Economic Affairs, Vol. 64, No. 2, pp. 323-332, June 2019

DOI: 10.30954/0424-2513.2.2019.7

Financial and Real Sector Linkages: Evidence from India

Bhaskar Goswami* and Sudeshna Dutta

Department of Economics, University of Burdwan, Golapbag, Burdwan-713104, West Bengal, India

*Corresponding author: mailbhaskar08@gmail.com

ABSTRACT

Financial and real sector linkages have been the subject of interest among economists since the global financial crisis. This paper investigates the cointegrating relationship and the causality between the financial and real sector in India for the period 1982 to 2015 using time series annual data. The financial sector is proxied by liquid liabilities, domestic credit given by financial sector and market capitalisation as percentages of GDP. The real sector is proxied by real GDP with net capital formation and real interest rate used as control variables. The Augmented Dickey Fuller and Phillips Perron tests show that all variables are stationary at first differences. The Johansen cointegration test reports cointegrating relations between financial and real sector when domestic credit given by financial sector and liquid liabilities as percentages of GDP represent the financial sector. However, the error correction model gives the speed of adjustment between the financial and real sector only when domestic credit as a percentage of GDP is used as an indicator of financial sector. The Granger test reveals that there is a unidirectional causality from real to financial sector when domestic credit and liquid liabilities as percentages of GDP represent the financial sector. We find evidence of a demand following hypothesis or growth driven finance hypothesis. These results have significant inferences for economists and policy makers.

JEL classification: G00, E00, E44, C58

Highlights

- Cointegration detected between financial and real sector.
- Speed of adjustment associated with domestic credit as indicator of financial sector.
- Unidirectional causality from real to financial sector.

Keywords: Error Correction Model, Financial sector, Granger causality, Johansen Cointegration, Real sector

The Global Financial Crisis of 2008-2009 emphasized the association between financial repression and economic downswing. This has ushered in a renewed interest in the association between the financial and real sector. Earlier, the financial sector was considered to play a minor role in economic growth. But, nowadays, the intensification of the financial system inadvertently impacts the real economy. A developed and efficient financial system could provide information about profitable investment opportunities and consequently impact economic growth. Similarly, an economic downturn may affect the financial system by dampening the valuation of financial assets. This interaction between the financial sector and the real economy is simply referred to as financial and real sector linkages and has become an area of significance among macroeconomic practitioners.

Financial and real sector of an economy share a strong association. Both the sectors need each other to sustain themselves. Since 1991, the Indian economy underwent major reforms through the new economic policy when liberalisation, privatisation and globalisation became the fundamental ideology of the development process. This had a profound impact on the financial system. It was during this time that it was realised that a well-developed and efficient financial system was necessary to support the various reforms introduced in the real economy. In a way it hinted towards the integration of the financial sector with the real economy

There is a diversity of studies investigating the link between financial sector and real sector.

Such studies date back to Schumpeter (1911) who emphasized the role of financial intermediaries in economic growth. Beck and Levine (2004) observed that both stock markets and banks independently stimulate growth. Apergis, N. *et al.* (2007) found a cointegrating relation between financial development and growth for OECD and Non-OECD countries and bi-directional causality between financial development and economic growth. Ailemen and Unemhilin (2017) discovered that market based financial structure have a positive impact on economic growth in Nigeria. Bhatia A. (2017) identified some financial indicators in the case of USA and India that could impact and forecast changes in the economic scenario. The financial variables like interest rates and interest rate spreads play a lead role in predicting recessions in free market economies. Empirically, the literature is dissected over the direction of causality among the two sectors. Some support unidirectional causality of supply leading hypothesis or the finance-led growth hypothesis which postulates that financial sector development stimulates and drives economic growth. Whereas, some are in favour of the demand following hypothesis or the growth-driven finance hypothesis which proposes that economic growth leads to financial development. There are a number of empirical studies in the literature that provide support for the supply leading hypothesis (Sehrawatand Giri, 2015; Akinlo and Egbetunde, 2010; Christopoulosa Dimitris K. and Tsionas Efthymios G, 2004; Banerjee and Ghosh, 1998; Shaw, 1973). Studies supporting the demand following hypothesis include (Onayemi, 2013; Simwaka *et al.*, 2012; Jenkins and Katircioglu *et al.*, 2010; Odhiambo, 2008). Some are of the view that causality is bidirectional, i.e., both financial and real sector cause and complement each other which include the works of Odediran and Udeaja (2010), Acaravci *et al.* (2009), Apergis N *et al.* (2007), Calderon and Liu (2003), and Luintel and Khan (1999).

Studies in the Indian context use different approaches to analyse the link between the financial and real sector. Banerjee and Ghosh (1998) reported a supply leading relationship from real disbursements to real investments in India but found a weak evidence to assert reverse causality. Chakraborty I (2010) examined the impact of financial sector development on economic growth in the post-reform period and found that stock market development is not important in enhancing economic growth in India, but on the other hand, market rate of interest reforms that were introduced in the Indian banking system have enhanced economic growth significantly. Pradhan (2011) found that growth is caused by both financial and stock market development in an Indian context. Acharya *et al.* (2009) and Sehrawat and Giri (2015) found a long run relationship between financial development and economic growth for Indian states.

Hence, there are diverse studies seeking to establish the financial and real sector linkages with varied results. Presently, the financial sector has a critical role in an emerging economy like India. However, whether the financial system has a sound impact on the real sector in India or not has been quite an unexamined area. In fact, the macroeconomic and financial sector linkages has not been extensively examined for India and still remains a major research gap. Hence the lack of unanimity in results and dearth of work related to this area provides us further motivation to conduct this study. Against this backdrop, the present paper is a humble attempt to throw some light on such a linkage in an Indian context. The basic objective of our study is to identify the link and direction of causation between real and financial variables using macro-economic annual data for the period 1982-2015, in an Indian context and hence establish the long run and short run association between the financial and real sector of India. The rest of the paper has the following structure: firstly, a description of the data and methodology is given, followed by the discussion of empirical results and lastly the concluding remarks are given.

Data and Methodology

This paper investigates the link between the financial and real sector in India using annual data for the period 1982-2015[1]. This period is chosen because of data availability and also since it includes the period of major economic reforms of 1991.

The three indicators used to represent the financial sector are (1) total domestic credit (DC) provided by the financial sector as a percentage of GDP (2) liquid liabilities (LL), defined as M3, including the

[1]We assume away any structural break in the time series data, which however, is for the sake of analytical simplicity.

currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries as a percentage of GDP and (3) stock market capitalisation (MC) as a percentage of GDP. The first indicator DC, measures the degree of financial intermediation and is a key indicator of financial development. The second indicator LL, is a primary measure of financial depth as it represents the overall size of the financial sector. Lastly, the third indicator MC, represents the size of the stock market. These indicators are chosen after careful consideration of literature on the various aspects of financial development and hence ensure robust results. The indicator used to capture the real sector is real gross domestic product (GDPR). We have also used two control variables, namely, net capital formation (NCF) and real interest rate (IRR) to avoid simultaneous bias that could impact the causal direction between the financial and real sector (Akinlo and Egbetunde, 2010).

The data for MC and NCF were obtained from the Reserve Bank of India's database on Indian Economy. The data for DC, LL and IRR were obtained from the World Bank website and the data on GDPR for India has been obtained from the Indian Planning commission website. Data has been analysed using the econometric software, Eviews 7.0.

Model specification

The model estimated for this study is specified as follows:

$$FS_t^i = f(GDPR, IRR, NCF) + \xi_t \qquad \ldots(1)$$

Where FS is financial sector proxied by Domestic credit given by financial sector (DC), Liquid liabilities (LL), and stock market capitalisation (MC), as percentages of GDP.

i = DC, LL, MC.

GDPR is Real Gross Domestic Product.

NCF is Net Capital Formation.

IRR is Real Interest rate.

't' is the time trend and ξ is the error term.

The data has been analysed using 3 models to see the individual association of the financial indicators with the real economy. Model 1 uses DC as an indicator of financial sector and finds its impact on the real sector. Similarly, Model 2 and Model 3 use LL and MC as indicators of financial sector respectively and finds its impact on the real sector.

Model estimation technique

The study employs the multivariate cointegration approach to look into the association among the variables. The cointegration and error correction methodology adopted in this study is well substantiated in the literature (Johansen and Juselius, 1990; Johansen, 1988; Engle and Granger, 1987). However, the results of cointegration test given by Engle and Granger (1987) may differ since the residuals vary based on which time series variable is designated as the dependent variable. One important test for cointegration that is invariant of the ordering of variables is the full-information maximum likelihood test of Johansen or simply the Johansen test. The Johansen (1988) cointegration model based on the error correction representation is given by:

$$DY_t = \mu + \sum_{i=1}^{\rho-1} \tau_i DY_{t-i} + \Pi Y_{t-1} + \xi_t \qquad \ldots(2)$$

In the above equation (2), Y_t is a (nx1) column vector consisting of ρ variables, μ is a (nx1) vector consisting of constant terms, D is a difference operator, Γ and Π are the coefficient matrices and ξ is the error term. The coefficient matrix Π contains long run information about the underlying variables and is known as the impact matrix. The VAR equation (2) is estimated according to the Johansen methodology and the residuals are then used to compute two likelihood ratio (LR) test statistics that help determine the unique cointegrating vectors of Y_t. Both the trace test and the maximal eigenvalue test are used to determine the cointegrating rank.

Error Correction Model

The error correction equation used in the study is stated as follows:

$$DFS_t^i = \alpha_0 + \beta_1 DGDPR_t + \beta_2 DIRR_t + \beta_3 DNCF_t + \beta_4 ECM + \xi_t \qquad \ldots(3)$$

Where i=DC, LL and MC, ECM is the error correction term and ξ is the mutually uncorrelated pure white noise residual. The coefficient of the ECM indicates whether the past values of the variables affect the current values of the variables. The statistical significance and magnitude of this coefficient measures the tendency of each variable to return to the long run equilibrium. In other words, if a coefficient is significant then it means that the past equilibrium errors play a role in determining the current values. The coefficients of the difference terms are associated with the short run dynamics.

Stationarity test

In any time series analysis, a stationarity check is very crucial as the presence of unit roots or non stationarity in the series would lead to permanent effects of shocks. This could lead to misleading results. The essentiality of stationarity testing has been indispensable in the works of Chakraborty I (2010), Ailemen & Unemhilin (2017) and G. Ram Raj & Marcus A. (2019). Hence, we use both the parametric and non parametric tests of Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) respectively to check for the stationarity of the series. The tests are conducted with intercept and trend, at levels and first differences of the series.

Granger causality test

Granger causality tests are executed to explore the direction of the causal link between financial sector and real sector. If a variable A Granger causes a variable B, then the past values of A should have information that helps in predicting the present value of B and should supersede the information contained in past values of B alone. Basically we want to see if any change in financial sector Granger causes the change in real sector if past values of the change in financial sector improve unbiased least-square predictions about the change in real sector. We have tested the null hypothesis H_0 that A does not granger cause B and B does not granger cause A.

RESULTS AND DISCUSSION

This section deals with the results of the unit root, VAR lag order criterion, cointegration, error correction, and Granger causality tests conducted.

Stationarity Test Results

The paper uses both the Augmented Dickey-Fuller and the Phillips-Perron tests to explore the existence of unit root in each of the time series variables. A variable will be stationary if the ADF and PP values are greater than the critical value at a given level of significance (1%, 5%, 10% levels). All the variables were differenced once and were found stationary for intercept and trend. Table 1 summarises the results of both ADF and PP tests with intercept and trend after first differencing the variables.

Table 1: Unit Root Test for Stationarity at First Difference

Variables	ADF (intercept and trend)	PP (intercept and trend)
DC	-4.400(-4.273)***	-4.567(-4.273)***
LL	-3.640(-3.557)**	-3.640(-3.557)**
MC	-8.916(-4.273)***	-10.889(-4.273)***
GDPR	-3.474(-3.2121)*	-3.395(-3.212)*
NCF	-6.179(-4.273)***	6.178(-4.273)***
IRR	-7.918(-4.273)***	-8.297(-4.273)***

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

Figures within parentheses indicate critical values.

Source: Authors' own calculation using Eviews 7.0.

VAR Lag Order Selection Criteria Results

Prior to conducting the cointegration tests, an optimal lag length has to be chosen. We perform the VAR lag order selection criterion to find out the optimal lag length which is tabulated below model wise. From Tables 2, 3 and 4 we see that the optimum lag order is 4, 4 and 1 respectively for DC, LL and MC as given by the lag order specified by the most number of criteria like the LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion).

Model 1: DC as an indicator of financial sector

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-623.0782	NA	1.68e+13	41.80521	41.99204	41.86498
1	-501.1832	203.1584	1.46e+10	34.74555	35.67968*	35.04438
2	-484.8635	22.84761	1.53e+10	34.72423	36.40567	35.26214
3	-463.2149	24.53503	1.24e+10	34.34766	36.77640	35.12464
4	-432.2589	26.82851*	6.58e+09*	33.35060*	36.52664	34.36664*

** indicates lag order selected by the criterion; Source: Authors' own calculation using Eviews 7.0*

Model 2: LL as an indicator of financial sector

Table 3: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-634.8482	NA	3.69e+13	42.58988	42.77670	42.64964
1	-490.5691	240.4651	7.21e+09	34.03794	34.97207*	34.33678
2	-473.4619	23.95011	7.14e+09	33.96412	35.64556	34.50203
3	-458.5710	16.87635	9.10e+09	34.03806	36.46681	34.81504
4	-425.1790	28.93969*	4.10e+09*	32.87860*	36.05465	33.89465*

** indicates lag order selected by the criterion; Source: Authors' own calculation using Eviews 7.0.*

Model 3: MC as an indicator of financial sector

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-653.2740	NA	1.26e+14	43.81827	44.00509	43.87803
1	-548.9696	173.8406*	3.54e+11*	37.93131	38.86544*	38.23015*
2	-538.8631	14.14907	5.59e+11	38.32421	40.00565	38.86212
3	-523.1793	17.77505	6.76e+11	38.34529	40.77403	39.12226
4	-495.2666	24.19097	4.39e+11	37.55111*	40.72716	38.56715

** indicates lag order selected by the criterion; Source: Authors' own calculation using Eviews 7.0.*

Table 5: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.822400	104.5797	47.85613	0.0000
At most 1 *	0.758711	54.46120	29.79707	0.0000
At most 2	0.352975	13.23019	15.49471	0.1066

*Trace test indicates 2 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0*

Table 6: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05Critical Value	Prob.**
None *	0.822400	50.11846	27.58434	0.0000
At most 1 *	0.758711	41.23101	21.13162	0.0000
At most 2	0.352975	12.62573	14.26460	0.0893

*Max-eigenvalue test indicates 2 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0*

Cointegration Results

Now that it has been established that all variables are integrated of order 1, hence, the existence of cointegration is tested. We use the Johansen approach to test for the existence of cointegration between the variable series. The cointegration results are discussed below model wise in this subsection.

Model 1: DC as an indicator of financial sector

Tables 5 and 6 show that the trace test and maximum eigenvalue statistic reject the null hypothesis of no cointegration at 5 per cent level. We observe that there are two cointegrating equations between DC and GDPR, NCF and IRR with lag length of 4 in first difference. Hence, a long run relationship exists between the financial and real sector when DC represents the financial sector.

Table 7: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.814805	100.8913	47.85613	0.0000
At most 1 *	0.633606	51.98733	29.79707	0.0000
At most 2 *	0.510149	22.86996	15.49471	0.0032
At most 3	0.072225	2.174016	3.841466	0.1404

*Trace test indicates 3 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 levels; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0.*

Table 8: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.814805	48.90400	27.58434	0.0000
At most 1 *	0.633606	29.11737	21.13162	0.0031
At most 2 *	0.510149	20.69595	14.26460	0.0042
At most 3	0.072225	2.174016	3.841466	0.1404

*Max-eigenvalue test indicates 3 cointegrating equation(s) at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0.*

Table 9: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05Critical Value	Prob.**
None	0.493097	46.57797	47.85613	0.0656
At most 1	0.409128	24.83603	29.79707	0.1674
At most 2	0.220092	7.999045	15.49471	0.4655
At most 3	0.001390	0.044522	3.841466	0.8329

*Trace test indicates no cointegration at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0.*

Table 10: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.493097	21.74195	27.58434	0.2339
At most 1	0.409128	16.83698	21.13162	0.1798
At most 2	0.220092	7.954523	14.26460	0.3833
At most 3	0.001390	0.044522	3.841466	0.8329

*Max-eigenvalue test indicates no cointegration at the 0.05 level; * denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values; Source: Authors' own calculation using Eviews 7.0.*

Model 2: LL as an indicator of financial sector

Tables 7 and 8 denote that the trace test and maximum eigenvalue statistic reject the null hypothesis of no cointegration at 5 per cent level. Both trace and maximum eigenvalue tests report three cointegrating equations between LL and GDPR, NCF and IRR with lag length of 4 in first difference. This implies that a long run relationship subsists between the financial and real sector when LL represents the financial sector.

Model 3: MC as an indicator of financial sector

From Tables 9 and 10, it is observed that there is no cointegration between MC and GDPR, NCF and IRR with lag length of 1 in first difference. Hence, when market capitalization as percentage of GDP is used to represent the financial sector, there is no long run relationship between the financial and real sector (that is, no cointegrating equation).

Error Correction model

Now that cointegration has been detected among the variables under study except when MC is used as an indicator of the financial sector, it denotes that a long term relationship exists between the variables. However, the cointegrating equation only captures the long run relation and fails to throw any light on the short run dynamics. However, its existence itself indicates that there must be some short term forces that help in restoring equilibrium in case of any divulges from it and hence keep the relationship in the long run intact. The Engle-Granger Theorem states that the Error Correction Model is a comprehensive model which combines short run and long run dynamics. The error correction term measures the speed of adjustment to restore equilibrium in the dynamic model. The error correction coefficient given by U(-1) shows the speed at which the variables return to the equilibrium and whether it has a statistically significant coefficient with a negative sign. In other words, a highly significant error correction term is an indicator of a stable long-term relationship.

Model 1: DC as an indicator of financial sector

Table 11 shows that the error correction coefficient has the expected negative sign and lies between the usual range of 0 and 1. Precisely, the speed of adjustment is -0.228 suggesting that about 23 percent of errors generated in each period is automatically corrected by the system in the subsequent period and is statistically significant at 10 percent level.

Table 11: Error Correction Model 1

Dependent Variable: D(DC)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.158710	0.406501	2.850446	0.0081
D(GDPR)	0.010720	0.013116	0.817323	0.4206
D(IRR)	-0.244788	0.161714	-1.513711	0.1413
D(NCF)	-0.000184	0.000295	-0.622157	0.5389
U(-1)	-0.228990	0.115546	-1.981806	0.0574
R-squared	0.216751	Mean dependent var		1.002914
Adjusted R-squared	0.104858	S.D. dependent var		2.066615
S.E. of regression	1.955265	Akaike info criterion		4.317655
Sum squared resid	107.0457	Schwarz criterion		4.544399
Log likelihood	-66.24131	Hannan-Quinn criterion		4.393948
F-statistic	1.937128	Durbin-Watson stat		1.326448
Prob (F-statistic)	0.131945			

D is the difference operator; Source: Authors' own calculation using Eviews 7.0.

The result of Error correction model in this case is robust as is evident from the LM test reportedin Table 12. The result under LM test suggests that the errors are not further serially correlated at 5 % significance level.

Table 12: Breusch-Godfrey Serial Correlation LM Test

F statistic	2.262301	Prob. F(4,24)	0.0922
Observed R squared	9.035731	Prob. Chi Square(4)	0.0602

Source: Authors' own calculation using Eviews 7.0.

Model 2: LL as an indicator of financial sector

From Table 13, we see that although, there exists a long run equilibrium between LL as a proxy for the financial sector and the real sector, the equilibrium is not stable as suggested by the sign of the coefficient of the ECM term in the error correction model. Also the coefficient of the ECM term is not statistically significant. Hence, although a long run relationship exists, the adjustment to the long run equilibrium is not clear from the error correction model. This may indicate that the long run relationship might not be stable.

Table 13: Error Correction Model 2

Dependent Variable: D(LL)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.700366	0.376574	4.515357	0.0001
D(GDPR)	0.014738	0.011610	1.269453	0.2147
D(IRR)	-0.045909	0.144126	-0.318531	0.7524
D(NCF)	-0.000590	0.000306	-1.924875	0.0645
U(-1)	0.134496	0.098560	1.364604	0.1832
R-squared	0.122675	Mean dependent var		1.270631
Adjusted R-squared	-0.002657	S.D. dependent var		1.726159
S.E. of regression	1.728451	Akaike info criterion		4.071056

Sum squared resid	83.65120	Schwarz criterion	4.297799
Log likelihood	-62.17242	Hannan-Quinn criterion	4.147348
F-statistic	0.978800	Durbin-Watson stat	1.367341
Prob(F-statistic)	0.434919		

D is the difference operator; Source: Authors' own calculation using Eviews 7.0.

Table 14 reports the LM test that suggests that the errors are not further serially correlated. So the test results of the Error Correction Model is robust.

Table 14: Breusch-Godfrey Serial Correlation LM Test

F statistic	**1.463122**	**Prob. F(4,24)**	**0.2444**
Observed R squared	6.469549	Prob. Chi Square(4)	0.1667

Source: Authors' own calculation using Eviews 7.0.

Model 3: MC as an indicator of financial sector

When MC is used to represent the financial sector, Tables 9 and 10 indicate no cointegration between the financial and real sector. Hence, the error correction model is not used as it would make no sense in studying the speed of adjustment since no long run association has been detected between MC and GDPR, NCF and IRR. This suggests that for India, market capitalization or for that matter stock markets, is not a proper representation of the overall financial system.

Granger Causality Results

The Granger causality results are discussed below model wise in this subsection. From the results of the pair-wise granger causality test tabulated in Tables 15, 16 and 17, we see that there is a unidirectional causality running from Real GDP to the financial sector when the financial sector is proxied by domestic credit and liquid liabilities. In case of domestic credit, the causality lasts for a lag length period of 4, but for liquid liabilities the causality occurs at a lag length of 1 period only. For the case of market capitalisation we find no evidence of any causality.

Table 15: Pairwise Granger causality tests of Model 1 (DC as an indicator of financial sector)

Lags: 1		
Null Hypothesis:	**F statistic**	**Probability**
D(GDPR) does not Granger Cause D(DC)	8.92362	0.0057
D(DC) does not Granger Cause D(GDPR)	0.12815	0.7229
Lags: 2		
D(GDPR) does not Granger Cause D(DC)	2.97265	0.0688
D(DC) does not Granger Cause D(GDPR)	0.60067	0.5559
Lags: 3		
D(GDPR) does not Granger Cause D(DC)	7.23641	0.0014
D(DC) does not Granger Cause D(GDPR)	0.71077	0.5555
Lags: 4		
D(GDPR) does not Granger Cause D(DC)	6.54188	0.0016
D(DC) does not Granger Cause D(GDPR)	0.42961	0.7855

D is the difference operator; Source: Authors' own calculation using Eviews 7.0.

Table 16: Pairwise Granger causality tests of Model 2 (LL as an indicator of financial sector)

Lags: 1		
Null Hypothesis:	**F Statistic**	**Probability**
D(GDPR) does not Granger Cause D(LL)	3.44666	0.0736
D(LL) does not Granger Cause D(GDPR)	0.47100	0.4980

D is the difference operator; Source: Authors' own calculation using Eviews 7.0.

Table 17: Pairwise Granger causality tests of Model 3 (MC as an indicator of financial sector)

Lags: 1		
Null Hypothesis:	**F Statistic**	**Probability**
D(GDPR) does not Granger Cause D(MC)	0.19136	0.6650
D(MC) does not Granger Cause D(GDPR)	0.63999	0.4302

D is the difference operator; Source: Authors' own calculation using Eviews 7.0.

CONCLUSION

The linkages between the financial and real sector is quite an unexplored area in an Indian context. This paper examines the association and the causality between the financial sector and real sector in India for the period 1982 and 2015 using time series annual data. The study employs domestic credit given by financial sector, liquid liabilities and market capitalisation as percentages of GDP to represent the financial sector while real GDP is used to represent the real sector with two control variables, namely, net capital formation and real interest rate. The empirical results are based on the ADF tests, Phillips Perron tests, Johansen Cointegration tests, Error correction model and Granger causality tests.

The ADF and Phillips Perron tests show that all variables are stationary at first differences. The Johansen cointegration test reports cointegrating relations between financial and real sector in the case when domestic credit and liquid liabilities as percentages of GDP is used as a proxy of financial sector. However, the error correction model gives evidence of a long term relationship between the financial and real sector only in the case when domestic credit is used as an indicator of financial sector. The Granger test shows there is a unidirectional causality running from real to financial sector when domestic credit and liquid liabilities is used as a measure of financial sector.

Hence, we find empirical evidence that financial sector development is triggered by real sector growth in case of India. This is also known as the demand following hypothesis or growth driven finance hypothesis. Our findings are in line with Onayemi (2013), Simwaka et al. (2012), Jenkins and Katircioglu et al. (2010) and Odhiambo (2008) but contradicts with Banerjee and Ghosh (1998),Sehrawat and Giri (2015),Akinlo and Egbetunde (2010), Christopoulosa Dimitris K. and Tsionas Efthymios G(2004)and Shaw(1973).The results point to a few significant observations, namely, 1) the Indian financial sector is well represented by domestic credit disbursed by the financial sector and the liquid liabilities of the banking sector, and 2) the stock markets (proxied by market capitalization), in isolation, fails to capture the Indian financial sector.

REFERENCES

Acaravci, S.K., Ozturk, I. and Acaravci, A. 2009. Financial development and economic growth: literature review and empirical evidence from sub-Saharan African countries. *South African Journal of Economics and Management Sciences,* **12**(1): pp. 11-27.

Acharya, D., Amanulla, S. and Joy, S. 2009. Financial Development and Economic Growth in Indian States: An Examination. *International Research Journal of Finance and Economics,* Issue 24.

Ailemen, M.I. and Unemhilin, D.O. 2017. Impact of Market-Based Financial Structure on the Growth of Nigerian Economy: An Econometric Analysis. *Economic Affairs,* **62**(2): 207-217.

Akinlo, A.E. and Egbetunde, T. 2010. Financial Development and Economic Growth: The Experience of 10 Sub-Saharan African Countries Revisited. *The Review of Finance and Banking,* **02**(1): 17-28.

Apergis, N., Filippidis, I. and Economidou, C. 2007. Financial Deepening and Economic Growth Linkages: A Panel Data Analysis. *Review of World Economics / Weltwirtschaftliches Archive,* **143**(1): 179-198.

Banerjee, S.S. and Ghosh, S. 1998. Demand following and supply leading relationships: an empirical analysis. MPRA Paper 22443, University Library of Munich, Germany.

Beck, T. and Levine, R. 2004. Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance,* **28**.

Bhatia, A. 2017. Can Financial Variables Predict Recessions? A Study of U.S.A. and India. *Economic Affairs,* **62**(3): 503-530.

Calderon, C. and Liu, L. 2003. The Direction of Causality between Financial Development and Economic Growth. *Journal of Development Economics,* **72**: 321-334.

Chakraborty, I. 2010. Financial Development and Economic Growth in India: An Analysis of the Post-reform Period. *South Asia Economic Journal,* **11**(2): 287–308.

Christopoulosa, Dimitris K. and Tsionas, Efthymios G. 2004. Financial development and economic growth: evidence from panel unit root and cointegration tests. *Journal of Development Economics,* **73**.

Engle, R.F. and Granger, C.W.J. 1987. Cointegration and error correction: representation, estimation and testing. *Econometrica,* **55**(2): 251-276.

G. Ram Raj & Marcus, A. 2019. Market Linkage of Indian Stock Market with Select Stock Markets. *Economic Affairs,* **64**(1): 185-190.

Jenkins, H.P. and Katircioglu, S.T. 2010. The Bounds Test Approach for Cointegration and Causality between Financial Development, International Trade and Economic Growth: The Case of Cyprus. *Applied Economics,* **42**: 1699-1707.

Johansen, S. 1991. Estimation and hypothesis testing of cointegrating vectors in Gaussian vector autoregressive models. *Econometrica,* 55.

Johansen, S. 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, **12**: 231-54.

Johansen, S. and Juselius, K. 1990. Maximum likelihood estimation and inference on cointegration - with application to the demand for money. *Oxford Bulletin Economics and Statistics*, **52**(2): 169-210.

Luintel, K.B. and Khan, A. 1999. A Quantitative Reassessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR. *Journal of Development Economics*, **60**: 381-405.

Odediran and Udeaja. 2010. Financial sector development and economic growth: empirical evidence from Nigeria. *CBN Economic and Financial Review*, **48**(3): 91-124.

Odhiambo, N.M. 2008. Financial development in Kenya: a dynamic test of the finance-led growth hypothesis. *Economic Issues*, **13**(2): 21-36.

Onayemi. 2013. Output growth, economic openness and financial deepening in Nigeria: a structural differential and causality Analyses. *European Journal of Humanities and Social Sciences*, **26**(1): 1381-1395.

Pradhan, R.P. 2011. Financial Development, Growth and Stock Market Development: The Trilateral Analysis in India. *Journal of Quantitative Economics*, **9**(1): 134-145.

Schumpeter, J. 1911. The Theory of Economic Development. Cambridge: Harvard University Press.

Sehrawat, M. and Giri, A.K. 2015. The role of financial development in economic growth: empirical evidence from Indian state. *International Journal of Emerging Markets*, **10**(4): 765-780.

Shaw, E.S. 1973. Financial Deepening in Economic Development. New York: Oxford University Press.

Simwaka, K., Munthali, T., Chiumia, A. and Kabango, G. 2012. Financial development and economic growth in Malawi: An Empirical Analysis. *Banks and Bank Systems*, **7**(3): 85-96.