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RESEARCH METHODOLOGY
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DOES FINANCIAL DEVELOPMENT CAUSE ECONOMIC GROWTH? A TIME SERIES ANALYSIS FOR INDIAN ECONOMY

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ABSTRACT

The present study examines the causal relationship between financial development and economic growth for the Indian economy since financial sector reforms. By applying the techniques of unit–root tests and the long–run Granger non-causality test proposed by Toda and Yamamoto (1995), we test the causal relationships between the economic growth rate and financial development proxies. On the whole it is found that higher levels of financial development are significantly and robustly correlated with faster current and future rates of economic growth and physical capital accumulation. From the results it can be concluded that a strong positive relationship exists between financial sector development and economic growth. This study confirms the results that causality runs from financial development to economic growth. Policy makers need to concentrate on financial development to boost economic growth.

KEYWORDS
financial development, Toda and Yamamoto causality test.

INTRODUCTION

Academic literature on the relationship between financial development and economic growth dates back to as early as the early twentieth century (Schumpeter, 1911).The issue has been of great interest and generated considerable amount of debate among economists for many years. The debate primarily revolved around two major questions: *first* whether at all there is a relationship between development of financial sector on economic growth and *second*: what could be the nature and direction of the causal relationship, if any i.e. does development of financial sector promote economic growth or does economic development foster financial sector development? The possible directions of causality between financial sector development and economic growth were highlighted by Patric (1966) in his '*supply leading*' and '*demand following*' hypotheses. The 'supply leading' hypotheses claims a causal relationship from financial development to economic growth by saying that intentional creation and development of financial institutions and markets would increase the supply of financial services and thus lead to economic growth while the demand following hypothesis claims that it is the growth of the economy which causes increased demand for financial services which in turn leads to development of financial markets.

REVIEW OF LITERATURE

An extensive volume of literature and research work has emerged attempting to answer the above questions, both at the theoretical and empirical level. The findings and views expressed in these works have been generally conflicting in nature. Some studies like King and Levin (1993a, b), Levin and Zervos (1998), Demirguc and Maksimovic (1996) have found positive causal effects of financial development on economic growth in line with the 'supply leading' hypothesis. These studies claim that countries with better developed financial systems particularly those with large efficient banks and a large well organized and smoothly functioning stock markets tend to grow much faster by providing access to much needed funds for financially constrained economic enterprises. Kletzer and Pardhan (1987), Beck (2002), also argue along similar lines but they also tried to establish that financial development is much more effective in promoting economic growth in more industrialized economies than in agricultural economies. Their view has been contradicted in some other studies which argue that countries at their early stage of development benefit more from financial sector development than their older and mature counterparts (Fry, 1995). Levin et.al (2000) examined empirically by incorporating adequate corrections for the effects of simultaneity bias and country specific effects, effects of other determinants of growth and biases arising from model specific errors like omitted variables. Their conclusions identified a causal relationship running from financial development indicators to economic growth even after controlling for such factors. Support for the 'demand following' argument is also there in the research works over the last four or five decades. Robinsson (1952) argued that financial development primarily follows growth in the real economy, as a result of increased demand for financial services. Lucas (1988) stated that the role of financial sector development in causing economic growth of a country has been 'badly overstressed'.

The direction of causality between financial development and economic growth is crucial because it has different implications for development policies. Economic growth leads financial development, (demand following hypothesis) means when real growth has been taking place so that the expansion of financial institutions is only a result of the need of the expansion of the real economic activities. Support of this view can be found; in Arestis and et al (2002), Ang and Mckibbin (2007) has found out that unidirectional causality that runs from Economic Growth to financial development.

On the other hand financial development leads economic growth (supply leading hypothesis) means that the expansion of financial system may help to improve and lead economic growth by increasing savings and improving borrowing options and the reallocation of capital. Bhattacharya and Sivasubramanian (2003), Amenounve and et al.(2005) investigated the unidirectional causality runs from financial development to economic growth. At the same time, financial and the real sectors may expand together contributing to the developments of each other, which shows bidirectional causality between financial development and economic growth. Two way relationship between financial development and economic growth has been shown by Demetriades and Luintel(1996),Ghirmay(2004). From the above studies it is understood that causality will differ from country to country. Patrick (1966) mentions that, there are economies with supply leading and demand following hypothesis, he also mentions that in the early stages of development the economy will follow the supply leading hypothesis, where, as when the economy grows, it will follow the demand following hypothesis.

VARIABLES AND METHODOLOGY

This section pins down the variables relevant to the model and methodology adopted in analysing the data. Economic growth is a measure of growth in aggregate output of a nation during a specified time period. It can be measure by GDP_{fc} at constant prices. When the growth rates are to be used to judge the improvement in the economic well being of people, or any other similar purpose, the rate expressed in per capita terms would be more meaningful. In this analysis however, the objective is to see the impact of financial development on economic growth, in terms of an overall output expansion. So using the rates in

per capita terms will not be meaningful. The rates of growth of per capita will be affected by the growth rate of the population, which has as such no bearing in context of role of finance. So as an indicator of economic growth, the study has used the annual GDP_{fc} at constant prices (EGFC).

In studies where credit has been used as an indicator of financial development, it is only bank credit that is considered. However, significant financial development takes place outside the banking system. Moreover as the financial system develop the portion of the bank credit to the total credit advanced usually falls. For this reason the credit advanced by non baking financial institutions has also been included in the study. Credit thus consist of non-food credit advanced by scheduled commercial banks, credit advanced by non scheduled commercial banks, cooperative banks and financial assistance disbursed by the non- banking financial institutions. It excludes credit to the public sector in the form of food credit and therefore is able to represent more accurately the role of financial intermediaries in channelizing funds to the private market participants. This measure will therefore be more directly linked to investment and growth than various other measures often used in other studies. Chakraborty (2007) used bank credit as variable to measure the banking sector in their study. This indicates the importance of the role played by the financial sector, especially the deposit money banks, in the financing of the economy (Levine, 2003); it also measures the activity of financial intermediaries in one of their primary function of channelling savings to investors.

It is more appropriate to include an indicator for stock markets size (Stock Market Capitalisation Ratio). Chakraborty (2007) used market capitalisation ratio to represent the stock market in India.

Capital formation takes place in private sector and public sector. The trends and composition of the public and private sector and their influence on economic growth can often be different. In such a case they need to be separately accounted for. In case of India however, during the time period under study, the two trend to move parallel to each other. Both seen equally related to economic growth initially three time series were examined: capital formation by private sector, capital formation by public sector and total capital formation. All the three series follow a more or less similar pattern. Moreover the correlation coefficients of each series with economic growth are nearly the same. Therefore rather than taking the rates as separate variables and adding to the number of variables , the study has used Gross Domestic Capital Formation (GDCF) both public and private as single variable. Economic growth is supposed to be an increasing function of capital formation (Barro, 1974).

The study employed advanced time series techniques such as Johansen's multivariate cointegration, Vector Error Correction Model (VECM) to examine the short run and long run relationship between stock market indicators and economic growth of India. Toda and Yamamoto causality tests was applied for determining the causality among the variables. The four variables are included in the analysis related to indicators of economic growth and financial sector development. Annual GDP_{fc} at constant prices (EGFC) is used for indicator of economic growth. Two indicators of financial development are Institutional credit to the private sector as a ratio of GDP (CR) and Stock market capitalisation ratio (SMC). One variable i.e., CR is taken for the banking sector development and other variable i.e., SMC is taken for the stock market development. Gross domestic capital formation as ratio of GDP (GDCF) is other important variable is used because Economic growth is supposed to be an increasing function of capital formation. The annual time series data is used for analysing the relationship between financial development and economic growth the time period is 1968 to 2013, so that a sufficient time period is covered during pre- financial sector reforms and post-financial sector reforms. The data is transformed in natural logarithm form and then the analysis is done.

A brief outline of the traditional causality test, viz., Granger causality (1969) and subsequent improvements, namely, Toda and Yamamoto (1995) version of Granger causality is presented below, followed by discussion of the principal variables employed.

GRANGER CAUSALITY TEST

Traditionally Granger (1969) causality is employed to test for the causal relationship between two variables. This test states that, if past values of a variable *y* significantly contribute to forecast the future value of another variable *x* then *y* is said to Granger cause *x* . Conversely, if past values of *x* statistically improve the prediction of *y* , then we can conclude that *x* Granger causes *y* . The test is based on the following regressions:

" X is said to Granger –cause Y if Y can be better predicted using the histories of both X and Y than it can by using the history of Y alone."

We can test for the absence of Grange Causality by estimating the following VAR model:

$Y_t = a_0 + a_1Y_{t-1} + \ldots\ldots\ldots + a_pY_{t-p} + b_1X_{t-1} + \ldots\ldots\ldots b_pX_{t-p} + u_t$

$X_t = c_0 + c_1X_{t-1} + \ldots\ldots\ldots + c_pX_{t-p} + d_1Y_{t-1} + \ldots\ldots\ldots + d_pY_{t-p} + v_t$

Then testing $H_0: b_1 = b_2 = \ldots\ldots\ldots b_p = 0$, against H_A: 'Not H_0', is a test that X does not Granger –cause Y.

Similarly testing $H_0: d_1 = d_2 = \ldots\ldots\ldots d_p = 0$, against H_A: 'Not H_0', is a test that Y does not Granger –cause X.

In each case, a rejection of the null implies there is Granger causality.

The Granger causality test is easy to carry out and be able to apply in many kinds of empirical studies. However traditional Granger causality has its limitations. First, as pointed out by Gujarati (1995), a causality test is sensitive to model specification and the number of lags. It would reveal different results if it was relevant and was not included in the model. Therefore, the empirical evidence of two variable granger causality is fragile because of this problem. Second, time series are often non stationary (Maddala, 2001). This situation could exemplify the problem of spurious regression. Gujarati (2006) had also said that when the variables are integrated, the f-test procedure is not valid, as the test statistics do not have a standard distribution.

The Granger non causality test should not be tested in the VAR with the differences of the data.VAR model can be used for other purposes with differenced data if the series are I(1), but not cointegrated. If the time series are cointegrated then VECM model can be estimated for the purposes other than testing for the Granger non causality.

Recent studies on time-series econometrics have highlighted several crux issues pertaining to Granger causality test. First, the direction of causality depends critically on the number of the lagged terms included. If the chosen lag length is smaller than the true lag length, the omission of relevant lags may cause bias. Conversely, the inclusion of extraneous lags in the equation may cause the estimates to be inefficient. In our model, we have used the Akaike and Schwarz information criterion (AIC / SIC) to fix the choice of lag length. Secondly, traditional Granger causality test is based on the assumption that the variables are stationary, or even if non-stationary must have the same order of integration. As observed by Toda and Phillips (1993), any causal inference in Granger jargon is questionable when there are stochastic trends and the F – test is not valid unless the variables in levels are cointegrated.

There are tests for cointegration and cointegrating ranks namely, error correction model (ECM) due to Engle and Granger (1987) and the vector autoregression error correction model (VECM) due to Johansen and Jesulius (1990). Unfortunately, these tests are not easily comprehensible and requires fulfillment of the sufficient rank conditions based on trace and maximum eigen value test for cointegration. Toda and Yamamoto (1995) propose an interesting and simple procedure requiring the estimation of an augmented VAR which guarantee the asymptotic distribution of the Wald statistics (an asymptotic chi-square distribution).

RESULTS FOR POST- REFORM PERIOD (1992-2013)

This section deals with descriptive statistics, line graph and unit root test (Stationarity test) results ,lag selection criteria of the variables included in the study i.e., economic growth, gross domestic capital formation ,credit and stock market capitalisation during the post financial sector reform period (1992-2013).

DESCRIPTIVE STATISTICS

In order to understand the behaviour of data series included in the study , mean, median, standard deviation, Skewness, kurtosis and Jacque –Bera are measured and presented in the table . It is found that all variables have positive mean value. Jarque –bera test value and the probability show that the data series are normal.

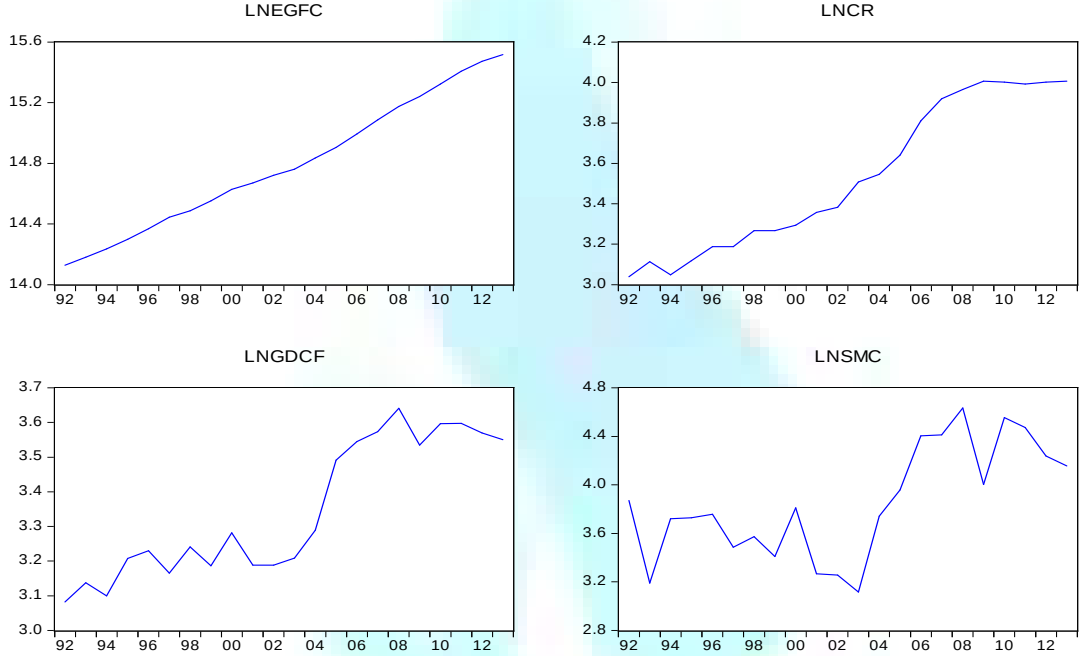
TABLE 1: DESCRIPTIVE STATISTICS OF VARIABLES DURING POST REFORM PERIOD (1992-2013)

	LNEG	LNCR	LNGDCF	LNSMC
Mean	14.79246	3.530120	3.345802	3.853314
Median	14.74076	3.444859	3.261837	3.784302
Maximum	15.51700	4.007432	3.640572	4.634984
Minimum	14.12825	3.038350	3.081925	3.116183
Std. Dev.	0.436984	0.367973	0.195770	0.464298
Skewness	0.162024	0.176852	0.249583	0.110071
Kurtosis	1.827702	1.432336	1.366356	1.914166
Jarque-Bera	1.356015	2.367455	2.674796	1.125207
Probability	0.507627	0.306136	0.262528	0.569724
Sum	325.4341	77.66264	73.60763	84.77290
Sum Sq. Dev.	4.010064	2.843481	0.804843	4.527017
Observations	22	22	22	22

LINE GRAPH

The basic movement and characteristics of variables can also be understood through line graph presented below figure 1. The entire variables move in the same direction with minor fluctuation but there is much fluctuation in the stock market capitalisation.

FIGURE 1: LINE GRAPH OF VARIABLES (1992-2013)



STATIONARITY TEST (UNIT ROOT)

Augmented Dickey-Fuller (ADF) (1981) test and Philips Perron test were used to examine the stationarity characteristics of the series. Table 2 reports the ADF unit-root test and Philips Perron test results below:

TABLE 2: UNIT ROOT TEST (1992-2013)

Variables	Level/first difference	Calculated –test statistics	ADF critical value 5 %	Stationarity
Economic Growth	Level	-1.403713	-3.644963	Not stationary
	First difference	-3.832045	-3.658446	Stationary
Credit	Level	-2.984574	-3.690814	Not stationary
	First difference	-3.498957	-3.268973*	Stationary
GDCF	Level	-1.949712	-3.644963	Not stationary
	First difference	-4.930433	-3.658446	Stationary
SMC	Level	-2.988881	-3.644963	Not stationary
	First difference	-6.825911	-3.658446	Stationary
Variables	**Level/first difference**	**Calculated –test statistics**	**PP critical value 5 %**	**Stationarity**
Economic Growth	Level	-1.490849	-3.644963	Not stationary
	First difference	-3.832045	-3.658446	Stationary
Credit	Level	-1.676973	-3.644963	Not stationary
	First difference	-3.518874	-3.268973*	Stationary
GDCF	Level	-2.076050	-3.644963	Not stationary
	First difference	-4.920746	-3.658446	Stationary
SMC	Level	-3.065376	-3.644963	Not stationary
	First difference	-6.651386	-3.658446	Stationary

*indicates 10 % level of significance

LAG ORDER SELECTION

The step of discovering the long run relationship among explanatory variable requires an adequate lag length of them in order to remove any serial correlation. The optimum lag length is usually selected based on AIC, SIC and HQ test statistic. All the test indicates that 1 lag order should be selected for the data analysis.

TABLE NO. 3: VAR LAG ORDER SELECTION CRITERIA (1992-2013)

Lag	LR	AIC	SIC	HQ
0	NA	-4.970572	-4.771426	-4.931697
1	140.4223*	-12.73206*	-11.73632*	-12.53768*
2	16.61658	-12.64265	-10.85034	-12.29278

* indicates lag order selected by the criterion

To take policy decision it is important to know which way financial development and economic growth cause each other and therefore an attempt is made to find out the causality between financial development and economic growth in Indian Context. To inspect the causality between the different variables of the model, the short run and the long run causality is determined. The first test reveals the significance of the sum of lagged terms of each explanatory variable by the mean of Chi-square test and the second test indicates the significance of the error correction term by the mean of the T-test. Table no.4 below illustrates the results of all these causality tests during the post- reform period i.e., 1992-2013.

TABLE NO. 4: VAR GRANGER CAUSALITY/BLOCK EXOGENEITY WALD TESTS RESULT (1992-2013)

Dependent variable	Independent variable					ECT_{t-1} Coefficient [t-ratio]
	Chi-sq –statistics (p-value)					
	LNEGFC	LNCR	LNGDCF	LNSMC	All	
LNEGFC		7.306100	0.945126	4.444822	22.41278	-0.159548
		(0.0259)**	(0.6234)	(0.1083)	(0.0010)*	[-4.20070]*
LNCR	0.726710		0.369903	4.556172	4.905748	0.138825
	(0.6953)		(0.8311)	(0.1025)	(0.5560)	[0.82125]
LNGDCF	0.122875	8.910529		4.371619	15.38950	-0.143529
	(0.9404)	(0.0116)**		(0.1124)	(0.0174)**	[-0.60104]
LNSMC	1.292429	4.219899	0.522227		15.51788	-1.547328
	(0.5240)	(0.1212)	(0.7702)		(0.0166)**	[-1.32360]
*,**and*** denotes 1% , 5% and 10% level of significance						

The Chi-square statistics for the short run dynamics reveals that the null hypothesis of GDCF does not cause EGFC is accepted at 1% level of significance and CR not cause EGFC is rejected at 5% level of significance. It means that there is unidirectional causality runs from CR to Economic Growth in the short run. When EGFC is dependent variable and all other independent variables were taken together then the null hypothesis is also rejected at 1% level of significance means all the variables taken together can cause EGFC. CR was found that can significantly cause GDCF at 5 % level of significance in the short run period, even all the variables when taken together can cause GDCF at 5 % level of significance. Overall results show that in the short run period, there is unidirectional causality running from CR to EGFC and GDCF. No variable was found that can influence SMC in the short run period,but when all the independent variables are taken together then they can influence SMC at 5 % level of significance.

In the long run, the error correction term coefficients show that there is long run causality from the independent variables such as GDCF, SMC and CR to EGFC meaning that GDCF, SMC and CR have influence on dependent variable EGFC in the long run at 1% level of significance.

CONCLUSION

The present paper makes a modest attempt to explore the causal relationship between financial development and economic growth in the Indian economy for the period from 1992-2013. The study primarily revolved around question that what could be the nature and direction of the causal relationship, if any i.e. does financial development promote economic growth or vice versa? To test this hypothesis, we employed the methodology of *Granger non-causality* proposed by Toda and Yamamoto (1995).

Chakraborthy (2007) made a study in India by taking market turnover, market capitalisation ratio, bank credit, stock market volatility for financial development indicator during 1996-2005 and found out that causality is run from economic growth to financial development in the post liberalisation period. It seems that the role of financial development may not be crucial for economic growth in the post liberalisation period. This study does not confirm the results but contradict and state that causality runs from financial development to economic growth. It is understood that policy makers need to concentrate on financial development to boost economic growth.

On the whole it is found that higher levels of financial development are significantly and robustly correlated with faster current and future rates of economic growth and physical capital accumulation. From the results it can be concluded that a strong positive relationship exists between financial sector development and economic growth.

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