Is the Financial-Led Growth Hypothesis Valid for Sri Lanka? – An ARDL Bounds Test Approach

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The financial-led growth hypothesis suggests that the financial development of a country plays a major role in its economic growth. Several channels through which financial development promotes growth in the economy include efficient allocation of capital, mobilization of savings through attractive instruments, lowering of the cost of the information gathering and presenting, among others. Financial development has been a much debated issue among economists and policy makers both in developed and developing countries, including Sri Lanka. This paper empirically examines the validity of the financial-led growth hypothesis in Sri Lanka using time series data from 1966 to 2016. The paper uses the Autoregressive Distributed Lag (ARDL) bounds testing for cointegration developed by Pesaran et al. (2001). The empirical results confirm the validity of the financial-led growth hypothesis for Sri Lanka.

Introduction

The financial-led growth hypothesis suggests that the financial development of a country plays a major role in its economic growth. According to World Bank (2001), financial development makes a significant contribution to growth; it is fundamental for poverty alleviation and is associated with immense improvements in income distribution. Although the relationship between financial development and economic growth has been one of the most debated issues in the literature since the pioneering contributions of Schumpeter (1912), Goldsmith (1969), McKinnon (1973), and Shaw (1973), there is no agreement among economists whether financial development causes economic growth or economic growth causes financial development. The literature suggests four possible relationships between finance and economic growth: finance-led growth referred to as supply-leading hypothesis, growth-driven finance referred to as demand-following hypothesis, a bidirectional relationship referred to as feedback, and no relationship between financial development and economic growth. The nature of the relationship is still an open issue in the literature. Therefore, it is important to establish the causality between financial development and economic growth as it has many implications for policy makers in respect of formulating policies for economic growth and development.

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Since political independence in 1948 up to 1977, the financial sector development of Sri Lanka was highly restricted by enforcing different financial regulations, especially since the early 1960s. During this period of time, private sector involvement in the financial sector was highly restricted and the foreign financial institutions were virtually eliminated. As a result, there was inefficient allocation of financial resources, and subsequently it undermined the economic growth of the country. The country officially introduced financial liberalization policies under economic reforms in 1977, paving the way for sustained economic growth. These policy reforms are considered to be responsible for financial deepening in Sri Lanka (Chandana, 2000; and Rexiang and Rathanasiri, 2011). The financial sector development was impressive from 1977 to 2008 along with the introduction of a series of policy reforms in the financial sector. These reforms include removing the entry restriction of foreign banks to the local market and a number of regulations on local private banks, significant reforms in foreign exchange transactions and exchange rate mechanism, lifting credit ceilings, changes in the financial legal framework, interest rate deregulation, reducing reserve requirements, current account liberalization, modernizing the payment and settlement systems, and opening the foreign currency banking units. As a result of this wide range of reforms, entry barriers to the financial sector were removed, new forms of financial institutions were introduced and interest rate ceilings and preferential credit facilities were also removed (Seelanatha and Wickremasinghe, 2009). A number of domestic and foreign banks and other financial institutions were established, and the branch network expanded. The most advanced technology and banking practices were also introduced competitively. A competitive financial environment was created due to these reforms. Overall, Sri Lanka's financial sector has achieved a commendable development and it is well above many developing countries, particularly in the field of financial institutions, markets, instruments, financial products, innovations, delivery efficiency, application of new technology, proper supervision and liberal policies in the financial sector.

This study investigates the financial-led growth hypothesis in Sri Lanka using time series data from 1966 to 2016, and is significant in terms of its contribution to economic literature in Sri Lanka and other similar developing countries. This study is the first attempt to investigate the financial led-growth hypothesis by using a more appropriate econometric technique, the ARDL bounds testing—a test that has not been applied for finance-led growth hypothesis on Sri Lanka.

Literature Review

The theoretical foundation of the relationship between the financial development and economic growth is a rich and diverse area. The roots of the theoretical discourse go back to the work of Schumpeter (1912) and thereafter to Goldsmith (1969), McKinnon (1973) and Shaw (1973). According to Schumpeter, financial intermediaries play a key role in fostering technological innovation and economic growth by providing basic services such as mobilizing savings, evaluating investment projects, managing and pooling risks, monitoring managers,

and facilitating transactions. Goldsmith argued that the financial sector development plays a crucial role in fostering economic growth by providing basic services such as mobilizing savings, monitoring managers, evaluating investment projects, managing and pooling risks, and facilitating transactions.

McKinnon and Shaw have supported Schumpeter's view to promote development of the financial sector for economic growth. They argue that government restrictions on the banking system such as interest rate ceilings, high reserve requirements and directed credit programs, prohibitive taxes on transactions, and restrictions on global players have a negative effect on the development of the financial sector, consequently adversely affecting the economic growth of a country. According to their model, a more liberalized financial system will induce an increase in savings and investment and therefore, promote economic growth. Scholars such as Bencivenga and Smith (1991) and Shan *et al.* (2001) also suggest that financial intermediation has a positive effect on steady-state growth. Further, Benhabib and Spiegel (2000) argue that a positive relationship is expected between financial development and total factor productivity growth.

Theoretical research in the 1990s on the relationship between financial development and long-run growth received new impetus, especially from the endogenous growth. The endogenous growth literature has reached similar conclusions with the McKinnon-Shaw hypothesis by explicitly modeling the services provided by financial intermediaries such as risk-sharing and liquidity provision. The endogenous growth literature provides ample evidence that financial development is a key determinant of economic growth. The financial intermediaries and securities markets, for the purpose of this theory, allow business owners and investors to undertake innovative activities leading to economic growth. This theory interconnects financial development with economic growth based on the logic to reduce information, transaction, and monitoring costs. A well-developed financial system performs a number of critical functions to augment intermediation efficiency. As a result, enhanced financial intermediation efficiency causes economic growth. Greenwood and Jovanovic (1990) developed a model in which financial intermediation and growth were both endogenous. These authors assumed that there was a positive two-way causal relationship between financial development and economic growth. King and Levine (1993b) argued that the financial intermediaries and securities markets allow certain entrepreneurs to undertake inventive activities, which affect economic growth through productivity improvement.

Empirical Studies

Numerous empirical studies have been carried out to examine the relationship between financial development and economic growth as it is a practically useful area for policy analysts. Table 1 summarizes the findings of the influential studies on the relationship between financial development and economic growth, specifically for developing countries, and some other studies in the context of the SAARC region.

Table 1: Previous Findings on the Direction of Causality Between Financial Development and Economic Growth, Various Countries			
Author	**Country**	**Period**	**Direction of Causality**
King and Levine (1993a)	80 countries	1960-1989	FD ⇒ EG
Gregorio and Guidotti (1995)	100 countries	1960-1989	FD ⇒ EG
Odedokun (1996)	71 countries	1960-1980	FD ⇒ EG
Levine (1998)	44 countries	1975-1993	FD ⇒ EG
Neusser and Kugler (1998)	13 countries	1970-1991	FD ⇒ EG
Rousseau and Wachtel (1998)	5 countries	1871-1929	FD ⇒ EG
Levine *et al.* (2000a)	71 countries	1961-1995	FD ⇒ EG
Levine *et al.* (2000b)	74 countries	1960-1995	FD ⇒ EG
Jaffee and Levonian (2001)	23 countries	1995	FD ⇒ EG
Khan and Senhadji (2003)	159 countries	1960-1999	FD ⇒ EG
Fatima (2004)	Morocco	1970-2000	FD ⇒ EG
Christopoulos and Tsionas (2004)	10 countries	1970-2000	FD ⇒ EG
Fink *et al.* (2005)	33 countries	1990-2001	FD ⇒ EG
Khan *et al.* (2005)	Pakistan	1971-2004	FD ⇒ EG
Acaravci *et al.* (2007)	Turkey	1986-2006	FD ⇒ EG
Apergis *et al.* (2007)	65 countries	1975-2000	FD ⇒ EG
Sanusi and Salleh (2007)	Malaysia	1960-2002	FD ⇒ EG
Majid (2008)	Malaysia	1998-2006	FD ⇒ EG
Kiran *et al.* (2009)	10 countries	1968-2007	FD ⇒ EG
Caporale *et al.* (2009)	10 New EU countries	1994-2007	FD ⇒ EG
Atif *et al.* (2010)	Pakistan	1980-2009	FD ⇒ EG
Kargbo and Adamu (2010)	Sierra Leone	1970-2008	FD ⇒ EG
Rexiang and Rathanasiri (2011)	Sri Lanka	1977-2008	FD ⇒ EG
Ewetan and Okodua (2013)	Nigeria	1981-2011	FD ⇒ EG
Ray (2013)	India	1990-2011	FD ⇒EG
Jung (1986)	56 countries	1948-1981	EG ⇒ FD
Agbetsiafa (2003)	8 countries	1963-2001	EG ⇒ FD
Waqabaca (2004)	Fiji	1970-2000	EG ⇒ FD

Table 1 (Cont.)

Author	Country	Period	Direction of Causality
Odhiambo (2004)	South Africa	1968-2000	EG ⇒ FD
Zang and Kim (2007)	74 countries	1961-1995	EG ⇒ FD
Guryay *et al.* (2007)	Northern Cyprus	1986-2004	EG ⇒ FD
Odhiambo (2008)	Kenya	1969-2005	EG ⇒ FD
Amarathunga (2010)	Sri Lanka	1960-2008	EG ⇒ FD
Ndlovu (2013)	Zimbabwe	1980-2006	EG ⇒ FD
Sunde (2013)	Namibia	1990-2011	EG ⇒ FD
Murinde and Eng (1994)	Singapore	1979-1990	FD ⇔ EG
Luintel and Khan (1999)	10 countries	1951-1995	FD ⇔ EG
Al-Yousif (2002)	30 countries	1970–1999	FD ⇔ EG
Caldero and Liu (2003)	109 countries	1960-1994	FD ⇔ EG
Abu-Bader and Abu-Qarn (2006)	05 countries	1960-2004	FD ⇔ EG
Yucel (2009)	Turkey	1989-2007	FD ⇔ EG
Odeniran and Udeaja (2010)	Nigeria	1960-2009	FD ⇔ EG
Jahfer and Inoue (2014)	Sri Lanka	1996-2011	FD ⇔ EG

The above reviews of the empirical findings confirmed that though the relationship between financial development and economic growth has mostly supported that financial development has a positive impact on economic growth, the evidence on the relationship mainly suggests a mixed finding. As can be seen, about 58% of the studies support causality from FD to EG, while 23% support the opposite direction. And the remaining support bidirectional causality between FD and EG. This diverse result arises due to the types of data, the alternative econometric methods, time periods that were considered, and the characteristics of various countries.

Data and Methodology

Annual time series data on GDP per capita, employment, gross fixed capital formation, financial development, inflation and trade openness, during the periods 1966-2016, have been used in this study. Following standard practice, we take natural logarithm of GDP per capita as an indicator of economic growth that is denoted by *LGDPPC* (King and Levine, 1993a; Demetriades and Hussein, 1996; Luintel and Khan, 1999; Levine *et al.*, 2000a; and Ravinthirakumaran and Ravinthirakumaran, 2018). The number of employees is used as a proxy for labor that is denoted by *LEMP* and the Gross Fixed Capital Formation (*LGFCF*)

has been used as a proxy for capital investment because of unavailability of data of capital stock (see for example, Balasubramanyam *et al.*, 1996; Barro, 1999; Kohpaiboon, 2003: and Shafiullah and Ravinthirakumaran, 2016). In this study, inflation is measured by the GDP deflator (*INF*) and the measure of trade openness is the ratio of sum of exports and imports to GDP (*LOPEN*) (Quispe-Agnoli and McQuerry, 2001; Rousseau and Sylla, 2001; Chang, 2002; Siddiki, 2002; and Ravinthirakumaran, 2014).

Various measures have been used in the literature to proxy for the financial development. This study constructs financial development variable using three main financial development indicators: the domestic credit provided by the banking sector as a percentage of GDP (*DCBS*), the domestic credit to private sector as a percentage of GDP (*DCPS*) and the broad money (M_2) as a percentage of GDP (M_2GDP). A higher *DCBS* indicates a higher degree of dependence on the banking sector for financing and higher development of the financial system. A higher M_2GDP ratio implies a larger financial sector and therefore a greater financial intermediary development. Finally, this study used the method of Levine *et al.* (2000a) to address the stock-flow problem of financial development variables. The problem refers to the fact the financial balance sheet items are measured at the end of the year, while GDP is measured during the year. According to Levine *et al.* (2000a), the present study deflated end-of-year financial balance sheet items by end-of-year Consumer Price Index (CPI), so that the average of the real financial balance sheet items in years t and $t-1$ are computed divided by real GDP in year t (Hassan *et al.*, 2011)[1]. All the variables in the dataset of this study are transformed into natural logarithms for the usual statistical reasons, except inflation. All the data has been gathered from the official database of the World Bank (2017) and various annual reports of Central Bank of Sri Lanka.

Econometrics Model

The paper uses the recently developed Autoregressive Distributed Lag (ARDL) bounds testing approach of cointegration, which was originally introduced by Pesaran and Shin (1999) and further extended by Pesaran *et al.* (2001). The ARDL approach, being a single equation technique, enjoys several advantages over the conventional type of cointegration methodologies.[2]

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[1] Our measures of financial development variables are calculated as follows:

$$FD_{i,t} = \frac{\frac{1}{2}[FD_{i,t-1}/CPI_{t-1}] + FD_{i,t}/CPI_t}{GDP_t}$$

where $FD_{i,t} = \{DCBS, DCPS, M_2GDP\}$

FD: Financial Development; *CPI*: Consumer Price Index (2005 = 100); *DCBS*: Domestic Credit provided by the Banking Sector as a percentage of GDP; *DCPS*: Domestic Credit to the Private Sector as a percentage of GDP; M_2GDP: Broad Money as a Percentage of GDP.

[2] The conventional methodologies include the residual-based Engle and Granger (1987) test, Johansen (1988), Johansen and Juselius (1990) and Gregory and Hansen (1996).

Firstly, the ARDL procedure is statistically a more significant approach to determine the cointegration relation in small samples and henceforth conducting bounds testing will be appropriate for the present study. The second advantage of the ARDL model, given the power and testing of the long-run relationship, is that it can be applied irrespective of whether underlying regressors are purely I(0), purely I(1) or mutually cointegrated. Thirdly, the technique estimates the short-run and long-run components of the model simultaneously, removing problems associated with omitted variables and autocorrelation. And finally, this procedure generally provides unbiased estimates of the long-run model and valid *t*-statistic even when some of the regressors are endogenous (Harris and Sollis, 2003).

An ARDL representation can be specified as follows:

$$\Delta LGDPPC_t = \beta_0 + \beta_1 \sum_{i=1}^{p} \Delta LGDPPC_{t-1} + \beta_2 \sum_{i=1}^{p} \Delta LEMP_{t-1} + \beta_3 \sum_{i=1}^{p} \Delta LGFCF_{t-1}$$

$$+ \beta_4 \sum_{i=1}^{p} \Delta FD_{t-1} + \beta_5 \sum_{i=1}^{p} \Delta INF_{t-1} + \beta_6 \sum_{i=1}^{p} \Delta LOPEN_{t-1} + \delta_1 LGDPPC_{t-1}$$

$$+ \delta_2 LEMP_{t-1} + \delta_3 LGFCF_{t-1} + \delta_4 FD_{t-1} + \delta_5 INF_{t-1} + \delta_6 LOPEN_{t-1} + \mu_t \quad ...(1)$$

where β_0 is the constant and μ_t is the white noise error term; the error correction dynamics is denoted by a summation sign, while the second part of the equation corresponds to long-run relationship. Schwarz Bayesian Criterion (SBC) has been used to identify the optimum lag of model. Pesaran and Smith (1998) argue that the SBC should be used in preference to other model specification criteria because it often has more parsimonious specifications; the relatively small sample data in this study reinforces this point.

To investigate the presence of long-run relationship among the selected variables, bound testing procedure is used, which is based on the *F*-test. The *F*-test is a test of the hypothesis of no cointegration among the variables against the existence or presence of cointegration among the variables, denoted as:

H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$ *(No cointegration)*

H_1: *At least one* $\delta_1 \neq 0$ *(Cointegration exists)*

In the ARDL approach, this paper first estimates the *F*-statistic by using the appropriate ARDL models. Then, the Wald (*F*-statistic) test is used to investigate the long-run relationship among the series. For that, the computed *F*-statistic is compared with sets of critical values for the bound test. Pesaran *et al.* (1996) tabulated two sets of critical values for the bound test and were reproduced by Pesaran and Pesaran (1997) and Pesaran *et al.* (2001). The first set of critical values assumes all variables to be I(0) and it is the Lower Critical Bound (LCB), and the other set of critical values assumes that all variables are I(1), which is the Upper Critical

Bound (UCB). The null hypothesis of no cointegration is rejected if the calculated *F*-statistic exceeds the UCB value. The results are said to be inconclusive if the *F*-statistic falls between the UCB and LCB. Lastly, the null hypothesis of no cointegration is accepted if the *F*-statistic is below the LCB. However, Narayan (2004 and 2005) argues that existing critical values, because they are based on large sample sizes, cannot be used for small sample sizes. Given a relatively small sample size in this study of 52 observations, the critical values used are as reported by Narayan (2004) which is based on small sample size between 30 and 80.[3]

If a long-run relationship between financial development and economic growth is found then we estimate the long-run coefficients. The following model will be used to estimate the long-run coefficients:

$$LGDPPC_t = \alpha_0 + \alpha_1 \sum_{i=1}^{p} LGDPPC_{t-1} + \alpha_2 \sum_{i=1}^{p} LEMP_{t-1} + \alpha_3 \sum_{i=1}^{p} LGFCF_{t-1}$$

$$+ \alpha_4 \sum_{i=1}^{p} FD_{t-1} + \sum_{i=1}^{p} INF_{t-1} + \sum_{i=1}^{p} LOPEN_{t-1} + \mu_t \quad ...(2)$$

If there are evidences to support the long-run relationship between financial development and economic growth then this study estimates the short-run coefficients by employing the following model:

$$\Delta LGDPPC_t = \psi_0 + \psi_1 \sum_{i=1}^{p} \Delta LGDPPC_{t-1} + \psi_2 \sum_{i=1}^{p} \Delta LEMP_{t-1} + \psi_3 \sum_{i=1}^{p} \Delta LGFCF_{t-1}$$

$$+ \psi_4 \sum_{i=1}^{p} \Delta FD_{t-1} + \psi_5 \sum_{i=1}^{p} \Delta INF_{t-1} + \psi_6 \sum_{i=1}^{p} \Delta LOPEN_{t-1} + \gamma ECT_{t-1} + \mu_t \quad ...(3)$$

The Error Correction Model (ECM) shows the speed of adjustment needed to restore the long-run equilibrium following a short-run shock. The γ is the coefficient of error correction term in the model that indicates the speed of adjustment.

Before proceeding further with the ARDL bounds test, this study tests for the stationarity of the selected time series data to determine their order of integration. This is to ensure that the variables should not be stationary at an order of I(2) because the computed *F*-statistic provided by Pesaran *et al.* (2001) is valid only when the variables are I(0) or I(1). To check the stationarity, the study uses the Augmented Dickey-Fuller (ADF) (1979) test and Phillips and Perron (PP) (1988) test.

Results and Discussion

Table 2 presents the results of stationarity tests. First, these tests are applied on the level of variables then on their first difference.

[3] Pesaran and Pesaran (1997) and Pesaran *et al.* (2001), however, generated critical values based on 500 and 1000 observations and 20,000 and 40,000 replications, respectively, which are suitable for a large sample size.

Table 2: Results of ADF and PP Tests								
Variable	ADF				PP			
	Level Form		First Differenced Form		Level Form		First Differenced Form	
	t-Statistic	*p*-Value	*t*-Statistic	*p*-Value	*t*-Statistic	*p*-Value	*t*-Statistic	*p*-Value
LGDPPC	0.605	0.999	5.482*	0.000	0.566	0.999	5.352*	0.000
LEMP	1.352	0.862	5.763*	0.000	1.606	0.776	5.649*	0.000
LGFCF	1.739	0.719	6.258*	0.000	1.738	0.719	6.263*	0.000
FD	6.965*	0.000	–	–	8.551*	0.000	–	–
INF	4.963*	0.001	–	–	4.923*	0.001	–	–
LOPEN	1.912	0.631	5.310*	0.000	2.272	0.441	5.319*	0.000
Note: * indicates significance at 1% level.								

The reported results in Table 2 suggest that all variables are non-stationary when tested in level form and are stationary and integrated at first difference, except financial development and inflation. This implies that the series of variables may exhibit a valid long-run relationship.

Given a relatively small sample size (50) and the use of annual data, a lag length of 2 is used in the bounds test. For annual data, Pesaran and Shin (1999) suggest a maximum of 2 lags (see also Narayan, 2004; and Narayan and Siyabi, 2005).

The computed *F*-statistic for the cointegration test is displayed in Table 3. The critical value is reported together in the same table which is based on the critical value suggested by Narayan (2004). The calculated *F*-statistic (i.e., 5.1204) is higher than the upper bound critical value at 5% level of significance (4.218), using restricted intercept with trend. The result shows that the null hypothesis is rejected at 5% significance level in favor of the alternative, that there exists a cointegration relationship among the variables.

The orders of the ARDL model in the six variables are selected by using SBC. Equation (2) is estimated using the following ARDL (2, 1, 1, 0, 2, 0) specification. The estimated long-run coefficients of the model given in Equation (2) are reported in Table 4. The long-run test statistics indicate that the estimated coefficients of the long-run relationship are significant for all (except trade openness [*LOPEN*]) but in different significant levels.

The estimated coefficient of Financial Development (*FD*) has a positive impact on economic growth (*LGDPPC*) at 5% level. This suggests that in the long run, for a 1% increase in the financial development, the economic growth, on average, increases by about 0.06%. It confirms that, in the long run, there is a positive effect of financial development on economic growth in Sri Lanka. The labor force variable (*LEMP*) and capital investment variable (*LGFCF*) have the expected positive signs and are significant at 1% level. The macroeconomic stability variable, *INF*, has an expected negative sign and is significant at 1% level in the long

Table 3: *F*-Statistic of Cointegration Relationship			
Computed *F*-Statistic	Critical Values		Significance Level
	Lower Bound	Upper Bound	
5.1204**	3.955	5.583	1%
	2.900	4.218	5%
	2.435	3.600	10%

Note: ** shows the cointegration present at 5% level of significance. The upper and lower bounds were obtained using restricted intercept with trend. The critical values are obtained from Narayan (2004) Table: Case III.

Table 4: Long-Run Results Using ARDL Model			
Variable	Coefficient	*t*-Statistic	Probability
C	4.154*	7.073	0.000
FD	0.061**	1.778	0.044
LEMP	0.166*	6.372	0.000
LGFCF	0.220*	7.395	0.000
LOPEN	0.021	0.288	0.775
INF	–0.006*	–2.435	0.020

Note: * and ** indicate significance at 1% and 5% levels, respectively.

run. The trade openness (*LOPEN*) has a positive impact on economic growth but is insignificant. The long-run relationship between the variables indicates that there is Granger-causality in at least one direction which is determined by the *F*-statistic and the lagged error-correction term.

The results of short-run dynamic coefficients associated with the long-run relationships obtained from the ARDL-ECM Equation (3) are presented in Table 5. The optimal lag length for the selected error correction representation of the ARDL (2, 1, 1, 0, 2, 0) model is determined by the SBC. The given ECM is derived from the ARDL to be used for carrying out the Granger causality test.

Table 5 represents the short-run relationship between financial development and economic growth. The results reveal that the lagged error correction term for the estimated economic growth equation is both negative and statistically significant. This confirms a valid short-run relationship between financial development and economic growth in Sri Lanka. The coefficient of the error term is –0.1895 suggesting that about 18% of disequilibrium is corrected in the current year.

Further, the results indicate the positive and significant effect of financial development on economic growth in the short run as well. In the short run, employment, capital investment

Table 5: Short-Run Results Using ARDL Model			
Variable	**Coefficient**	***t*-Statistic**	**Probability**
$\Delta GDPPC1$	0.381*	0.381	0.027
ΔFD	0.011*	2.171	0.036
$\Delta LEMP$	0.031*	2.636	0.012
$\Delta LGFCF$	0.076*	3.345	0.002
$\Delta LGFCF1$	0.085*	3.636	0.001
$\Delta LOPEN$	0.070*	2.520	0.016
ΔINF	–0.353	–0.848	0.401
$ECT\ (-1)$	–0.189	–3.419	0.001
R^2	0.661		
$\bar{R}^2$	0.561		
F-Statistic	9.047		0.000
DW-Statistic	1.892		
Note: * indicates significance at 1% level.			

and trade openness have the expected positive sign and significant at 1% level. The macroeconomic stability variable has a negative impact but is insignificant.

The results of short-run Granger causality tests are shown in Table 6. As can be seen in the table, in the short run, the *F*-statistic on the explanatory variables suggests that at 1% level or better there is bidirectional Granger causality between capital investment and economic growth, employment and economic growth, and employment and capital investment. Further, it can be noticed from the table that at 5% level or better there is bidirectional Granger causality between financial development and economic growth, openness and economic growth, and inflation and capital investment. Further, the result shows that at 10% level or better, there is bidirectional Granger causality between inflation and economic growth, and openness and financial development.

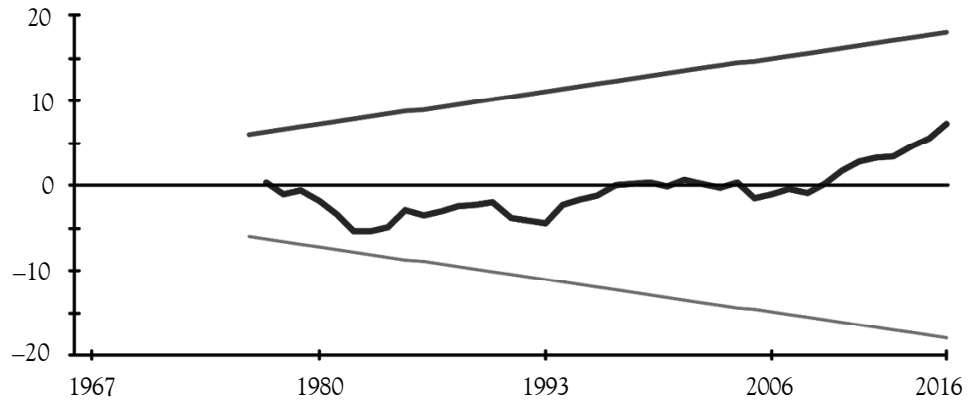
The cointegration relationship does not imply the stability of the estimated model; appropriate stability tests need to be conducted additionally after the cointegration is established. This paper has examined the stability of the long-run parameters together with the short-run movements for the equations. For the test, this paper relied on cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests proposed by Borensztein *et al.* (1998). This same procedure has been utilized by Pesaran and Pesaran (1997) and Mohsen and Ng (2002) to test the stability of the long-run coefficients. CUSUM test detects systematic changes from the coefficients of regression, while CUSUMSQ is able to detect the sudden changes from constancy of regression coefficients (Brown *et al.*, 1975). Figures 1 and 2 represent the results of CUSUM and CUSUMSQ tests, respectively. The results indicate that the statistics of both CUSUM and CUSUMSQ test lie within the interval bands at 5% confidence

Table 6: Results of Short-Run Granger Causality

Dependent Variable	F-Statistic						Direction of Causality
	ΔLGDPPC	ΔFD	ΔLEMP	ΔLGFCF	ΔLOPEN	ΔINF	
ΔLGDPPC	–	4.716** (0.030)	6.948* (0.008)	20.563* (0.000)	7.233** (0.027)	5.527*** (0.063)	FD ⇒ GDPPC EMP ⇒ GDPPC GFCF ⇒ GDPPC OPEN ⇒ GDPPC INF ⇒ GDPPC
ΔFD	8.607** (0.014)	–	0.008 (0.928)	0.009 (0.921)	4.727*** (0.094)	0.035 (0.852)	GDPPC ⇒ FD OPEN ⇒ FD
ΔLEMP	21.079* (0.000)	0.224 (0.636)	–	17.118* (0.000)	0.254 (0.987)	0.037 (0.847)	GDPPC ⇒ EMP GFCF ⇒ EMP
ΔLGFCF	21.695* (0.000)	0.003 (0.955)	12.673* (0.000)	–	1.865 (0.172)	9.935** (0.019)	GDPPC ⇒ GFCF EMP ⇒GFCF INF ⇒ GFCF
ΔLOPEN	11.969* (0.003)	3.071*** (0.080)	2.001 (0.157)	2.779*** (0.095)	–	0.146 (0.702)	GDPPC ⇒ OPEN FD ⇒ OPEN GFCF ⇒ OPEN
ΔINF	7.081* (0.008)	3.503 (0.174)	1.509 (0.219)	12.049* (0.001)	0.297 (0.586)	–	GDPPC ⇒ INF GFCF ⇒ INF

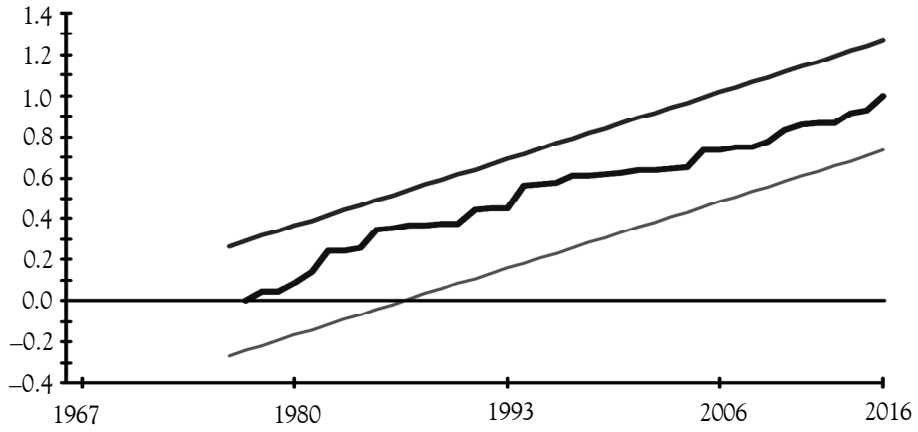
Note: *, **, *** indicate significance at 1%, 5% and 10% levels, respectively.

Figure 1: Plot of Cumulative Sum of Recursive Residuals



Note: The straight lines represent critical bounds at 5% significance level.

Figure 2: Plot of Cumulative Sum of Squares of Recursive Residuals



Note: The straight lines represent critical bounds at 5% significance level.

interval. The results also suggest that there is no structural instability in the residuals of equation of economic growth.

The reliability of parameters estimated is tested by applying usual diagnostic tests, viz., Lagrange multiplier test of residual serial correlation, Ramsey's RESET test using the square of the fitted values for correct functional form, normality test based on skewness and kurtosis of residuals, and heteroskedasticity test based on the regression of squared residuals on squared fitted values.

As can be seen in Table 7, the model generally passes all diagnostic tests in the first stage. These tests show that there is no evidence of autocorrelation and that the models pass tests for normality, thus proving that the error is normally distributed. The adjusted R^2 shows (Table 5) that around 56% of the variation in economic growth is explained by the regress in the model.

Table 7: Diagnostic Test

Test Statistics	LM Version	*F*-Version
A: Serial Correlation	CHSQ (1) = 0.2820 (0.595)	$F(1,36)$ = 0.2084 (0.651)
B: Functional Form	CHSQ (1) = 0.3570 (0.180)	$F(1,36)$ = 0.3140 (0.390)
C: Normality	CHSQ (2) = 0.5228 (0.770)	Not applicable
D: Heteroskedasticity	CHSQ (1) = 0.4346 (0.835)	$F(1,47)$ = 0.4172 (0.839)

Note: A: Lagrange multiplier test of residual serial correlation; B: Ramsey's RESET test using the square of the fitted values; C: Based on a test of skewness and kurtosis of residuals; D: Based on the regression of squared residuals on squared fitted values.

Conclusion

This paper has empirically examined the validity of the financial-led growth hypothesis in Sri Lanka over the period 1966 to 2016. The ARDL bounds testing approach to cointegration was adopted to estimate the long-run relationship and short-run dynamic parameters of the model. The test suggests that there exists a unique cointegrating relationship among real GDP, financial development, employment, capital investment, inflation and trade openness. The Granger causality test confirmed that there exists a bidirectional causality between financial development and economic growth. This implies that financial development stimulates economic growth and, simultaneously, economic growth propels financial development. The finding confirms that financial development and economic growth were very interdependent in Sri Lanka during the period 1966-2016. Furthermore, the result reveals that there exists a bidirectional causality between other macroeconomic variables such as economic growth and employment, economic growth and capital investment, economic growth and trade openness, economic growth and inflation, financial development and trade openness, employment and capital investment and between inflation and capital investment.

The policy implication of this result is that financial development is considered as the policy variable to accelerate economic growth and it could be used as the policy variable to generate financial development in the country. Therefore, to maintain a sustainable economic growth, the government has to deepen the financial sector and undertake essential measures to strengthen the long-run relationship between financial development and economic growth.

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