

**CORRESPONDENCE BETWEEN FINANCIAL EVOLUTION AND
ECONOMIC GROWTH: A STUDY ON INDIAN PERSPECTIVE**

*Shiv Ranjan

**Kanika Tomer

***Dr. Ruchika Gupta

****Dr. Anish Gupta

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The paper aims at the impact of financial evolution in India upon the economical growth during the period of 1970 to 2019. The financial sector of India has evolved over the years and can be measured using variables like Credit made available to the Private Sector by the banks domestically, M3 Broad Money or Liquid Liability and Credit given by Financial sector involving the financial institutions across the country. The economic growth of a country can be measured using the real GDP per capita values. The study of the existence of co-integration and cause-effect relationship between financial evolution variables and economical growth measurement via real GDP per capita, we have used Johansen Test, Vector Autoregressive analysis and Granger causality respectively. We have observed a unidirectional flow from real gross domestic product to financial evolution. This confirms that economy's growth causes the need for better and faster financial services and hence, follows demand hypothesis.

Keywords: Financial Evolution, Growth, GDP Per Capita, Credit Availability, Liquid Liability, Credit to the Private Sector, Financial Sector, Economic Development, Broad Money, Vector Autoregressive Analysis, Granger Causality, Johansen Test, Ordinary Least Square Method.

Introduction

Evolution of the financial system and economy's development has been read extensively [Schumpeter - 1911; McKinnon & Shaw - 1973]. This study is well recognized and appreciated for identifying the critical existence and evolution of the financial sector for economy's growth. The course of cause and effect amid financial evolution and economy's growth is utterly significant as it brings out different inferences for a different growth strategies. However, the relationship emanates a blurry image. According to economical theories, evolved and efficient financial sector reduces shocks occurring due to incomplete information. Additionally, it helps in declining the transaction cost; mobilize savings with risk diversification causing efficient allocation of resources. There are immense number evidences in the literature of growth that illustrates that financial evolution directs economic growth.

There are four bases of different schools of thoughts on the economic growth:

1. The Growth Lead by Supply

This hypothesis identifies a strapping relationship between financial evolution and economy's

growth. A fragile financial system consists of low level savings, distortion of prices, fluctuation in the investment & saving returns along with unequal distribution. Such a system acts as a barrier in the growth rate. A strong financial system accentuates the growth of the economy as it facilitates credit supply in the economy, enhances the quality of Investment outlays and creates incentives for innovation in this sector. [1]

2. The Growth Followed by Demand

This hypothesis states that economy's growth is a source of development in the financial sector. A significant study was conducted by Teng & Liang, 2006 to study the relation between output progress and financial development using Vector Autoregressive Analysis for China during 1952 till 2001. The evidences show the existence of co-integration in the two variables. According to this hypothesis, economic growth is no longer caused by financial evolution. Instead, economic growth boosts the financial evolution by incentivizing the increase in efficiency and productivity. [2]

3. The Interdependence of Growth and Financial Development

This hypothesis states a feedback loop among the

*Amity Business School, Amity University, Greater Noida, UP, India

**Research Scholar, Amity School of Economics, Amity University, UP, India.

***Amity Business School, Amity University, Greater Noida, UP, India.

****Amity School of Engineering & Technology, Amity University, Greater Noida, UP, India.

economic growth and the financial evolution. A study conducted by Husam-Aldin, 2012 depicts the feedback effect in United Arab Emirates. The author utilized Autoregressive Distributed Lag methodology in order to study the cointegration. Financial development was depicted with the help of variables, namely monetization ratio and credit distribution by banks to the private sector. Another study was conducted by Sakhaei & Eslamloueyan, 2011 to depict the cointegration with the help of Generalized Least Square (GLS) methodology using Seemingly Unrelated Regression (SUR). [3]

4. Economic Growth Independent of Financial Evolution

The hypothesis states that there isn't any link between financial sector advancement and economic growth. A study was conducted by Bakhouch, 2007 where the causal relationship was studied between these two variables for Algeria using the model of an Autoregressive distributed Lag. Another study by Patrick directs the path of economic growth in relation with financial development. He has stated that "the financial development brings out the real innovation-type investment prior to the slowdown of economic growth". [4]

This paper aims in studying the path of causality corresponding to financial system advancement and economic development by using time series data of India from 1970 till 2019.

Literature Review

Indian republic is an emerging economy amongst the political and economical turmoil across globe. India has shown a relatively stable political system and prosperous economy. The economic growth has been connected to financial evolution by several economists. The evolution of the financial sector and economy's growth has been studied extensively [Schumpeter – 1911; McKinnon & Shaw – 1973]. A stable and evolving financial system helps in mobilizing the savings which is an essential for the economic growth. As per the study conducted by Robinson, 1952 the financial evolution pursue economic growth when this growth actually takes place due to several reasons. Another study conducted by Patrick, 1966 has described two hypothesis: The Growth lead by Supply and growth followed by demand. This was further analyzed by Greenwood, Levine and Smith, 1990 & 1997; Hung & Blackburn, 1998.

Previous studies conducted and their major findings:

- Demonstration of the impact of health of financial sector on economy's growth was done by Smith & Benecivenga, 1991.

- A research was conducted for over eighty countries to study the significant relationship amid a sound financial system and economic growth by Levine & King, 1993.
- Vector autoregressive framework, vector correction model and granger causality test was used to study data for Egypt conducted by Abu-Qarn and Abu- Bade, 2005 for the period of 1960 till 2001 which focused on the strength of the financial sector as a significant instrument towards the mobilization of savings. Hence, promotes economic growth.
- To study the correspondence of financial evolution with economic growth, Zervos & Levine, 1996 made use of horizontal cross sectional methodology.
- Wachtel & Rousseau, 1998 deducted the causality amid growth of an economy and financial sector via studying 5 developed nations.
- A similar relationship was observed for Organization for Economic cooperation and development countries by Kugler & Neusser, 1998.
- Data of forty seven countries was analyzed to study the correlation amid liquidity in the securities 3 by Zervos & Levine, 1998.
- A drastic contrast in the pattern of this relationship came into light when Zhenhui Xu, 2000 used data of forty countries to show that health of financial sector does not impact the growth of the economy.
- Correspondence among securities sector and financial market from 1971 till 2007 was studied by Nicholas M Odhiambo, 2008 using ADLM.
- The Liquidity and Profitability in Steel Companies in India like TATA Steel, SAIL, JSW Steel impact the growth rate and productivity of these companies. This phenomenon can be applied to various sectors. The paper by Jain M.K., Garg V. and Ranjan S. (2017) suggested that "there is no significant difference in the companies net worth ratio, return on capital employed and dividend payout". Therefore, steady of level of liquidity provides steady level of profit ratios. [5]

Several researches with empirical evidences have been conducted to study the relationship. Economists applied approaches with various forms of data.

This causality differs from developing and developed country. The strength of causality is observed more in developing countries than developed countries.

Studies conducted use Vector autoregressive analysis which is beneficial in identifying the overall effect of financial growth towards economy's growth. However, this impact is not universal across nations as few economies are bank based and others are market based, the impact on the economic growth of financial evolution differs accordingly.

Market based financial structure helps in enhancing performance and diversity in technology by improvising credit facility and risk sharing. On the other hand, the bank based financial structure are effective in the managing frailer infrastructures.

Data Assortment

Financial Evolution can be studied using different variables. In our study, we have used three variables - Credit Given by Financial Sector, liquid liability and availability to private sector of credit by banks domestically.

Economic growth can be studied using real gross domestic product. This can be calculated using nominal gross domestic product which can be adjusted using GDP deflator.

1. A Credit Given by Financial Sector

The domestic credit given by financial sector is the credit provided to several sectors in the country apart from the credit provided by the central government. The financial sector consists of financial corporations, deposit money banks, foreign exchange companies and monetary authorities. This variable specifies the echelon of savings which signifies growth of the banking organization. [6]

Additionally, this sector includes leasing corporations, pension scheme, insurance company, moneylenders, and foreign exchange companies. As the international reserves are deposited in commercial banks rather than central bank, the credit given by financial sector can be negative due to net obtained by deducting the claims of the government from the deposits.

2. M3: Broad Money – Liquid Liability

Monetary aggregates define M3 as broad money as it is a method which is inclusive of the overall money supply of the country. However, a large portion of this money is in the form currency in developing countries which is deposited outside. [6]

Ratio of M3 to GDP reflects the widespread use of currency. Therefore, we have taken liquid liability (% of GDP) as a variable of volume of financial system. M3 is inclusive of narrow money [deposits at the bank which is easily convertible along with

currency (M0 & M1)], short term deposits at the bank, short term funds in the money market (M2), long term bank deposits and in the market. [7]

Liquid liability connotes the easily accessible money which can be utilized for the purchase of goods and service while keeping the cost nil.

3. Availability to Private Sector of Credit by Banks Domestically

The credit is in the form of loans, trade credit, securities to private sector is established as per the World Bank. The banks providing such credits comprises of central monetary authorities, financial leasing companies, insurance companies, money lenders, and commercial banks.

This variable is significant while indicating the depth of the banking system because it depicts the investments quantitative and qualitative part.

4. Real GDP (per capita)

Gross domestic Product (GDP) is the aggregate market value of all final goods & services produced within an economy over an accounting year. GDP indicates the level of economic development & standard of living of an economy. [8]

Data Scrutiny

The paper has used times series data since 1970 - 2019 to evaluate the correspondence among financial evolution and growth. The past literature has used OLS (Ordinary least Square Method), granger causality test, cross sectional data, co integration based on generalized methods of moments. In this paper, we have used Vector autoregressive model to find the aggregate impact of the variables.

Firstly, we have used linear regression method on our data. The results of which are shown in table 2 in the Appendix.

The "OLS" report shows a high R square & adjusted R square value. We suspected the existence of spurious regression as there is no direct link between the variables. The negative coefficient of C_BANK variable means it impacts the GDP negatively. Therefore, we cannot rely on these results. The presence of stochastic trend is the reason for bias results. There may also be presence of Endogeneity.

The correspondence among the two study areas is based on cointegration as well as granger causality test. [9] The Vector (St) of the variables we have chosen can be written as:

$$St = \phi_1 st-1 + \phi_2 st-2 + \dots + \phi_k st-k + \epsilon_t \quad (1)$$

Now, we will first run Vector Autoregressive Analysis using:

$$R_GDP = f(C_PRIV, C_BANK, L_LIAB) \quad (2)$$

1. Unit Roots Analysis

Post the removal of stochastic trend (after being differenced “d” times), a time series variable is called as integrated of order “d”. In order to confirm the integration of order “d”, the time series variable is further differenced “d-1” times.

All the variables in their level form show either an upward or downward tendency. The equation has a trend term & intercept. SBIC (Schwarz Bayesian Information Criterion) / AIC (Akaike Information Criterion) utilize to minimize lags in the model.

SBIC – Lag value 1

AIC – Lag value 2

We have chosen ideal lag of SBIC, 1.

The test equation of Aug. Dickey Fuller Test is:

$$\Delta y_t = \alpha_0 + \theta y_{t-1} + y_t + \alpha \Delta y_{t-1} + \dots + \alpha_p \Delta y_{t-p} + \epsilon_t \quad (3)$$

The hypothesis Testing:

H0: $\theta = 0$ (presence of unit root)

HA: $\theta < 0$ (Stationary Trend)

This is a left tailed test.

All variables possess unit root in their level form. Variables are hence, non – stationary. Hence, the results of OLS are biased.

The results show the nonexistence of unit root in dC_PRIV at ten percent level and in dC_BANK at both five percent and ten percent level.

2. Analysis of Co-integration using Johansen

If the two series contain linear combination of lower order of integration, then cointegration is present. This existence helps us to determine whether the variables will possess long run stability. We have used Johansen Cointegration Test in their level form.

We will now utilize the methodology developed to test the presence of cointegration by Juselius & Johansen, 1990.

H0 = Absence of Co integration; Hi = Presence of co integration

We have used cointegration test in the time series Vector autoregressive model in their level form. There are two test statistics namely, eigenvalue and trace as per the Johansen, 1998.

The likelihood ratio (LR) Test:

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^p \ln(1 - \lambda_i) \quad (4)$$

λ_i = Max statistics for ith root.

T = Total usable observation

r = Between 0 to p-1

H0 = the no. of distinct character roots $\leq r$ (where $r = 0$)

Hi = the no. of distinct character roots $\leq r+1$ and so forth.

We fit Vector autoregressive model to the time series data and choose the required no. of lags.

For the order of Vector AutoRegressive model, p=1 means appt. specification.

The results depict the existence of co integration. Therefore, the correspondence among variables is stable. Although due to lag length sensitivity of λ_{trace} , there is no clear co integration rank. When we use lag value as 2, cointegration rank comes out to be 1 but the results of augmented dickey fuller test are improper as variables are integrated of order 1 after 1st difference.

The LR for max statistic test:

$$\lambda_{\text{max}}(r_0) = -T \log(1 - \lambda_{r_0+1}) \quad (5)$$

The results of the test show the trace statistics and max statistics:

3. Vector Error Correction Model

The presence of cointegration allows the deviation in the short run to become stable in the long run and establish equilibrium state. The VEC Model leads to convergence of endogeneous variables in the long run in reference to short run deviation. Now, we estimate the VAR model to outline the adaptation of deviations in the LR equilibrium. Error correction Error correction indicates adjustment and adaptation rate. We have utilized Hendry, 1992 form of ECM given below:

$$\Delta y_t = \beta_1 \sum \Delta y_{t-i} + \beta_2 \sum \Delta x_{t-i} + \beta_3 \sum \Delta z_{t-i} + \beta_4 \sum \Delta m_{t-i} + \lambda ECT_{t-i} + \epsilon_{t-i} \quad (6)$$

Where,

Δ = 1st difference

ECT-i = Error Correction with lag of i.

λ = Coeff. Of ECT, where t is from -1 & 0.

ϵ_t = residual

ΔY_t doesn't have stochastic trend as Y_t is integrated of order, where ECT-I contains I(1) and λECT_{t-i} contains I(0). λECT_{t-i} is the LR parameter and $\beta_1, \beta_2, \beta_3$ and β_4 are SR parameters.

VEC model analysis shows that p values of all the variables are greater than 5% (level of significance).

Therefore, 1 period lag Δ in the variables has no impact on the current value of R_GDP. On the contrary, 1 period lag Δ in R_GDP is significant for all individual variables present value as the p values are less than 5% (level of significance).

C_PRIV increases 0.18 with 1p.c. increase in 1st difference lag value of R_GDP.

C_BANK increases 0.25 with 1p.c. increase in 1st difference lag value of R_GDP.

L_LIAB increases 0.18 with p.c. increase in 1st difference lag value of R_GDP.

4. Granger Causality Test

We will now check the causal correspondence between the two variables namely financial evolution & growth with granger causality test. The bivariate form for the test is given below:

$$y_t = \alpha_{10} + \sum_{j=1}^k \alpha_{1j} y_{t-j} + \sum_{j=1}^k \beta_{1j} x_{t-j} + u_t \quad (7)$$

$$x_t = \alpha_{20} + \sum_{j=1}^k \alpha_{2j} y_{t-j} + \sum_{j=1}^k \beta_{2j} x_{t-j} + u_t \quad (8)$$

We will use Wald F statistic hypothesis test with $F = \text{Difference Restricted sum of squares} / \text{Unrestricted sum of squares} / \text{divided by the lag length}$. This is equal to unrestricted sum of squares divided the difference between sample size, twice the lag length and 1.

$H_0 = \alpha_{11-1k} \ \& \ \beta_{11-1k} = 0$ if calculated value < critical value; No Granger cause & $H_a = \alpha_{11-1k} \ \& \ \beta_{11-1k} = 0$ if calculated value ; Granger cause.

The validity of this hypothesis will be dependent on the order of the vector autoregressive model.

The results show the causality among R_GDP & other variables as uni directional. Hence, the values of R_GDP in past years have an effect on the variable's present value, C_RIV, C_BANK & L_LIAB. These results prove that demand for financial evolution follows growth.

We will now perform the Breusch Godfrey Serial Correlation & residual normality to test the efficiency and specification quality. Our test results shows absence of serial auto correlation (approval of lag order) and correct specification (refer to appendix for test tables).

4.5 Endogeneity Problems

The problem of endogeneity may exist in time series data where the values in current period may be dependent on values in the prior period.

As per our results of Granger causality, it is clear that R_GDP values of prior periods impacts the current values of C_BANK, C_PRIV & L_LIAB.

So, we need to make these variables exogenous. For this, two stage least square can be used with instrumental variables like gross domestic savings/GDP & outstanding debt/GDP. This may not eliminate the endogeneity completely but will minimize it to a great extent.

Conclusion

This paper aims to determine the correspondence among financial evolution - economic growth via the times series data from 1970 to 2019 - India. The results show the existence of unit root in the variable's level-form and stationary at 1st difference. The VEC model is used to cointegrate the variables (endogeneous) to converge in LR while adjusting the SR fluctuations by eliminating insignificant variables. We have tried to study the causal relationship between real gross domestic product with C_PRIV, C_BANK and L_LIAB. Results of granger causality test show a unidirectional relation i.e. the past values of real gross domestic product has an impact on the present values of the variables of study.

The fiscal policies in India should focus on efficiency and productivity to increase demand in finance area. Such policies should be adopted which focuses on economic growth and reforms in financial sector simultaneously.

Conflict of Interest

There is no conflict of interest among the authors.

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Appendix

Table 1: Review of Statistics

Var.	Obs	Mean	Std. Deviation	Min.	Max.
R_GDP	57	318.03	186.48	152.06	840.85
C_PRIV	57	24.44	13.12	7.71	51.87
C_BANK	57	43.52	16.75	21.24	77.151
L_LIAB	57	42.19	16.33	22.18	74.48

Where,

R_GDP is the real GDP per capita; C_PRIV is the availability of private sector by banks,

C_BANK is the total credit provided by the financial system and L_LIAB is the liquid liability

Table 2: Linear Regression Results

Source	SS	df	MS	Number of Observations : 57 F(3,51) : 410.35 Prob > F: 0 R-squared: 0.9602 Adj R squared: 0.9579 Root MSE: 0.10362
Model	13.218323	3	4.4061076	
Residual	0.5476148	51	0.0107375	
Total	13.765937	54	0.2549248	

ln_gdp	Coef.	Std. Err.	t	P > t	[95% Conf. Interval]	
c_priv	0.0058175	0.005932	0.98	0.331	(-) 0.0060912	0.0177626
c_bank	(-)0.0075097	0.004243	(-) 1.77	0.083	(-) 0.01602671	0.0010077
l_liab	0.0331915	0.00502	6.61	0	0.0231139	0.0432691
_cons	4.409119	0.066967	65.84	0	4.274678	4.54356

Table 3: The Dickey Fuller Test Statistics in Their Level Form

Variable	Test Statistic	1%	5%	10%
LnR_GDP	3.83	-3.58	-2.93	-2.60
C_PRIV	1.01	-3.58	-2.93	-2.60
C_BANK	0.34	-3.58	-2.93	-2.60
L LIAB	0.92	-3.58	-2.93	-2.60

Table 4: The Dickey Fuller Test Statistics in Their First Difference Form

Variable	Test Statistic	1%	5%	10%
dlnR_GDP	-4.08	-3.58	-2.93	-2.60
dC_PRIV	-2.91	-3.58	-2.93	-2.60
dC_BANK	-3.174	-3.58	-2.93	-2.60
dL_LIAB	-4.113	-3.58	-2.93	-2.60

Table 5: Results of Johansen's Cointegration Test

Trend: Constant
Sample: 1961-2016
Number of Obs. = 56
Lags = 1

Max. Rank	Parms	LL	eigenvalue	trace statistic	5% Critical Value
0	4	(-) 161.4157	.	67.57	47.21
1	11	(-) 142.7968	0.498	30.33	29.69
2	16	(-) 135.8284	0.227	16.39	15.42
3	19	(-) 130.1455	0.189	5.03	3.77
4	20	(-) 127.6306	0.088		