Does financial development drive economic growth ? an ARDL approach

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Does financial development drive economic growth ? an ARDL approach

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Abstract*:* This paper examines the Granger-causal relationship between financial development and economic growth. India is taken as a case study. The Auto-Regressive Distributed Lag (ARDL) method (also known as the bounds testing approach) proposed by Pesaran-Shin-Smith (2001) has been employed The study finds that financial development and economic growth are cointegrated in the long run i.e. there is a long run theoretical relationship between these variables. Our findings are in line with (McKinnon (1973); King and Levine (1993a, b); Neusser and Kugler (1998); Levine (1997); Beck (2000). For a developing country like India financial development is evidenced to lead growth rather than the other way around. This has a major policy implication for the government of India. If government wants to increase economic growth, it can do so by bringing out reforms in the banking sector and capital market sector. Hence, India may consider banking sector and capital market sector as the policy variables and the authorities should take necessary steps to bring about reforms in these sectors to enhance economic growth in the economy.

Keywords: lead-lag, economic growth, financial development, ARDL, India

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1.0 Introduction

The optimal financial structure that promotes long-run economic growth culminates in four distinct views: the bank-based, the market-based, the financial services, and the law and finance (Dolar & Meh, 2002; Levine, 2005). The bank-based view emphasizes the important role of intermediaries to stimulate economic growth. Being intermediaries they facilitate the channelling of funds between lender and borrower's indirectly. As these funds are invested in production it fuels the engine of economic growth. Therefore, the economic growth is seen as connected to the indirect finance spread (Gurley & Shaw, 1960). Considering the microeconomic foundations of intermediation, the bank was regarded as the best tool to overcome market frictions; it reduced information cost (Greenwood & Jovanovic, 1990), mobilized savings and provided liquidity (Gorton & Pennacchi, 1990).

The market-based proponents insist on the merits of market financing. They say markets helps in diversification of risk and provide necessary risk management tools to identify, measure, mitigate and evaluate various risk. The markets provide information in an effective way which helps managers in taking critical decisions. This helps the mangers in better funding of projects of new technologies subject to diversity of opinions (Boot & Thakor, 1997).

The financial services view, developed by Merton and Bodie (1995), overcame this distinction and minimized the importance of bank-based/market-based debate. According to Levine (1997), the emphasis is put on the stability of financial functions carried out by both banks and markets. It says that focus should be on the capacity of the overall system to offer various important financial services, rather than on institutional structure.

According to the legal view developed by LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1997), bank based/market based classification is not a useful way to distinguish financial systems. They say financial development components are determined by the legal codes which protects various rights of the contracting parties and the efficiency of contracts.

Financial development and economic growth are positively correlated and finance plays an important role in growth in the long run (Goldsmith, 1969; King and Levine, 1993; Demirguc-Kunt and Levine, 2004; Beck, Levine, and Loayza, 2000; Beck et al., 2014.

On the other hand, many economists argue finance is a relatively unimportant factor in economic development. Particularly, Robinson (1952) contends that financial development simply follows economic growth. Later, Lucas (1988) terms the relationship between financial development and economic growth "overstressed" (cited in King & Levine, 1993). We can state that in spite of voluminous amount of research the issue is still remain somewhat controversial.

While there is no doubt that a developed economy needs a sophisticated financial sector, at the current state of knowledge there is no empirical evidence to support the notion especially with respective to India.

To full fill this gap, a humble attempt has been made to look into this conflicting causality between financial development and economic growth in India by employing yearly data over the period 1960 – 2013 by using a robust and advanced time series technique, Autoregressive Distributed Lag (ARDL) cointegration method which is applicable regardless weather the variables are I (1) or I (0).

Financial development and economic growth found to be cointegrated in the long run i.e. there is a long run relationship between these variables in India. Our findings are in line with (McKinnon (1973); King and Levine (1993a, b); Neusser and Kugler (1998); Levine (1997); Beck (2000). For a developing country like India financial development leads growth rather than other way around.

This has a major policy implications for government of India. If government wants to increase the economic growth, it can do so by the bringing out the reformation in the banking sector and capital market sector. Hence, India should consider banking sector and capital market sector as the policy variable and authorities should take necessary steps to bring the reform in these sectors to enhance economic growth in the economy.

The paper is organized as follows. Section 2 reviews on the relevant theoretical and empirical literature. Data and methodology are explained in section 3. The empirical results and discussions are presented in section 4. The last section ends with the concluding remarks and policy implications of the paper.

1.1 Economy of India

The economy of India is the seventh-largest in the world by nominal GDP and the third-largest by purchasing (PPP). The country is classified as a newly industrialized country, one of the G-20 major economies, a member of BRICS and a developing economy with approximately 7% average growth rate for the last two decades. The long-term growth prospective of the Indian economy is moderately positive due to its young population, corresponding low dependency ratio, healthy savings and investment rates, and increasing integration into the global economy. The Indian economy has the potential to become the world's 3rd-largest economy by the next decade, and one of the largest economies by mid-century. And the outlook for short-term growth is also good as according to the IMF, the Indian economy is the "bright spot" in the global landscape. India also topped the World Bank's growth outlook for 2015-16 for the first time with the economy having grown 7.3% in 2014-15 and expected to grow 7.5-8.3% in 2015-16.

India has the one of fastest growing service sectors in the world with annual growth rate of above 9% since 2001, which contributed to 57% of GDP in 2012-13. India has capitalized its economy based on its large educated English-speaking population to become a major exporter of IT services, BPO services, and software services with $167.0 billion worth of service exports in 2013-14. It is also the fastest-growing part of the economy. The IT industry continues to be the largest private sector employer in India. The agricultural sector is the largest employer in India's economy but contributes to a declining share of its GDP (17% in 2013-14). India ranks second worldwide in farm output. The Industry sector has held a constant share of its economic contribution (26% of GDP in 2013-14). The Indian auto mobile industry is one of the largest in the world with an annual production of 21.48 million vehicles (mostly two and three wheelers) in FY 2013-14. India has $600 billion worth of retail market in 2015 and one of world's fastest growing E-Commerce markets.

India's two major stock exchanges, Bombay Stock Exchange and National Stock Exchange of India, had a market capitalization of US$1.71 trillion and US$1.68 trillion respectively as of Feb 2015, which ranks 11th & 12 largest in the world respectively according to the World Federation of Exchanges.

2.0 Literature Review

Many theories have been developed to explain the phenomena of growth. One of the most prominent areas of growth research is the study of finance-growth nexus. In his ground breaking research Schumpeter (1911) (cited in King & Levine, 1993) argued that the financial intermediaries play an important role in technological innovation and economic development.

Goldsmith (1969) argues that one of the most important problems in the field of finance, is the effect that financial structure and development have on economic growth (Goldsmith, 1969 cited in Demirguc-Kunt and Levine, 2004, 3).

Comprehensive amount of research has been conducted in this field and has been growing continuously. Many of the research work done on this subject says that financial development promotes growth. (McKinnon (1973); King and Levine (1993a, b); Neusser and Kugler (1998); Levine (1997); Beck (2000)

On the other hand, many economists argue finance is a relatively unimportant factor in economic development. Particularly, Robinson (1952) contends that financial development simply follows economic growth. Later, Lucas (1988) terms the relationship between financial and economic development “overstressed” (cited in King & Levine, 1993).

After Glodsmith’s ground breaking empirical research many empirical works have been carried out to investigate finance-growth relationship. King and Levine (1993) studied 80 countries over the 1960-1989 period to investigate the relationship between financial development and economic development. In their comprehensive research in this field,

Demirguc-Kunt and Levine (2004) confirm that in the recent past, researchers have shown that financial development has positive impact on economic growth, not due only to simultaneity bias, at firm level (Demirguc-Kunt & Maksimovic, 1998), industry level (Rajan &Zingales, 1998; Wurgler, 2000) and pooled cross-country, time series studies (Beck, Levine, and Loayza, 2000; Beck et al.,2014).

On the contrary, a study conducted by Stephen Cecchetti and Enisse Kharroubi recently outlined the negative link between the finance sector and growth, after a certain point. They further argue that when an economy is immature and the financial sector is small, then growth of the sector is helpful (Cecchetti & Kharroubi, 2012).

Therefore, we can argue that the finance-growth relationship is not settled yet, in spite of, vast literature contributed in understanding this dynamic relationship.

3.0 Data and Methodology

The study attempts to investigate the dynamic relationship between economic growth (GDP per capita as a proxy), financial development (domestic credit to private sector as a share of GDP as a proxy), using Auto Regressive Distributed Model (ARDL) for India over a period of 1960-2013 based on annual data obtained from the World Development Indicators.

Theoretical Model Specifications

$$G = \int (E, T, B, I)$$

Where,

G= real GDP per capita, proxy of growth

E = Government Expenditure (control variable)

T = Trade (control variable)

B = Domestic Credit to Private Sector, proxy for financial development

I = Foreign Direct Investment – Net Inflows (control variable)

The ARDL cointegration approach is used first for testing the presence of a long term relationship with the lagged levels of the variables. It helps in identifying the dependent variables (endogenous) and the independent variables (exogenous) which are called the 'forcing variables".

Moreover, if there is a long term relationship among the variables, then the ARDL analysis generates the ECM equation for every variable, which provides information through the estimated coefficient of the error correction term about the speed at which the dependent variable returns back to equilibrium once shocked. This enables us to test whether finance leads growth or growth leads finance.

In regard to the time-series studies, the regression analysis that has been applied for many decades to estimate the long-run relationship among economic and social variables is now considered to have either estimated a spurious relationship (if the original 'level' form of the variables was non-stationary) or estimated a short-run relationship (if the variables were 'differenced' to make the original variables stationary). The damaging limitation of the traditional regression analysis (i.e., either spurious or not testing theory) has been addressed by the recent and ongoing cointegration time series techniques. The significant contributions made by the time series cointegration techniques starting with the publication of the seminal paper by Engle and Granger (1987) has been recognized through the recent award of the Nobel Prize in Economic Science to Engle and Granger in 2003.

Although the conventional cointegrating procedure has made an important advance on regression analysis by focusing on the point that any regression analysis should start off, not mechanically, but by testing the stationarity and cointegration properties of the time series involved, the cointegrating estimates also are subject to a number of limitations (Masih et al., 2008). The estimates derived from the cointegrating tests (such as the Johansen test) and the unit root tests (such as, the augmented Dicky-Fuller and Phillips-Peron, etc. which precede the cointegrating tests), are found to be biased. The tests lack power and are biased in favour of accepting the null hypothesis. The cointegration tests require the variables to be I(1) but the order of integration of a variable, whether I(1) or I(0), may depend on the number of lags included or whether the intercept and/or the trend are included or excluded in the unit root

tests. Moreover, the Johansen cointegrating tests have small sample bias and simultaneity bias among the regressors.

The Auto-Regressive Distributive Lag (ARDL) method (also known as the bounds testing approach) proposed by Pesaran-Shin-Smith (2001) that we have employed is free from the above limitations of the unit root and cointegration tests. The ARDL bounds testing approach does not require the restriction imposed by cointegration technique that the variables are I(1) or I(0). Moreover, the bounds testing procedure employed in this study is robust for small sample size study (Pattichis, 1999; Mah, 2000; and Tang and Nair, 2002). Pattichis (1999) applied ARDL bounds test with 20 observations, whereas studies of Mah (2000) and Tang and Nair (2002) had observations of 18 and 28 respectively. Furthermore, the bounds testing approach is possible even when the explanatory variables are endogenous (Alam and Quazi, 2003).

The ARDL technique involves two stages. At the first stage, the existence of a long-run relationship among the variables is investigated. This is done by constructing an unrestricted error correction model (VECM) with each variable in turn as a dependent variable and then testing whether or not the 'lagged levels of the variables' in each of the error correction equations are statistically significant (i.e., whether the null of 'no long run relationship' is accepted or rejected).

Basically, the ARDL method is the Wald test (F-statistic version of the bounds testing approach) for the lagged level variables in the right-hand side of VECM. That is, we test the null hypothesis of non-cointegrating relation (Ho: b1= b2= b3=…= bn=0) by performing a joint significance test on the lagged level variables. The asymptotic distribution of the F- statistic is non-standard under the null hypothesis of no cointegrating relation between the examined variables, irrespective whether the explanatory variables are purely I(0) or I(1).

The test consists of computing an F-statistic testing the joint significance of the 'lagged levels of the variables' in each of the above error-correction form of the equation. The computed F-statistic is then compared to two asymptotic critical values. If the test statistic is above an upper critical value, the null hypothesis of 'no long-run relationship' can be rejected

regardless of whether the variables are I(0) or I(1). Alternatively, when the test statistic falls below a lower critical value, the null hypothesis of 'no long-run relationship' is accepted regardless of whether the variables are I(0) or (1). Finally, if the test statistic falls between these two bounds, the result is inconclusive. It is only in this case that the researcher may have to carry out unit root tests on the variables.

As regards the implications of the F-statistics, if all the F statistics in all equations happen to be insignificant, then that implies the acceptance of the null of 'no long run relationship' among the variables. However, if at least one of the F-statistics in the error correction equations is significant, then the null of 'no long-run relationship' among the variables is rejected. In that case there is a long run relationship among the variables. When the F-statistic is significant, the corresponding dependent variable is endogenous and when the F-statistic is insignificant, the corresponding dependent variable is exogenous or called 'long-run forcing variable'.

Once the long run relationship has been demonstrated, the second stage of the analysis involves the estimation of the long run coefficients (after selecting the optimum order of the variables through AIC or SBC criteria) and then estimate the associated error correction model in order to estimate the adjustment coefficients of the error-correction term. Since the data are yearly, we choose one for the maximum order of the lags in ARDL model. Since the observations are yearly, for the maximum order of the lags in the ARDL model we choose 1 and carry out the estimation over the period of 1961 to 2013.

The ARDL model specifications of the functional relationship between real GDP per capita (G), government expenditure as a share of GDP (E), trade as a share of GDP (T), domestic credit to private sector as a share of GDP (B), foreign direct investment (I) can be estimated below:

$$DG_t = a_0 + \sum_{i=1}^{k} b_1 DG_{t-i} + \sum_{i=0}^{k} b_2\, DE_{t-i} + \sum_{i=0}^{k} b_3 DT_{t-i} + \sum_{i-0}^{k} b_4 DB_{t-i} + \sum_{i-0}^{k} b_5 DI_{t-i} + b_6 LG_{t-1} + b_7 LE_{t-1} + b_8 LT_{t-1} + b_9 LB_{t-1} + b_{10} LI_{t-1} + \mu_t$$

ARDL bounds testing procedure permit us to take into consideration I(0) and I(1) variables together. The null hypothesis of the non-existence of a long-run relationship is denoted by

F_{LG}(LG|LE, LT, LB, LI)is H0 = b6 =b7 =b8 =b9 =b10=0) . Similarly, we compute the F statistics when the other variables in Eq. (2) are used as dependent variables and denote them with F_{LE}(LE|LG, LT, LB, LI), F_{LT}(LT|LG, LE, LB, LI), F_{LB}(LB|LG, LE, LT, LI), and F_{LI}(LI|LG, LE, LT, LB) while the null hypothesis means there is no cointegration, against the alternative hypothesis of there is cointegration. H_0: b6 ≠ b7 ≠ b8 ≠ b9≠ b10 ≠ 0. In equation, k is lag criteria.

The calculated F-statistics derived from Wald test are compared with Pesaran et al. (2001)'s critical values. If calculated F-statistics falls below the Pesaran et al. (2001)'s lower critical values, it is accepted that there is not relationship between time series. If calculated F-statistics is among Pesaran et al. (2001)'s lower and higher critical values, it is avoided to make certain commitment and referred to other cointegration tests. If calculated F-statistics is upper than bound critical values, it is accepted that there is relationship between time series. In other words the null hypothesis is rejected.

After estimating the existence of long run relationship between variables the second step is selecting optimal lag length by using of standard criteria such as Swartz Bayesian (SBC) or Akaike Information (AIC). After that long run and short run coefficients could be predicted. ARDL long run form is exhibited in equation below:

$$LG_t = a_0 + \sum_{i=1}^{k} b_1 LG_{t-i} + \sum_{i=0}^{k} b_2 LE_{t-i} + \sum_{i=0}^{k} b_3 LT_{t-i} + \sum_{i=0}^{k} b_4 LB_{t-i} + \sum_{i=0}^{k} b_5 LI_{t-i} + \mu_t$$

Error correction term is used in the ARDL short run model. The short run dynamic model can be presented as follows

$$DG_t = a_0 + \sum_{i-1}^{k} b_1 DG_{t-i} + \sum_{i=0}^{k} b_2 DE_{t-i} + \sum_{i=0}^{k} b_3 DT_{t-i} + \sum_{i=0}^{k} b_4 DB_{t-i} + \sum_{i=0}^{k} b_5 DI_{t-i} + b_6 ECT_{t-i}$$

Where ECT is lagged error correction term.

The hypothesis that we will be testing is the null of 'non-existence of the long-run relationship' defined by

$$H0: b1 = b2 = b3 = b4 = b5 = 0$$

Against, existence of a long-run relationship.

$$H1: b1 \neq b2 \neq b3 \neq b4 \neq b5 \neq 0$$

As discussed earlier, we use the following variables for our lead-lag analysis. All the variables are transformed into logarithms to achieve stationarity in variance. All the level forms of the variables were transformed into the logarithm scale. We begin our empirical testing by determining the stationarity of the variables used. In order to proceed with the testing of cointegration later, ideally, our variables should be I(1), in that in their original level form, they are non-stationary and in their first differenced form, they are stationary. The differenced form for each variable used is created by taking the difference of their log forms. For example, DG = LG – LGt−1. We then conducted the Augmented Dickey-Fuller, Philip-Perron and KPSS test. (ADF) test on each variable (in both level and differenced form). The table below summarizes the results.

4.0 Discussion of the results and findings

A stationary series has a mean(to which it tends to return), a finite variance, shocks are transitory, autocorrelation coefficients die out as the number of lags grows, whereas a non-stationary series has an infinite variance(it grows over time), shocks are permanent(on the series) and its autocorrelations tend to be unity. If the series is ‘stationary’, the demand-side short run macroeconomic stabilisation policies and financial development are likely to be effective and promote economic growth but if the series is ‘non stationary’, the supply-side policies are more likely to be effective.

4.1 Unit Root Test

Table 1: Results of Augmented Dickey Fuller (ADF) of Non-Stationarity

		AIC				SBC		
		Test Stat.	Critical Val	Decision		T stat.	Critical Val	Decision
Intercept and Trend; Log Transformed Variables; Null: Non-Stationary								
LG	ADF(4)	0.94542	-3.362	Non-Stationary	ADF(1)	-0.27751	-3.5868	Non-Stationary
LE	ADF(1)	-2.7295	-3.5868	Non-Stationary	ADF(1)	-2.7295	-3.5868	Non-Stationary
LT	ADF(1)	-2.0379	-3.5868	Non-Stationary	ADF(1)	-2.0379	-3.5868	Non-Stationary
LB	ADF(3)	-2.2935	-3.3156	Non-Stationary	ADF(1)	-1.4935	-3.5868	Non-Stationary
LI	ADF(3)	-2.1559	-3.3156	Non-Stationary	ADF(1)	-2.1198	-3.5868	Non-Stationary
Intercept and No Trend; First Difference of Log Transformed Variables; Null: Non-Stationary								
DG	ADF(5)	-1.4098	-2.7486	Non-Stationary	ADF(1)	-4.2068	-2.8188	Stationary
DE	ADF(1)	-5.1287	-2.8188	Stationary	ADF(1)	-5.1287	-2.8188	Stationary
DT	ADF(1)	-3.9146	-2.8188	Stationary	ADF(1)	-3.9146	-2.8188	Stationary
DB	ADF(2)	-2.6156	-2.8374	Non-Stationary	ADF(1)	-3.8097	-2.8188	Stationary
DI	ADF(1)	-6.156	-2.8188	Stationary	ADF(1)	-6.156	-2.8188	Stationary

Table 2: Results of PP and KPSS Tests

	PP			KPSS		
	Test Stat.	Crit. Val.	Decision	Test Stat.	Crit. Val.	Decision
LG	0.97752	-3.5405	Non-Stationary	0.15119	0.15511	Stationary
LE	-2.3414	-3.5405	Non-Stationary	0.14037	0.15511	Stationary
LT	-2.5692	-3.5405	Non-Stationary	0.15718	0.15511	Non-Stationary
LB	-1.763	-3.5405	Non-Stationary	0.09194	0.15511	Stationary
LI	-2.6236	-3.5405	Non-Stationary	0.12759	0.15511	Stationary
DG	-7.0738	-2.8855	Stationary	0.43376	0.3957	Non-Stationary
DE	-5.4379	-2.8855	Stationary	0.17123	0.39572	Stationary
DT	-6.2335	-2.8855	Stationary	0.36865	0.39572	Stationary
DB	-6.6959	-2.8855	Stationary	0.10041	0.39572	Stationary
DI	-9.9248	-2.8855	Stationary	0.11802	0.39572	Stationary

On the above mentioned results of unit root test we can see that it varies from one test to another test. If we analyse the results of unit root tests of all variables in the differenced form, we observe that domestic credit to private sector and foreign direct investment are non-stationary. It is more than evident that the results are not consistent across various tests. Therefore, variables we are using for this analysis are I (0) or I (1).

As the results of unit root test are not consistent we decided to use ARDL technique to test the long run relationship among the variables. Before proceeding with the test of cointegration, we try to determine the order of the vector auto regression (VAR), that is, the number of lags to be used.

4.2 VAR Order Selection

Before moving on to test the cointegration among the variables, we first have to determine the optimal order of VAR. To choose the optimal order of VAR, we look at the highest AIC and SBC values. Then, we also look at the adjusted LR test. According to our findings, the highest AIC and SBC suggest one lag order.

4.3 Testing Cointegration

An evidence of cointegration implies that the relationship among the variables is not spurious, i.e. there is a theoretical relationship among the variables and that they are in equilibrium in the long run.

Table 3: Engle –Granger (E-G) Test

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.8050	55.3597	54.3597	53.3938	53.9906
ADF(1)	-2.9993	55.3683	53.3683	51.4365	52.6301
ADF(2)	-2.3033	55.7981	52.7981	49.9003	51.6907

95% critical value for the Dickey-Fuller statistic = -4.6941

As depicted in the above table the critical value is higher than the t-statistics. So, we cannot reject the null that the residuals are non-stationary. Statistically, the above results indicate that the variables we have chosen, in some combination, result in not a stationary error term.

As it is non-stationary that indicates that there is no cointegration. These initial results are not intuitively appealing, to our mind. On the other hand that if the variables are not found to be cointegrated, they may be fractionally cointegrated. So, we have decided to go for Johansen cointegration test in the following step.

Table 4: Johansen Cointegration Test

Criteria	**Number of cointegrating vectors**	
VAR Lag Order	**Two**	**Three**
Maximal Eigenvalue	No cointegration	No cointegration
Trace	No cointegration	One
AIC	Four	Three
SBC	No cointegration	No cointegration
HQC	Two	Three

The above results conflict with each other, it also conflicts with Engle – Granger. As these approaches have many limitations that are taken care off by ARDL. For that reason, we decided to go for ARDL approach for testing cointegration among variables.

Table 5: F-Statistics for Testing the Existence of Long-Run Relationship (Variable Addition Test)

Variables	**F statistics**	**Critical Value Lower**	**Critical Value Upper**
DG	4.3889*	2.649	3.805
DE	1.6858	2.649	3.805
DB	1.5506	2.649	3.805
DI	2.9492	2.649	3.805
DT	3.7939	2.649	3.805

The critical values are taken from Pesaran et al. (2001), unrestricted intercept and no trend with four regressors. * denote rejecting the null at 5 percent level.

Table above shows the calculated F-statistics for dependent variable DG (Growth) is 4.3889, which is higher than the upper bound critical value 3.805 at the 5% significance level. This implies that the null hypothesis of no cointegrating long-run relationship can be rejected. These results reveal that a long-run relationship exists between financial development and,

growth in India. This could be considered as a finding in view of the fact that the long run relationship between the variables is demonstrated here avoiding the pre-test biases involved in the unit root tests and cointegration tests required in the standard cointegration procedure. The evidence of long run relationship rules out the possibility of any spurious relationship existing between the variables. In other words, there is a theoretical relationship existing between the variables.

At this stage we run the ARDL test to confirm the short-term and long-term relationship, study long-run coefficients and error-correction model to identify which variables are endogenous and which are exogenous.

As stated earlier, cointegration tells us that there is a long run relationship between the variables. However, there could be a short-run deviation from the long-run equilibrium. Cointegration does not unfold the process of short-run adjustment to bring about the long-run equilibrium. For understanding that adjustment process we need to go to the error-correction model. The t-ratio or the p-value of the error-correction coefficient indicates whether the deviation from equilibrium (represented by the error-correction term) has a significant feedback effect or not on the dependent variable. In other words, if the dependent variable is endogenous or exogenous.

Table 6: ARDL Bound Test for existence of Level relationship

Dependent Variable	F Statistics	Lower Bound (Critical Value)	Upper Bound (Critical Value)
LG	7.3459*	3.1097	4.4233
LE	3.5169	3.1097	4.4233
LT	5.0029*	3.1097	4.4233
LB	1.3157	3.1097	4.4233
LI	2.4242	3.1097	4.4233

The critical values are taken from Pesaran et al. (2001), unrestricted intercept and no trend with four regressors. * denote rejecting the null at 5 percent level.

From the table above, we can see that when real GDP per capita is the dependent variable, the calculated F-statistic FLG (LG|LE, LT, LB, LI) =7.3459 is greater than the upper bound of

the critical value obtained from Pesaran et al. (2001), indicating there is compelling evidence for cointegration between growth and its determinant in India for the study period.

These results reveal that a long-run level relationship exists between finance and growth, they are co-integrated. This by itself is a significant finding in view of the fact that the long run relationship between the variables is demonstrated here avoiding the pre-test biases involved in the unit root tests and cointegration tests required in the standard cointegration procedure. The evidence of long run relationship rules out the possibility of any spurious relationship existing between the variables. In other words, there is a theoretical relationship existing between the variables. The process has been repeated for the other variables and result shows that for trade (LT) is highly cointegrated with their determinants.

At this stage we can argue that finance is leading growth in India. It is a unidirectional relationship. Our finding is in line with (McKinnon (1973); King and Levine (1993a, b); Neusser and Kugler (1998); Levine (1997); Beck (2000).

The policy implications are government has to give domestic credits to private companies for economic growth of the country. The government has to spend on financial infrastructure like building efficient markets, stock markets etc. for economic growth.

Table 7: Results of Estimated Long-Run Coefficients using the ARDL Approach

Dependent Variable	LG
LE	3.9194 (3.1937)
LT	0.21044 (0.25085)
LB	0.12271 (0.15371)
LI	1.236* (0.41723)
INPT	-11.4947 (14.7094)
Chi-Square Serial Correlation	1.4589 [.227]
Chi-Square Functional Form	1.6703 [.196]
Chi-Square Normality	.38933 [.823]
Chi-Square Heteroscedasticity	3.7124 [.054]

Note: * denotes significant at 5 percent level, figures in the parenthesis () denotes standard error, and figures in the brackets [] denotes p values.

The table above provides the estimates of the ARDL long-run coefficient for our models based on our research objective. The estimated long run coefficients of the long run relationship above show that only foreign investment inflows have significant effect on the real GDP per capita in India. It implies that 1% increase in foreign investment inflows will increase the real GDP per capita by 1.236%. The results somehow look misleading as 1% change in foreign investment may not change real GDP per capita by 1.236%, but when we look at the diagnostics test the model looks well specified. The reasons for this large amount of change can be; India is a developing country, so whenever there are net inflows into the country they are well utilized in factors of production and this may ignite the growth engine of the country. This will automatically increase employment in the country and may lead to economic growth.

In the following table, the ECM's representation for the ARDL model is selected with AIC criterion.

Table 8: Error correction model of ARDL

Variables	Coefficients	Standard Error	T Value [P-Value]	Decision
ecm(-1) dLG	-0.1171	0.055325	-2.1166 [.040]	Endogenous
ecm(-1) dLE	-0.29391	0.16851	-1.7441 [.090]	Exogenous
ecm(-1) dLT	-0.20309	0.082814	-2.4524 [.018]	Endogenous
ecm(-1) dLB	-0.060162	0.036453	-1.6504 [.106]	Exogenous
ecm(-1) dLI	-0.73379	0.17375	-4.2233 [.000]	Endogenous

As discussed earlier, cointegration tells us that there is a long run relationship between the variables. However, there could be a short-run deviation from the long-run equilibrium.

Cointegration does not unfold the process of short-run adjustment to bring about the long-run equilibrium. For understanding that adjustment process we need to go to the error-correction model. The T-ratio or the p value of the error-correction coefficient indicates whether the deviation from equilibrium (represented by the error-correction term, 'ecm') has a significant feedback effect or not on the dependent variable (e.g.real GDP per capita). In other word, whether the variable is endogenous or exogenous. The error correction coefficient being significant confirms our earlier findings of a significant long-run cointegrating relationship between the variables. Moreover, the size of the coefficient of the error-correction term indicates the speed of medium to long run adjustment of the dependent variable to bring about the long run equilibrium. The size of the coefficient of the error-correction term is also indicative of the intensity of the arbitrage activity to bring about the long-run equilibrium.

We can say that government expenditure and domestic credit to private sector are leading variables. It implies that these variables initially receives exogenous shocks resulting in deviations from equilibrium and transmits the shocks to other variables. Growth, trade and foreign direct investment inflows are dependent variables and these bears the burnt of short run adjustment to bring about the long-term equilibrium among the cointegrating variables. All these results have important policy implications in fuelling the economic growth of the country.

The error correction coefficient estimated for variable real GDP per capita is - 0.1171. It implies a slow speed of adjustment to equilibrium after a shock. The same is with trade variable, but when we look at error correction coefficient of foreign direct investment variable is -0.73379. It implies a fast speed of adjustment to equilibrium after a shock.

Although the error correction model tends to indicate the endogeneity/exogeneity of a variable, we had to apply the variance decomposition technique to discern the relative degree of endogeneity or exogeneity of the variables.

4.4 Variance Decompositions (VDC)

Although the error correction model tends to indicate the endogeneity/exogeneity of

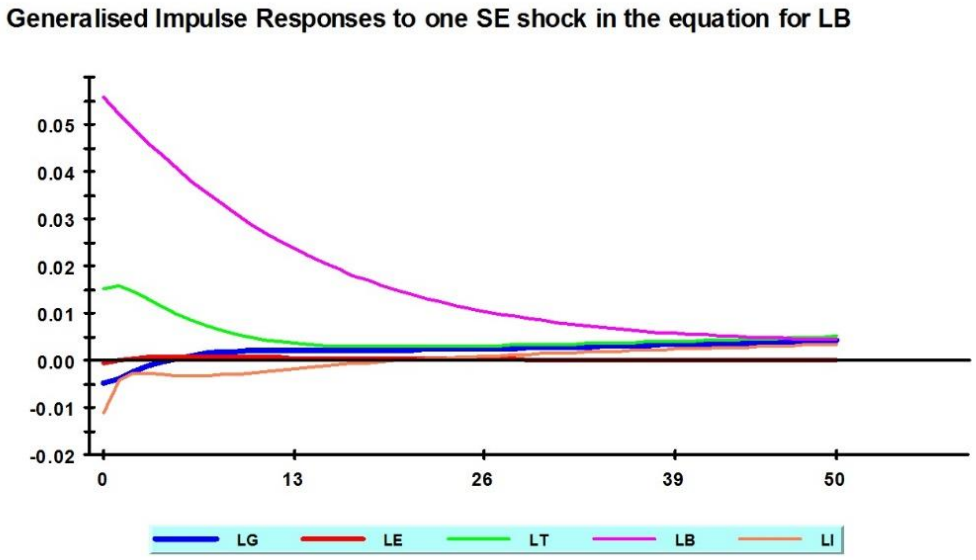
a variable, we had to apply the variance decomposition technique to discern the relative degree of endogeneity or exogeneity of the variables. The relative exogeneity or endogeneity of a variable can be determined by the proportion of the variance explained by its own past. The variable that is explained mostly by its own shocks (and not by others) is deemed to be the most exogenous of all. Out of orthogonalized and generalized VDCs, there are two important limitations of orthogonalized VDCs. Firstly it depends on the particular ordering of the variables in the VAR, Secondly it assumes that when a particular variable is shocked, all other variables in the system are switched off. Generalized VDCs do not have these limitations so we decided to rely on it. We applied Generalized VDCs and obtained the following results.

Table 9: Generalized VDC

Horizon (Year)	Variables	LG	LE	LT	LB	LI	Ranking
1	**LG**	0.96758	0.006329	0.023821	0.027582	0.12997	3
1	**LE**	0.002031	0.97436	0.1449	0.00417	0.10793	2
1	**LT**	3.45E-02	0.063622	0.96414	0.045004	0.020361	4
1	**LB**	0.02942	0.006687	0.039168	0.99735	0.018334	1
1	**LI**	0.11203	0.13609	0.021216	0.022154	0.86862	5
5	**LG**	0.76058	0.010137	0.068687	0.011227	0.18252	3
5	**LE**	0.01243	0.87254	0.25285	0.012825	0.078346	2
5	**LT**	0.032396	0.10403	0.71999	0.051823	0.023648	4
5	**LB**	0.01824	0.029349	0.037506	0.96458	0.00869	1
5	**LI**	0.21117	0.2542	0.014061	0.014707	0.52156	5
10	**LG**	0.58045	0.068437	0.079429	0.006383	0.1676	3
10	**LE**	0.013827	0.82537	0.28638	0.025582	0.073766	2
10	**LT**	0.1053	0.17731	0.49017	0.040822	0.046318	4
10	**LB**	0.015192	0.06894	0.030515	0.89356	0.007031	1
10	**LI**	0.29646	0.25686	0.010174	0.012606	0.40174	5

From the table we can see that in the year 1 horizon, domestic credit to private is the most exogenous and foreign direct investment is the most endogenous followed by government expenditure. In the year 5 horizon and year 10 horizon the results are same. There is no change in the ranking. When we compare VDC results with ECM results there is no inconsistency in the results.

Figure 1: Impulse Response



From the analysis of VDC and impulse response (IR), which necessarily shows the same result in different form, by shocking our target variables, mostly finance and growth variables, we can argue that the result in IR seems to support the findings from VDC, however, some of them are supported by theory while some of them are counter intuitive.

5.0 Conclusion and Policy Implications

The main objective of this paper was to address the issue of causality between financial development and economic growth, from the bank-market based perspective. We applied a recent time series technique; ARDL to find out this causality between financial development and economic growth. We found that the financial development leads growth in India rather than the other way around. Our findings are in line with Patrick (1966) who concluded that for a developing economy, financial development leads growth.

The major policy implication of the paper is that if government wants to increase the economic growth, it can do so by the bringing out the reforms in the banking sector and capital market sector. Hence, India should consider banking sector and capital market sector

as the policy variables and authorities should take necessary steps to bring about the reforms in these sectors to enhance economic growth in the economy.

The limitations of the study are innumerable. First, due to lack of consistent availability of data, more variable were not taken such as market capitalization/GDP, number of firms listed on the stock exchange etc. We personally feel variables such as market capitalization/GDP and financial deepening variable such as number of firms listed on the stock exchange might have given the different set of results Second, our sample is very small and it could have been interesting to see how our result would respond to increased sample. These limitations broaden the scope for further research and it would be interesting as well as helpful for the policy makers, when larger sample is taken and more variables are taken into consideration.

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