings should be geared up in order to stimulate growth and eventually will lead to the well-being of the Malaysian economy.

Keywords: Savings, Growth, VECM, VDC, Malaysia

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Introduction

From the economic perspective, savings is one of the most important determinants for economic growth. Typically, economic growth is measured by the change in per-capita Gross Domestic Product (GDP). Most economists agree that high rates of savings and investment in the country have been a key factor for economic success (Mansur, Mamalakis and Idris, 2011)

In the 1950s through 1970s, Malaysia's gross national saving was 22.5 percent, and became the highest among the rest of the Asian countries. The impressive performance began after 1987 whenever the economy achieved above 7 percent growth in seven consecutive years reaching virtual full employment in 1995. The reform economic policy in Malaysia on that time has transformed this country from resource-based to market-based economy. This eventually changed the pattern of savings and investment in this country drastically (Mansur, Mamalakis and Idris, 2011).

The high rates of savings have attracted the economists' attention and demand some explanation because they have been a significant factor for Malaysia's development. Some economic writings on this subject cited a number of reasons for Malaysia's exceptional savings performance. Among others are; unequal distribution of income, the traditional attitudes of the Chinese community toward saving, the well developed system of social security combined with the custom of taking a job after retirement and the long record of price stability (Kasper and Wolfgang, 1974).

In 21th century, Malaysia becomes one of the fastest growing economies in Southeast Asian region and has been ranked third highest savings rate economy in the Newly Industrializing Economies (NIEs) (Tang (2008 and 2009)). The behavior of savings and investment are equally important in explaining the performance of the overall Malaysian economy.

With respect to the savings-growth theory, Harrod (1939) and Domar (1946) were the first group of economists that systematically modeled the role of savings on economic growth. They claimed that the speed of economic growth depends on the ability to save as high savings rate will increase the rate of investment and hence trigger economic growth.

Meanwhile, Solow model became one of the bases for a branch of macroeconomics that studies growth (Brown University, n.d). The gist of the theory suggests that the increase in savings rate will lead to greater capital formation, and eventually quicker growth. However, Lin (1992) added that this can only be realized if and only if resources such as savings are mobilized and easily translated into capital formation. Other than the positive effect of savings, Solow growth model also implies that the growth rates in population will retard the rate of growth due to slow growth capital per worker.

Besides, Lewis (1955) has elaborated on the relationship between savings and economic growth, particularly the importance of capital to a nation. He stated that by raising the savings rate in a nation, it will lead to real GDP growth. The theory behind Lewis's thought is that a higher savings rate will increase the rate of investment, which eventually leads to economic development and growth. This theory more or less is similar to Solow growth theory.

Contrary to the savings-led-growth model, Modigliani (1970) showed many years ago that a very simple version of the life-cycle model can predict that high growth causes high savings, and he found empirical support for the theoretical prediction using cross-country data. This is also supported by studies done by Baumol, Blackman, and Wolfe (1991), Deaton and Paxson (1992), and Bosworth (1993), who have also provided evidence that faster growth may raise saving.

To date, the contribution of savings for economic growth still becomes one of the main concerns among economists and policymakers. The debate really centres on 'which causes which'. Most of the growth theory suggests savings causes growth, whilst empirical studies have shown the inconsistent result, thus lead to invalidate the theory.

In the case of Malaysia, the inconsistency prevails when the different causality technique applied. For instance, the earlier study by Baharumshah et al. (2003) on the growth theories found no causality between savings and economic growth. Meanwhile, Boo and Normee (2004) observed that economic growth Granger-causes savings in Malaysia. However, Baharumshah and Thanoon (2003) re-investigated the long run causal relationship between savings and economic growth in Malaysia using the Toda and Yamamoto (1995) causality approach. They found that savings and economic growth in Malaysia is bi-directional causality in the long run.

This study is a humble attempt to re-investigate the issue prevails. In this study the author use an extended data with 47 years spanned (1967-2014), which to the best of author's knowledge there is none of the previous researchers employ such long data span yet for Malaysian savings-growth study. In addition, the data year is up to 2014, which can be considered as 'fresh data', thus hope will provide more robust inference.

Furthermore, most of Malaysian studies have omitted the consideration of the effect of structural break(s) in the unit root tests. Perron (1989) pointed out that the conventional unit root tests such as Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) may be biased when the time series pertain to structural change. Thus this can lead to the possibility of huge forecasting errors and invalidity of the model in general.

In this study the author wished to add the macroeconomics data of population, however the I(2) stationary property inherent in the data variable has limit the intuition to imply the complete Solow model to Malaysian economy.

The remainder of this article is set out as follows. Section 2 will provide the review on past literatures; Section 3 provides the methodology and data used. Section 4 discusses on the empirical result, and followed by the last Section 5, concludes the findings.

Literature Review

There is abundant of literature related to savings and growth. However there still no consensus in the causality direction between both variables. Some literatures suggest that economic growth causes change in savings (Sinha and Sinha (1998), Carroll et al. (2000) and Rodrik (2000)), while some others concludes that savings leads to economic growth through its impact on capital formation (Lewis (1955), Levine and Renelt (1992), Mankiw et al. (1992) and Alguacil et al. (2004)).

The multitude factors such as economic structure, different data spans and different econometric techniques might causes the inconclusive result of saving-growth relationship from one economy to another.

The different stage of economy is seen could influence the savings and growth. For instance, from the study done by Masson et al. (1998) to investigate the determinants of private savings behavior in industrial and developing countries. They found that factors such as GDP growth, real interest rate, and changes in the term of trades to be positively related to savings in both countries, though there was a slight different in term of the magnitude of these relationships. Besides, Loayza et al. (2000) studied to investigate the effects of policy and non-policy variables on savings. They found that a positive saving rate with the level and growth rate of real per capita income and the influence of income is larger in developing than in developed countries. However, Ramesh (2006) investigate the direction of same type of causality for high income countries, lower middle countries, upper middle countries and lower income countries found that the analysis outcome supports the hypothesis that the economic growth leads to higher gross domestic savings.

Furthermore, Baharumshah et al. (2003) conducted a study to find the direction of causality between savings and growth for Singapore, South Korea, Malaysia, Thailand, and the Philippines. The study has employed VECM on time series data from 1960-1997 and found that there is no causality between gross domestic savings and economic growth except for Singapore. On the other hand, Agrawal (2001) investigates the relationship between saving and growth in seven Asian countries (South Korea, Taiwan, Singapore, Malaysia, Thailand, Indonesia, and India). He reported that both high rate of growth of income per capita, and the rapidly declining age dependency ratio contributed to the high rate of saving in these countries.

Many researchers also have made an attempt by employing the different econometrics techniques to probe the issue. Chowdury (1987) argued that in most cases the non-consensus causality result between savings and growth was probably attributed to the different causality tests employed. Moreover, Lee, Lin, and Wu (2002) pointed out that relying on one causality test may not be enough to identify the true causal relationship. However, Tang (2009) argued that the causal relationship is not sensitive to the particular causality test used after he employs five causality test procedure to investigate the savings-growth nexus in Malaysia. On the other hand, Mavrotas and Kelly (2001) using Toda and Yamamoto (1995) technique to investigate direction of causal relationship among gross domestic product, gross domestic savings, and private savings for India and Sri Lanka. They suggest that there is no causality between GDP growth and private savings in India. While for Sri Lanka the bi-directional causality prevails.

Some researchers also have made inference based on the data used. For instance, after analyzing the growth-savings nexus for OECD countries, Attanasio et al. (2000) concludes that using annual data increases exactness and significance of empirical estimation as well as direction of causal relation rather than using the five-year average.

Methodology and Data

This study employs the most recent econometrics technique; Autoregressive Distributed Lag (ARDL) approach (also known as bounds testing procedure) which is developed by Pesaran et al. (2001) in a trivariate system. This approach is seen as more robust as compared to other cointegration tests (Engle and Granger, 1987; Johansen, 1988; Johansen and Juselius, 1990) and it is also more compatible to estimate the long run coefficients for the small data sample.

The ARDL approach is more preferable as compared to other conventional cointegration testing because it can be used with a mixture of I(0) and I(1) data, it involves just a single-equation set-up, making it simple to implement and interpret and the different variables can be assigned different lag-lengths as they enter the model[1].

The annually times series data of 47 years (1967-2014) covering in Malaysia was used in this analysis. The data of gross domestic saving, GDP per capita, interest rates and gross capital formation was sourced from World Bank Databank. The gross domestic saving, GDP per capita and gross capital formation data are measured in local currency, Malaysian Ringgit (MYR). Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption) (www.worldbank.org). GDP per capita is used as a proxy for rate of growth. Gross capital

[1] For details, kindly visit http://davegiles.blogspot.my/2013/06/ardl-models-part-ii-bounds-tests.html

formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories (www.worldbank.org).

For econometrics estimation purpose, the variables are transformed into logarithm form, and the regression equation is specified as follows;

$LGDP = \alpha0 + \alpha1LSAV + \alpha2LINT + \alpha3LCF + \varepsilon t$

Where,

LGDP: logarithm of GDP per capita

SAV: logarithm of saving

LINT: logarithm of interest rates

CF: logarithm of gross capital formation

εt: Error term

Empirical Results

This section will discuss the interpretation of the results from all testing done. The analysis begins with unit root test, to estimate the stationarity property of the variables. The analysis process is followed by lag order determination, cointegration test between variables, ARDL approach, error correction (ECM) test and lastly Variance Decompositions (VDCs).

(i) Unit root test

The stationarity test of the variables is the preliminary stage before we proceed to other econometrics analysis. Stationary time series data is necessary to have a valid t-statistics and F-statistics (Khan et. al, 2011). This will be implemented by unit root test; Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. In this analysis we are testing the null hypothesis of non stationary of the data by assuming that the test statistics is lower that the critical value. In this test, the time series will be transformed into log and difference form. The log form of time series will turn the series stationary in the variance. Meanwhile the first difference of the logged series will turn the series stationary in the mean. Ideally, the variables should be I(1) after the first differenced. The result from both tests is summarized as follows;

Table 1a: Augmented Dicky Fuller (ADF) Test

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LGDP	-3.7883	-3.5189	Stationary
LSAV	-1.7661	-3.5189	Non-stationary
LINT	-3.3083	-3.5189	Non-stationary
LCF	-2.9266	-3.5189	Non-stationary
Variable in Differenced Form			
DGDP	-3.1502	-2.9339	Stationary
DSAV	-3.4927	-2.9339	Stationary
DINT	-4.7681	-2.9339	Stationary
DCF	-4.3037	-2.9339	Stationary

Table 1b: Philips-Perron (PP) Test

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LGDP	-1.1363	-3.5066	Non-stationary
LSAV	-1.5192	-3.5066	Non-stationary
LINT	-2.3427	-3.5066	Non-stationary
LCF	-1.3631	-3.5066	Non-stationary
Variable in Differenced Form			
DGDP	-6.6306	-2.9256	Stationary
DSAV	-8.1066	-2.9256	Stationary
DINT	-4.8843	-2.9256	Stationary
DCF	-4.3538	-2.9256	Stationary

The results indicate that all the variables are non-stationary in the log level form except GDP per capita series. Meanwhile in the differenced from all the variables are stationary, thus concludes that the series has the combination of I(0) and I(1).

(ii) Determination of order of lag

This VAR approach will determine the number order of lag. The lag length selection is made by comparing the p-value with the 5% of significance level. This is important to note that the too small number of lag order selection may invalidate the test. Meanwhile the too large number of lag order will impact the degree of freedom of the observations.

Optimal order	AIC	SBC
	1	0

Table 2: Order of lag

The result indicates the conflict recommendation in the number of lag order by both selection criteria; Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). However the author has chosen the lag one to avoid a serial correlation in the variables.

(iii) Cointegration tests

Cointegration test will test whether all variables move together in the long run. It tests the theoretical relationship among variables. This can be done by implementing Johansen and Engle-Granger tests. The difference between both is; the former uses maximum likelihood and it can identify more than one cointegration, while the latter uses residual based approach and it can identify only one cointegration. The result is depicted in the table below;

Table 3a: Cointegration result from Maximal Eigenvalue estimation

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r<= 1	r = 2	20.3996	25.42	23.1

Table 3b: Cointegration result from Trace estimation

Cointegration LR Test Based on Trace of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r<= 1	r>= 2	31.2223	42.34	39.34

Both results from the Maximal Eigenvalue and Trace estimations denote one cointegration between variables. The number of cointegration is selected by observing the null hypothesis of ‘no cointegration’, and consequently comparing the t-statistics and critical value. The rule for accepting null is the t-statistics have to be lesser than the critical value. The results indicate that we fail to accept null at one cointegration for both estimations; Maximal Eigenvalue and Trace.

Thus this result proves that there is theoretical relationship among GDP, savings, capital formation and interest rates.

The author also implemented the Engle-Granger cointegrating test. The result derived is as follow;

	Test Statistic	AIC	SBC	HQC	95% critical value
ADF(3)	-2.1596	85.7353	82.2599	84.4614	-4.3681

Table 3c: Engle-Granger Cointegration test result

In the Engle-Granger cointegrating test, the selection is made based on the highest AIC value. The result indicates that there is no cointegration at 95% critical value.

Since the stationarity test indicate the mixture of I(0) and I(1) series, the author will proceed to the Autoregressive Distributed Lag (ARDL) approach since this technique can accommodate with this series characteristic.

(iv) Autoregressive Distributive Lag (ARDL) Approach

The Autoregressive Distributive Lag (ARDL) approach has some advantages over other cointegration approaches. Firstly, according to Pattichis (1999) and Mah (2000), this technique is comparatively more robust for the small or finite samples consisting of 30 to 80 observations. Secondly, it can be applied on the I(0) and I(1) series combination. However this approach cannot be applied on the variables with I(2) stationary, as to avoid spurious results. Thirdly, the ARDL technique applies general-to-specific modeling framework by taking sufficient number of lags to capture the data generating process. It estimates $(p + 1)k$ number of regressions in order to obtain an optimal lag length for each variable, where p is the maximum lag to be used, and k is the number of variables in the equation. The model is selected on the basis of different criteria like SBC, AIC, RBC and HQC. Moreover, as compared to the conventional methods, the ARDL approach can distinguish between dependent and explanatory variables and eliminate the problems that may arise due to the presence of autocorrelation and endogeneity.

The ARDL approach involves two steps for estimating the long-run relationship (Pesaran et al., 2001). The first step aimed to examine the existence of long–run relationship among all variables in the equations under estimation. The second step is to estimate the long-run and the short-run coefficients of the equation.

ARDL bound test is used to estimates the relationship among variables. The analysis was implemented based on the SBC selection with one lag. Result is summarized as follow;

Table 4: Bound testing results

Variables	F-statistic	Critical Value Lower (95%)	Critical Value Upper (95%)	Critical Value Lower (90%)	Critical Value Upper (90%)
LGDP	3.8483	3.5002	4.7097	2.8751	3.9947
LSAV	3.3020	3.5002	4.7097	2.8751	3.9947
LINT	5.3572	3.5002	4.7097	2.8751	3.9947
LCF	2.5093	3.5002	4.7097	2.8751	3.9947

In this test, the decision is made by comparing the F-statistics value with the upper bound and lower bound value. If the F-statistic lies above the upper bound value, it means that the null hypothesis of no level effect cannot be accepted, where we can assume that there is at least the possibility of long run or short run relationship among variables. Meanwhile if the f-statistic lies below the lower bound value, then the null hypothesis of no level effect can be accepted. However if the F-statistic value lies between the bound, the test is inconclusive.

The result from the **Table 4** indicates the existence of cointegration relationship between variables when the dependent variable is interest rates (LINT). The result denotes its F-statistic value (5.3572) is higher than the upper bound of 5% and 10% (4.7097 and 3.9947 respectively). Therefore we can conclude that there is a long-term theoretical relationship between variables, thus rule out the possibility of a spurious relationship.

(v) Long Run Coefficient test

The next step is to investigate the long run coefficient of variables. The results are as follows;

(i) LGDP = -11.14 + 0.32 INT - 0.60 CF + 1.41 SAV

(ii) LINT = -1.98 + 1.91 LCF - 1.36 SAV - 1.16 GDP

(iii) LCF = -24.83 + 2.30 SAV - 0.95 GDP + 1.42 INT

(iv) LSAV = 6.52 + 0.44 GDP - 0.32 INT + 0.60 CF

The highlighted coefficient denotes the most significant explanatory variables on the respective dependent variables. It is interesting to note that in the first equation the saving is highly significant to the economic growth. This is in congruent with the Solow growth model where it suggests that the increase in saving will lead to the higher capital stock and production, which consequently lead to the economic growth. Economic growth in a country can be measured by the level of per capita income. Ideally, countries can differ in their levels of GDP per capita either because of differences in capital or because of differences in productivity.

(vi) Error Correction Model (ECM)

The previous tests examine the long run relationship. In this section we will investigate the short run dynamics by using Error Correction Model (ECM). Although there is a long run relationship between variables, perhaps there still deviation between variables from one another, in short run. Thus the ECM test aimed to examine the convergence in the model which indirectly means that there is a significant long run relationship. This test is intuitively wanted to study which variable is exogenous and which variable is endogenous.

The result for ECM test is reported in the table below;

ECM (-1)	Coefficient	Standard Error	T-Ratio [Prob.]	C.V.	Result
dLSAV	-0.16166	0.06994	-2.3113[.026]	5%	Endogenous
dLGDP	-0.048394	0.053779	-.89986[.373]	5%	Exogenous
dLINT	-0.19086	0.057975	-3.2922[.002]	5%	Endogenous
dLCF	0.051896	0.086171	.60225[.550]	5%	Exogenous

Table 5: ECM result

The result indicates that two variables are exogenous; the GDP per capita (dLGDP) and capital formation (dLCF). The decision made by observing the null hypothesis of ‘variable is exogenous’, and comparing the p-value with 5% significance level. The null can be rejected whenever the p-value is less than the 5% significance level, and vice versa.

With reference to the result, economically the exogenous variables are not highly significant in explaining growth. GDP per capita in fact statistically had shown insignificant impact on growth (-0.048394). In terms of the speed of convergence to equilibrium, the coefficient of GDP per capita indicates the partial adjustment, while for the capital formation; the result implies that the system moves away from equilibrium in the long run. This result is particularly important to the policymaker who wants to know which variable is exogenous, and how long it takes for it to get back to the equilibrium if that variable is shocked.

(vii) Variance Decompositions (VDCs)

Variance Decompositions (VDCs) serve to determine the relative exogeneity and endogeneity of the variables by ranking the variables based on the degree of dependence on their own past lags. The Generalised VDCs is more preferable as compared to the Orthogonalised VDCs due to the result biasness towards the first variable in the VAR order. The following are the results for Generalised VDCs;

Horizon	Variable	LGDP	LSAV	LINT	LCF
	LGDP	92.88%	72.10%	21.84%	37.91%
5	LSAV	77.25%	95.79%	18.91%	11.86%
years	LINT	25.78%	19.10%	66.08%	34.54%
	LCF	36.17%	12.29%	8.62%	89.57%
	Exogeneity	92.88%	95.79%	66.08%	89.57%
	Ranking	2	1	4	3

Horizon	Variable	LGDP	LSAV	LINT	LCF
	LGDP	92.87%	72.09%	21.84%	37.92%
10	LSAV	77.25%	95.79%	18.91%	11.86%
years	LINT	25.78%	19.10%	66.08%	34.54%
	LCF	36.17%	12.29%	8.62%	89.57%
	Exogeneity	92.87%	95.79%	66.08%	89.57%
	Ranking	2	1	4	3

Horizon	Variable	LGDP	LSAV	LINT	LCF
	LGDP	92.87%	72.09%	21.84%	37.92%
15	LSAV	77.25%	95.79%	18.91%	11.86%
years	LINT	25.78%	19.10%	66.08%	34.54%
	LCF	36.17%	12.29%	8.62%	89.57%
	Exogeneity	92.87%	95.79%	66.08%	89.57%
	Ranking	2	1	4	3

Horizon	Variable	LGDP	LSAV	LINT	LCF
	LGDP	92.87%	72.09%	21.84%	37.92%
20	LSAV	77.25%	95.79%	18.91%	11.86%
years	LINT	25.78%	19.10%	66.08%	34.54%
	LCF	36.17%	12.29%	8.62%	89.57%
	Exogeneity	92.87%	95.79%	66.08%	89.57%
	Ranking	2	1	4	3

Table 6: Generalised VDCs

The forecast has been implemented for 20 years spans. Surprisingly every horizon indicates the same ranking for variables, with saving become the most exogenous series in each horizon. This is followed by GDP per capita, capital formation and interest rate.

The author is not sure on the validity of this analysis due to unchanged ranking over 20 years spans, but with reference to the growth theory such as Harrod-Domar model and Solow growth theory, this result seem make sense.

CUSUM and CUSUM Square Tests

Prior to ARDL analysis, the author undertook the Cumulative Sum of Recursive Residuals (CUSUM) and CUSUM of square (CUSUMSQ) test to investigate any recursive residual inherent in the variables. This is because the ARDL technique is sensitive to the structural break which if not will provide the invalid result. The figures below reflect the result of the CUSUM and CUSUMSQ test;

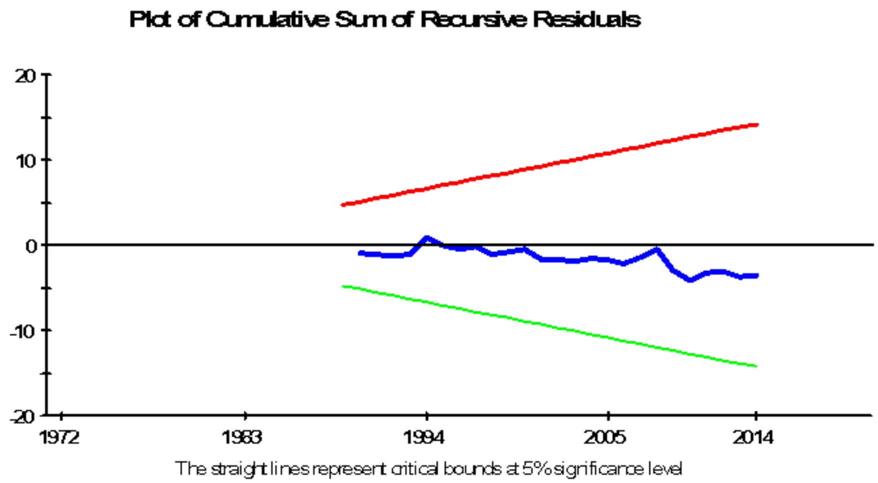

Figure 1: Result for CUSUM test

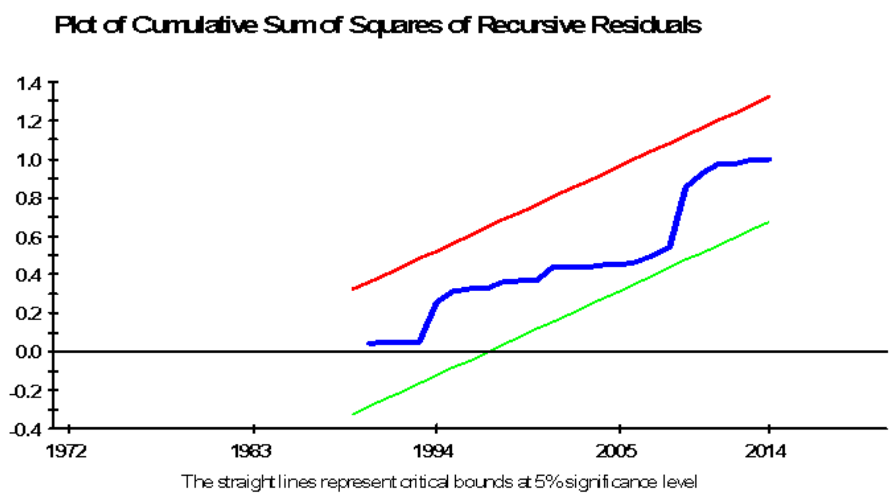

Figure 1: Result for CUSUMSQ test

It is important to note that the blue line must not cross the red and the green line for any of both charts. If it does not cross then it means that there is not issue of recursive residuals in terms of mean (in CUSUM) and in terms of variance (in CUSUMSQ) so we can proceed to the next step.

Conclusion

This paper is an attempt to re-investigate the causal link between savings and growth, particularly in Malaysia. After empirically analyse by using 47 years data span and recent econometrics approach of ARDL, this study concludes that there is a uni-directional causality exists between savings and growth, where savings leads to growth, and not vice versa. The finding thus is in tandem with the Solow growth model and Harrod-Domar model, where they suggest that increases of savings will affect the capital accumulation and thus economic growth in the long run.

Since this is an additional empirical evidence that support the previous literatures of savings led growth, thus policy for promoting savings should be geared up in order to stimulate growth and eventually will lead to the well-being of Malaysian economy. Revising the savings incentives perhaps would be one of the best ways in order to encourage the saving habit among people. The attractive savings incentives will attract people to save more and reduce wastage in spending.

In future, it is hoped that there will have an empirical study which include the population rate variables in the saving-growth nexus study for Malaysian economy. According to Solow model, the population growth rate will give an adverse effect on growth. However, it is interesting to test the effect of combination of savings and population rate to growth since it might empirically will gives the different inference.

REFERENCES

Agrawal, P. (2001). *The relation between savings and growth: Cointegration and causality evidence from Asia*. Applied Economics, 33(4), 499-513.

Alguacil, M, Cuadros, A. and Orts, V. (2004). *Does Saving Really Matter for Growth? Mexico (1970-2000)*. Journal of International Development, 16(2), 281-290.

Attanasio, O.P, Picci L, Scorcu A.E. (2000). *Saving, growth, and investment: A macroeconomic analysis using a panel of countries*. The Review of Economics and Statistics, 82(2): 182-211

Baharumshah, A.Z and Thanoon M.A. (2003). *Determinants of gross national saving in Malaysia: A macroeconomic analysis 1960-2000*. Savings and Development, 27(4), 421-440.

Baharumshah, A.Z, Thanoon M.A, and Rashid S. (2003). *Saving dynamics in the Asian countries*. Journal of Asian Economics, 13(6), 827-845.

Baumo,l. W.J, Blackman S.A.B and Wolfe E.N. (1991). *Productivity and American leadership: the long view*. Cambridge: MIT Press.

Boo M.C and Normee C.S. (2004). *Effect of foreign capital inflow and domestic savings on Malaysia's economic growth: Time series evidence*. The 16th Malaysian Economic Association Convention, 9 December 2004, Malaysia.

Carroll, C.D, Overland, J and Weil, D.N. (2000). *Saving and growth with habit formation*. The American Economic Reviews, 90(3), 341-355.

Chowdury, R.A (1987). *Are causal relationship sensitive to causality tests?* Applied Economics, 19, 459-465.

Domar, E.D. (1946). *Capital expansion, rate of growth, and employment*. Econometrica, 14(2), 137-147.

Harrod, R.F. (1939). *An essay in dynamic theory*. Economic Journal, 49(193), 14 - 33.

Khan, HHA, Zakaria Z, Abdullah H, Hassan S and Yaacob MA. (2011). *Savings and economic growth in Malaysia*. Economics and Finance Review, 1(6), 55 – 59

Lee, HY, Lin KS and Wu JL. (2002). *Pitfalls in using granger causality tests to find an engine of growth*. Applied Economics Letters, 9, 411-414.

Levine, R and Renelt D. (1992). *A sensitivity analysis of cross countries growth regression*. American Economic Review, 82(4), 942-963.

Lewis, W.A. (1955). *Theory of economic growth*. Allen and Unwin Ltd., London.

Lin, S.Y. (1992). Malaysia: *Saving-investment gap, financing needs and capital market development*. Malaysia Management Review, 27(4), 26-53.

Loayza, Norman and Rashmi Shankar (2000). *Private savings in India*. The World Bank Economic Review, 14(3), 571-594.

Mah, J.S. (2000). *An empirical examination of the disaggregated import demand of Korea — The case of information technology products*. Journal of Asian Economics, 11(2), 237-244.

Mankiw, N.G, Romer, D and Wei,l D.N. (1992). *A contribution to empirics of economic growth.* Quarterly Journal of Economic, 107(2), 681-712.

Mansur, K, Mamalakis M and Idris S. (2011). *Savings, investment & FDI contribution to Malaysian economic growth in the globalization era.* International Business & Economics Research Journal, 2(8), 1-14.

Masson, Paul R, Tamin Bayoumi, and Hossein Samiei . (1998). *International evidence on the determinants of private saving*. The World Bank Economic Review, 12(3), 483-501.

Mavrotas, G, Kelly R. (2001). *Old wine in new bottles: Testing causality between savings and growth.* The Manchester School, 69, 97-105

Modigliani, F. (1970). *The life cycle hypothesis of saving and intercountry differences in the saving ratio.* Induction, Growth, and Trade, (eds.) W.A. Eltis, M.F.G. Scott, and J.N. Wolfe. Oxford: Clarendon Press.

Pattichis, CS. (1999). *Time-scale analysis of motor unit action potentials.* IEEE Transactions on Biomedical Engineering, 46(11), 1320-1329.

Perron, P. (1989). *The great crash, the oil price shock and the unit root hypothesis*. Econometrica, 57(6), 1361–401.

Pesaran, M. H., Y. Shin and R. Smith. (2001). *Bounds testing approaches to the analysis of level relationships.* Journal of Applied Econometrics, 16, 289-326.

Ramesh, M. (2006). *Causal relationship between savings and economic growth in countries with different income levels*. *Economics Bulletin*, 5(3), 1-12

Rodrik, D. (2000). *Saving Transitions*. The World Bank Economic Review, 14(3), 481-507.

Sinha, D and Sinha, T. (1998). *Cart Before the Horse? The saving-growth nexus in Mexico*. Economics Letter, 61(1), 43-47.

Tang, C.F. (2008). *An empirical modelling on savings behaviour in Malaysia.* Labuan Bulletin of International Business and Finance, 6, 57–76.

Tang, C.F. (2009). *Does causality technique matter to savings-growth nexus in Malaysia?* Malaysian Management Journal 13 (1 & 2), 1-10.