Reserve Bank of India Occasional Papers
Vol. 24, Nos. 1, 2, Summer and Monsoon 2003

Analytics of Credit - Output Nexus in India

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This paper studies the relationship between bank credit and output for 25 states of India for the period 1981 to 2000. Long-term relationship between credit and output was found for 19 out of the 25 states, whose share is around 95 percent both in the combined credit and output for all the states under study. The causality analysis done in the Vector Error Correction framework reveals that it is output which granger causes credit for the majority of the states in India. Further, the elasticity of credit to output turns out to be much higher than that for output to credit. This goes to indicate that credit flow to different states in India is guided by the credit absorptive capacity of the states. The policy implication is that lack of credit off-take should not be seen as a problem in itself but should be seen in conjunction with what is happening on the growth front. The growth fatigue that India is experiencing in the second half of 1990s, therefore, needs to be tackled by addressing the structural issues rather than concerns over lack of credit off-take.

JEL Classification : C320, R110

Key words : State Domestic Product, Bank Credit, Error Correction Model.

Introduction

Judicious credit allocation to further growth has been a recurring theme of monetary policy in India. Growth is all about putting the economy to a trajectory of higher savings and channeling the savings into productive investment. In this scheme of growth the banking system has a dual role to play. The banking system acts both as a mobiliser of savings as well as an allocator of credit for production and investment. Banking activity in India was greatly State controlled till the onset of financial sector reforms in the early 1990s.[1] The motivation for state control of banking activities can be better appreciated if one traverses the broad agenda of economic policy making since independence.

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The author deeply acknowledges the inspirations of Dr. Narendra Jadhav. He owes a deep debt of gratitude to Satyananda Sahoo & Sikkantha Pattanaik for constructive comments. The author would like to place sincere thanks to V. L. Pinto for computational support. The views expressed in the paper are solely of the author and not of the institution to which he belongs.

Under the broad rubric of growth, balanced regional development has been one of the explicit planks of economic policy in India since the early days of planning. To pave the way for a more balanced pattern of development, it was necessary to ensure that availability of credit does not act, as a constraint on growth. Further there was a need to augment the savings of the economy to attain higher growth rates. This was sought to be achieved through mobilisation of savings by widening the reach of the banking system throughout the country. In this context nationalisation of banks through the Banking Companies (Acquisition and Transfer of Undertakings) Act 1970 in the late 1960s was a major landmark. The objective behind bank nationalisation was broadly two fold. First, it was directed at inculcating banking habits in the people so that deposit mobilisation is smoother, simpler and faster. Secondly, credit needs of the different sectors and states were sought to be adequately and timely addressed for balanced development. Consequent to nationalisation, the number of offices of scheduled commercial banks has increased from 8262 in 1969 to more than 66,000 at present. Also there has been significant improvement in the various indicators of financial development.[2]

While the success of bank nationalisation in mobilising savings is well documented, it has been a gray area as to how far the reach of banks has influenced credit allocation in the spatial and sectoral dimension and its consequent impact on the states' growth. Going by the credit view of growth, monetary policy by affecting the external finance premium[3] in the credit markets, influences real economic activity. The literature refers to two channels *i.e.*, the balance sheet channel and the bank lending channel through which, monetary policy actions impact on the external finance premium (Bernanke and Gertler, 1995). The balance sheet channel of monetary policy arises because changes in monetary policy not only affect the market interest rate but also the financial position of the borrowers. The bank lending channel, on the other hand, comes in force when changes in monetary policy affects the liquidity in the system and thus the availability of the resources with the banking system for lending. The ascendancy of the credit view in India can be traced back to the early 1950s when monetary policy was

supposed to be designed in the context of overall development planning. Fiscal policy being the dominant arm of the then policy, monetary policy was designed to cater to the objectives of the former. Consequently, monetary policy in India evolved with credit rationing as an integral part of it and the credit needs of the different sectors were prioritised. The rationing of credit was schematised with food credit as the top priority, followed by prescribed priority sector lending, sectoral limits for credit deployment and selective credit controls. Sectoral credit targets became the proximate target for monetary policy, which operated through the allocations of non-food commercial bank credit. The underlying idea is that credit does matter in the growth process. The interest rate structure was administered and given importance of second order in the conduct of monetary policy.

While the emphasis on the credit channel for the transmission of monetary policy in India still continues, its focus has undergone a change with the pursuing of economic reforms in the 1990s.The scope of the credit channel has been broadened to consider not only the quantum of credit but more importantly, the cost aspect of it while framing the monetary policy, in the changed scenario. Notwithstanding the change in focus, certain regulatory provisions such as directed lending are still in operation. This goes to indicate that the quantity aspect of credit is still taken with seriousness in policy making in India. This paper makes an attempt to study the impact of bank credit on growth at the regional level. The objective of the present study is two fold: First, to analyse the temporal and spatial pattern of growth and credit allocation over the last two decades, and second, to enquire into the nature of relationship between bank credit and output at the regional level. The rest of the paper is schematised as follows. Section I reviews the literature on the relationship between bank credit and growth. The major changes in the pattern of growth and credit allocation over the last two decades have been dealt in Section II.The data and empirical framework *i.e.*, methodology of the study) have been discussed in Section III. The econometric findings are discussed in Section IV. Finally, Section V presents some concluding observations.

Section I

Review of Literature

From the early days of Adam Smith, there has been a continuing and intense debate on the role of financial intermediaries in the development process. Adam Smith in his 'The Wealth of Nations' was skeptical about banks' ability to create capital. Nonetheless Adam Smith perceived banks' role in augmenting the productivity of capital stock in the economy and in the process driving growth. Dunning McLeod writing some 80 years after Smith's ' The Wealth of Nations' had attributed a much more positive role to banks' in promoting growth (Skaggs, 1999). He not only disagrees with Adam Smith's view that banks do not create capital but adds that by lending, banks bring unutilised resources into production; extend the market by providing credit facilities and more importantly promote venture capitalists through their cash credit facilities.

Schumpeter in his 'Theory of Economic Development' argued that financial intermediaries help the growth process in a variety of ways such as mobilising savings, evaluating projects, managing risks, monitoring managers, and facilitating transactions. Further, in his analysis of business cycles, bank credit play a crucial role in accentuating or moderating the phases of business cycles. Over the last fifty years, the literature on finance and development has proliferated both on theoretical as well as empirical plane. Two broad schools of thought, *viz.*, the financial structuralist and financial repressionist have been expounded in the literature that deal with the relationship between financial intermediaries and growth. The financial structuralists put forward a theory of quantity aspects of financial variables such as volume of credit that positively affect growth. The financial repressionists on the other hand contend how financial repression, especially in the form of below-equilibrium real interest rate and domestic currency over-valuation, retard growth.

Patrick (1966) provides a useful reference framework for the study of the causal relationships between bank claims and growth. Patrick makes a distinction between the 'demand-following approach' and the 'supply-leading approach' to financial development. Demand

following is defined as a situation where financial development is an offshoot of the developments in the real sector. Markets expand with growth and require more and efficient financial services to maintain the pace of growth. In the case of supply leading, financial development precedes and stimulates the process of economic growth; the supply of financial services and instruments create the demand for them. Patrick suggested that in the early stages of economic development, a supply-leading relation is more likely since a direct stimulus is needed to collect savings to finance investment for growth while, at a later stage, when the financial sector is more developed, the demand-following relation will be more prevalent. The two alternative hypotheses have been put to empirical testing by several authors. Gupta (1984) found support for the supply-leading hypothesis in a study of 14 developing countries. Both Jung (1986) and St. Hill (1992), using data on 56 countries, of which 37 were LDCs, found a moderate support for this hypothesis in LDCs, while the demand-following hypothesis appeared to fit more closely the situation in developed nations. These results are suggestive of the pattern of financial development envisaged by Patrick (1966).

Although the question of causality remains unresolved until now, the answer to this question has far-reaching policy implications and has, therefore, been a recurring subject of debate in the literature on financial markets and economic development. It is often argued that only in the case of supply leading, there is a need to direct attention to developments in the financial sector leading to adoption of credit focussed financial policy to stimulate growth. In the case of financial development arising spontaneously as the economy grows (demand-following approach), the thrust should be more on developments in the real economy. However such a theoretical dichotomy is difficult to defend in the context of continuous interaction between the real and the financial sectors in practice. Even when the evidence is suggestive of the demand-following approach to hold, the financial policy needs to be fine-tuned to let the demand following scheme run its full course.

Fase (2001) presents an empirical examination of the relationship between financial intermediation and economic growth. Employing data of aggregated balance sheets of financial institutions in the

Netherlands for the period 1900-2000 and conducting estimations and causality tests, Fase shows that financial intermediation encourages economic growth. Employing GMM (Method of Generalised Moments) panel estimators on a panel data set of 74 countries and cross sectional instrumental variable estimator for 71 countries, Levine *et al* (2000) find that the exogenous component of financial intermediary development is positively associated with economic growth.

King and Levine (1993) have studied the empirical link between a range of indicators of financial development and economic growth. They found that indicators of the level of financial development such as the size of the formal financial intermediary sector relative to GDP, the importance of banks relative to the central bank, the percentage of credit allocation to private firms, and the ratio of credit issued to private firms to GDP are strongly and robustly correlated with growth, the rate of physical capital accumulation, and improvements in the efficiency of capital allocation. Besides, the predetermined components of these financial development indicators significantly predict subsequent values of the growth indicators. Gregorio and Guidotti (1995) examined the empirical relationship between long-run growth, financial development (proxied by the ratio between bank credit to the private sector) and GDP for a large cross-country sample (sample of 98 countries for 1960-85). They found a positive effect of financial development on long run growth of real per capita GDP. Goldsmith (1969) used the ratio of assets of the financial intermediary to GNP as a proxy for financial development under the implicit assumption that the size of the financial system is positively correlated with the quality and provision of financial services. Using data on 35 countries from 1860 to 1963, his results indicated a rough 'parallelism' between economic and financial development.

Empirical studies of the credit-output relationship for the Indian Economy are at variance with each other. Industry level studies generally confirm the positive impact of unanticipated changes in credit on the level of output. Employing bivariate vector auto regression model, the Reserve Bank of India's (RBI's) Report on Currency on Finance (2001a) had found two-way Granger causality between GDP growth and real bank claims growth for the Indian economy over the period 1972 through

2000. Further, RBI's Report on Currency and Finance (2002a), using a simultaneous equations framework, shows that demand for non-food credit is predominantly influenced by output represented by index of industrial production (IIP) not only contemporaneously but also by 1 month and 2 month lagged output. Causality analysis in the Indian context (RBI, 2001b) reveals bi-directional causality in the Granger sense between cyclical movements of non-food credit and overall industrial production as well as with latter's components *i.e.*, basic goods, capital goods and consumer goods production. While the relationship between bank credit and growth has been studied at the sectoral level, studies relating financial development to growth at the aggregate level are rather few in the Indian context and particularly at the state level. The present study seeks to fill this gap.

Section II

Pattern of Growth and Credit Allocation

Overall Trends

A close examination of growth in credit[4] and output[5] over the last two decades (table-1) reveals the following :

Table 1: Growth of Output and Credit

(Figures are in percentages)

Variable	1981-1990		1991-2000		1981-2000	
	Output	Credit	Output	Credit	Output	Credit
NSDP*	4.9	16.6	6.6	15.7	5.6	16.2
Agriculture	2.7	16.7	3.5	10.5	3.2	12.6
Industry	6.0	16.6	7.2	15.8	6.5	16.6
Services	6.5	16.8	8.4	17.2	7.2	17.0

* Net State Domestic Product
Source: Central Statistical Organisation and Reserve Bank of India.

While output growth has improved in 1990s, credit growth has declined as compared to their growth rates in 1980s for all states taken together. Nevertheless, credit has grown much higher than output in both the decades. Except the services sector, credit growth has decelerated for agriculture and industry in the 1990s as compared to the 1980s. While

credit growth for the agriculture, industry and services was of the same order (around 16.5%) in the 1980s, credit growth for industry (15.8%) was distinctively higher than that for agriculture (10.5%) and credit for services (17.2%) grew at a faster pace than industry in the 1990s.

Now if we look at the share of different sectors in output and credit (table-2), the following pattern emerges:

Table 2: Share in Output and Credit

(Figures are in percentages)

Sector	Average Share in the 1980s		Average Share in the 1990s	
	Output	Credit	Output	Credit
Agriculture	39	17	31.6	12
Industry	24	46	26	48
Services	37	37	42.4	40

Source: Central Statistical Organisation and Reserve Bank of India.

While the respective shares of industry and services sectors in output have improved, that for agriculture has gone down in the 1990s as compared to the 1980s. The same applies to the share of the different sectors in credit over the two decades.

State wise Trends

What is happening to the share of different states in output and credit over the two decades can be seen from table-3.

Table 3: Changing Share of Different States in Output and Credit: 1990s *vis-a-vis* 1980s

States with increased share in output and credit	States with increased share in output but reduced share in credit	States with increased share in credit and reduced share in output	States with decline in their share in output and credit
Andhra Pradesh, Arunachal Pradesh, Delhi, Tamil Nadu, Maharastra,	Gujarat, Haryana, Karnataka, Rajasthan, Tripura, Nagaland	Andaman & Nicobar Islands, Manipur, Meghalaya, Madhya Pradesh	Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Kerala, Pondicherry, Punjab, Orissa, Uttar Pradesh, West Bengal

Source: Central Statistical Organisation and Reserve Bank of India.

While on the output front, 14 states have suffered a decline in their share (in the aggregate output for 25 states) in the 1990s as compared to the 1980s, 16 states underwent a deterionation in their share in aggregate credit in the 1990s. However, in terms of per-capita NSDP (PNSDP), 16 states have witnessed a rise in the compound growth rate of PNSDP in the 1990s over the 1980s and these 16 states have a share of more than 70 per-cent in the combined output of all the 25 states under consideration.

Changing Share of Different States in Output and Credit Across Sectors

Scanning through the data (Table-4,overleaf) for the share of different sectors in output and credit across states in the 1990s as compared to the 1980s reveals the following :

1. While the decline in the share of agriculture in output is universally applicable for all states, such decline in the share of credit is also observed for all states except for Andaman & Nicobar Islands, Arunachal Pradesh and Nagaland.

2. Of the 25 states, only five have suffered a decline in the share of industry in their output. The prominent among them are Maharastra, Tamil Nadu and West Bengal. However in terms of industry's share in total credit, as many as 14 have experienced a dip. The decline is noticeable in states such as Arunachal Pradesh, Assam, Bihar, Kerala, Tamil Nadu, Uttar Pradesh and West Bengal.

3. Except for Andaman & Nicobar Islands, Nagaland and Punjab, all other states witnessed an improvement in their share of the services sector in output. Similarly, share of services sector in credit improved for all states except for Delhi, Maharashtra, Manipur and Nagaland.

Table 4: Share in Output and Credit: States-wise and Sector-wise

(Figures are in percentages)

	AGRICULTURE				INDUSTRY				SERVICES			
	Share in NSDP		Share in Total Credit for the State		Share in NSDP		Share in Total Credit for the State		Share in NSDP		Share in Total Credit for the State	
	1980s	1990s	1980s	1990s	1980s	1990s	1980s	1990s	1980s	1990s	1980s	1990s
Andaman & Nicobar Islands	44	41	17	20	15	20	32	21	40	38	51	68
Andhra Pradesh	46	33	31	21	17	22	38	39	39	45	32	39
Arunachal Pradesh	53	44	10	14	20	23	59	47	28	34	31	39
Assam	47	42	18	14	22	20	45	40	34	39	38	46
Bihar	51	40	26	23	21	23	39	32	30	37	35	45
Delhi	8	3	3	2	24	23	42	56	70	74	54	42
Gujarat	38	25	15	12	29	35	61	60	35	40	24	28
Haryana	46	40	31	22	24	26	45	51	29	34	25	27
Himachal Pradesh	42	32	20	13	21	29	36	35	36	39	44	52
Jammu & Kashmir	45	38	12	7	16	16	34	25	40	46	54	60
Karnataka	43	34	23	19	24	26	43	42	34	41	34	39
Kerala	36	31	18	15	19	20	36	31	45	48	46	54
Madhya Pradesh	43	37	25	21	23	26	39	40	33	37	36	39
Maharastra	25	19	7	5	34	33	51	54	41	48	42	41
Manipur	45	35	17	13	19	20	23	35	40	45	60	52
Meghalaya	42	29	27	21	13	16	20	23	48	55	53	56
Nagaland	32	26	18	20	7	14	37	36	78	60	45	44
Orissa	57	42	28	20	18	21	34	32	28	37	39	48
Pondicherry	22	15	25	14	38	39	46	47	34	44	29	38
Punjab	50	46	33	21	16	20	34	41	35	33	33	38
Rajasthan	43	37	29	23	22	25	36	38	34	38	35	38
Tamil Nadu	27	23	17	13	35	33	50	48	39	44	33	39
Tripura	52	36	27	22	10	11	19	20	40	53	54	58
Uttar Pradesh	47	40	23	21	18	22	41	39	34	38	36	40
West Bengal	34	33	9	6	24	23	62	59	41	44	30	36

Source: Central Statistical Organisation and Reserve Bank of India.

Section III

Data Source and Methodology

In this study we analyse the relationship between finance proxied by scheduled commercial banks' credit and output at the state level. Income originating from the states rather than income accruing to state concept has been used to measure output. The State Domestic Product (SDP) data - overall and sector wise - with 1993-94 as the base year has been taken from the information supplied by the various states to the Central Statistical Organisation. The data on credit used in the study refers to the outstanding credit to different sectors from all scheduled commercial banks in a state. The data for credit have been taken from the 'Basic Statistical Returns' published by the Reserve Bank of India. The study examines the credit - growth relationship for 25 states over the period 1980 to 2000.

The output variable is represented by log of per capita net State Domestic Product (LPNSDP) and the credit variable by the log of per capita credit for the state (LPTCAS). The choice of the states and the time period has been completely motivated by the availability and consistency of the data series. Certain new states have been carved out from the existing ones in 2000, thus extending the period of analysis beyond year 2000 might introduce serious comparability problems. The period of study, thus, is confined up to the year 2000. However, with inclusion of states having share of less than 1 percent and as well having more than 10 percent in the combined NSDP for all the 25 states, heterogeneity that prevails across states in India has been captured considerably.

What we try to explore here are the causal relationships between credit and output. The widely accepted nomenclature for causality in econometrics is Granger Causality. According to Granger (1969), Y is said to Granger-cause X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically

independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability.

To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Equation (1) and (2) is estimated by OLS:

$$X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t} \qquad (1)$$

$$Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i} X_{t-i} + \sum_{j=1}^{p} b_{2j} Y_{t-j} + \mu_{2t} \qquad (2)$$

In the above system of equations, F- test is carried out for the null hypothesis of no Granger causality *i.e.*, if the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X (equation (1)), which means Y Granger-causes X. The definition of the Granger causality, however, is based on the hypothesis that X and Y are stationary or I(0) time series. And a stationary series is one, which has both a stable mean and standard deviation. If d differences have to be made to produce a stationary process, then it can be defined as integrated of orderd.

If several variables are all I (d) series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces may be expected to act so as to restore equilibrium, thus, they tend to move together in the long run irrespective of short run dynamics. If the series at hand appear to contain a (or at least a) unit root in their autoregressive representations, it may not be proper to apply the fundamental Granger method for variables of I(1).The classical approach to deal with integrated variables is to difference them to make them stationary. In the absence of cointegration, the direction of causality can be decided upon *via* standard F-tests in the first differenced Vector Auto Regression(VAR).

The VAR in the first difference can be expressed as:

$$\Delta X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i}\Delta X_{t-i} + \sum_{j=1}^{k} b_{1j}\Delta Y_{t-j} + \mu_{1t} \qquad (3)$$

$$\Delta Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i}\Delta X_{t-i} + \sum_{j=1}^{p} b_{2j}\Delta Y_{t-j} + \mu_{2t} \qquad (4)$$

However when both Yt and Xt are truly I(1) and cointegrated, the bivariate dynamic relation between Y and X will be misspecified if one works with the differences of Y and X. According to Engle and Granger (1987), the test needs to be carried out with error-correction models (ECM). They proved that any cointegrated series must have an error correction representation, and the converse also holds.

An ECM representation is essentially a restricted VAR with co-integration specification. So it is designed for the non-stationary series, which are found to be to be co-integrated.

$$\Delta X_t = \lambda_1 + \sum_{i=1}^{k} \alpha_{1i}\Delta X_{t-i} + \sum_{j=1}^{k} \beta_{1j}\Delta Y_{t-j} + \phi_1 ecm_{1t-1} + \mu_{1t} \quad ecm_{1t-1} = (X - \gamma Y)_{t-1} \qquad (5)$$

$$\Delta Y_t = \lambda_2 + \sum_{i=1}^{k} \alpha_{2i}\Delta X_{t-i} + \sum_{j=1}^{k} \beta_{2j}\Delta Y_{t-j} + \phi_2 ecm_{2t-1} + \mu_{2t} \quad ecm_{2t-1} = (Y - \delta X)_{t-1} \qquad (6)$$

Where (i=1, 2) is error-correction (EC) term(s) and are called coefficients of adjustment and one of them must not be equal to zero according to Engle and Granger (1987). In Equation (5) and (6), all series are I(0) processes. The parameters in the ECM have the following interpretations. In Equation (5), the coefficient of Y in the EC term (ecm_{1t-1}) is the long-run elasticity of X with respect to Y. Conversely, in Equation (6), the coefficient of X in the EC term (ecm_{2t-1}) is the long-run elasticity of Y with respect to X and clearly reflect the immediate response of X to changes in Y and the immediate response of Y to changes in X respectively. They are therefore the short-run elasticities. In Equation (5), the larger the parameter ϕ_1, the faster adjustment of X to the previous period's deviation from long-run equilibrium. At the opposite extreme, very small values of ϕ_1 imply that X is unresponsive to the last period's equilibrium error. The same condition exists in equation (6). Since the ECM terms ϕ_1 and ϕ_2 cannot at the same time be equal to zero in the

presence of the cointegrating relationship, there must exist one direction of long-term causality between Y and X.

An advantage of the cointegration analysis with respect to the conventional test is that if the two variables are cointegrated then there must exist Granger-causality at least in one direction. If the coefficient of the error correction term is significant, a causality relationship will exist between the two variables. Standard t test are used to test the significance of ϕ_1 and ϕ_2. Engle and Granger (1987) and Johansen (1988) present alternative methods for testing cointegration and the estimation of cointegrating vectors. However, the Johansen technique, which is based on the full system, multi-equation estimation has significant power advantage over the single-equation Engle-Granger method. Further, it avoids the simultaneous equation bias and estimator inefficiency problems inherent in single-equation methods by the full-system specification. This study uses augmented Dickey-Fuller (ADF) method to test the order of the series, and Johansen's method to test for cointegrating relationship. The credit-output relationship has been studied for each state under study to find whether any meaningful relationship exists between the two entities and if yes, the sensitivity parameter.

Section IV

Empirical Results

Using the Dickey-Fuller (Augmented) test for the appropriate lag length, it is found that both the variables for each state contain a unit root (Appendix-1). However both the variables are found to be stationary in their first difference *i.e.* they are I (1). As standard OLS would give spurious regressions if the variables under consideration were non-stationary, the next step was to test for co-integration between the two variables. Applying Johansen's co-integration tests for the appropriate lag length, it was found that for 19 out of the 25 states, the two variables were co-integrated (Appendix-2). This indicates that that there exists a long-term equilibrium relationship between credit and growth for the majority of the States.

Further, the six states where no co integrating relationship was found between the two variables, Granger causality was carried out on the first differences of the two variables. No evidence of causality, except for Meghalaya,[6] was found for five out of the six states. States such as Bihar, Jammu & Kashmir and Nagaland where no cointegatring relationship was found may be because growth in these states is adversely affected by factors beyond the purview of economic policy. Moreover, these states because of their past record of non performing assets and troubled character, lack the confidence of the banks when it comes to funding projects in these states. Frequent ethnic clashes and political instability in Nagaland perhaps act as a strong deterrent for the commercial banks to deploy their funds, thus absence of any co-integrating relationship between credit and output for these states. Absence of cointegrating relation for Haryana is a bit perplexing and needs further investigation, which is beyond the scope of the present study. For the states where cointegrating relationship was found to be valid, an error correction representation following the Johansen framework was worked out to infer about the nature of causality between the two variables (Appendix-3). The causality results are given in table-5.

Table 5: Causality Results based on ECM

Nature of causality	**Direction of causality**	**Long-run**	**Short-run**
Uni-Directional	Credit - Output	Karnataka, Orissa, Punjab, West Bengal	Delhi, Maharastra, Rajasthan, Tamil Nadu
Uni-Directional	Output-Credit	Andaman & Nicobar Island, Andhra Pradesh, Delhi, Gujarat, Himachal Pradesh, Kerala, Madhya Pradesh, Maharastra, Nagaland, Rajasthan, Tripura, Uttar Pradesh	Himachal Pradesh, Maharastra, Rajasthan
Bi-directional	Output - credit	Arunachal Pradesh, Assam, Tamil Nadu	

It is evident from the error correction framework that causality is predominant in the long run than in the short run. Further causality holds from credit to output only for Orissa, Punjab, Karnataka and West Bengal. But for the majority of the sates causality runs from output to credit. Further, the evidence of bi-directional causality is

restricted to only 3 states. As far as elasticities are concerned, elasticity of credit to output turned out to be much higher than elasticity of output to credit (table-6).

Table 6: Short-Run and Long Run Elasticities

STATE	Elasticity of Output to Credit		Elasticity of Credit to Output	
	Short run	Long run	Short run	Long run
Andaman & Nicobar Islands	na	na	na	2.68
Andhra Pradesh	na	na	na	2.29
Arunachal Pradesh	na	0.15	na	6.39
Assam	na	-0.03	na	26.84
Delhi	0.16	na	na	3.77
Gujarat	na	na	na	3.00
Himachal Pradesh	na	na	-1.17	3.14
Karnataka	na	0.13	na	na
Kerala	na	na	na	6.48
Madhya Pradesh	na	na	na	3.83
Maharastra	0.21	na	-1.04	2.91
Nagaland	na	na	na	-1.34
Orissa	na	0.13	na	na
Punjab	na	0.18	na	na
Rajasthan	0.86	na	-0.62	2.96
Tamil Nadu	-0.32	0.33	na	3.02
Tripura	na	na	na	-6.74
Uttar Pradesh	na	na	na	4.85
West Bengal	na	0.104	na	na

na-Not Applicable.

For the majority of the states, long run elasticities of both credit to output and output to credit are positive and the long run elasticities were significantly higher than short-run elasticities. The long-run elasticity of credit to output turned to be negative only for Nagaland and Tripura. This may be because these states account for a miniscule proportion both in the combined credit and output for all states. Further, growth in these states is being financed by loans and grants from the center than by credit from the commercial banks. In fact these states have suffered a decline in their share of credit for all states over the period under study. While states like Karnataka, Kerala, Punjab and Orissa displayed very high elasticity

of credit to output, the elasticity of output to credit was relatively higher for Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Maharastra and Tamil Nadu.

Section V

Conclusion

The idea behind a vast network of commercial bank branches cutting across the length and breadth of the country is that dispersion of credit for production activities is on a balanced footing. Though financial reforms are in vogue for over a decade in India, certain regulatory provisions such as directed lending is still in operation. The primary motive for such provisions is that no sector or state should compromise on development owing to lack of credit. The underlying hypothesis is that credit is an important input for production and possibly it is credit which Granger causes output. However the empirical exercise undertaken in the study reveals that for the majority of the states it is output which Granger causes credit. Thus a key feature on the dynamics of credit flow that emerges from this study is that credit flow to different states depends more on the credit absorptive capacity of the states notwithstanding regulatory provision on directed lending. This goes to support that demand-following approach predominates over the supply-leading hypothesis.

The other finding that long run elasticities are far greater than short run elasticites is along the expected lines. The nexus between credit and output is essentially a medium to long-term phenomenon. Further the present focus on growth supportive policy is well justified in light of the empirical finding that output Granger causes credit. Lack of credit off take should not be seen as a problem in itself but should be seen in conjunction with what is happening on the output front. The growth fatigue that India is experiencing in the second half of 1990s needs to be tackled by addressing the structural issues rather than concerns over lack of credit off-take and measure to improve the same. Credit, no doubt, plays an important role in the growth process but the dice seems to be loaded in favour of promoting growth so as to ensure a more balanced and growth-sustaining credit flow.

Appendix-1
Unit Root Tests Based on DF / ADF-Statistics

STATE	VARIABLE	TEST FOR UNIT ROOTS IN LEVEL (APPROPRITAE LAG)	TEST FOR UNIT ROOTS IN FIRST DIFFERENCE (APPROPRITAE LAG)
Andaman & Nicobar Islands	LPNSDP	-1.894	-4.438 *$
	LPTCAS	-.7874	-4.96 **
Andhra Pradesh	LPNSDP	-3.710(3)	-4.061 *
	LPTCAS	-2.545(2)	-3.348(2) ***
Arunachal Pradesh	LPNSDP	-1.791	-5.818 **
	LPTCAS	-1.751	-4.501 *
Assam	LPNSDP	-2.674 (2)	-4.723 *
	LPTCAS	-1.749(3)	-3.804 *
Bihar	LPNSDP	-2.72	-5.806 *
	LPTCAS	-1.1101	-4.341 *
Delhi	LPNSDP	-3.253(2)	-6.127 **
	LPTCAS	-2.621	-4.354 *
Gujarat	LPNSDP	-3.088	-6.104 *
	LPTCAS	-2.082	-4.583 *
Haryana	LPNSDP	-3.388	-4.799(1) *
	LPTCAS	-2.226(2)	-4.722 *
Himachal Pradesh	LPNSDP	-2.810	-5.184 **
	LPTCAS	-4.355(2)	-3.3976 *
Jammu &Kashmir	LPNSDP	-2.162	-5.952 **
	LPTCAS	-4.11(3)	-3.384 ***
Karnataka	LPNSDP	-2.266	-6.244 *
	LPTCAS	-2.542(1)	-3.122 *
Kerala	LPNSDP	-3.320	-3.839 *
	LPTCAS	-2.864	-5.126 *
Madhya Pradesh	LPNSDP	-3.562	-7.742 **
	LPTCAS	-1.998	-4.012 *
Maharashtra	LPNSDP	-2.850	-3.913(1) *
	LPTCAS	-2.387	-3.896 *
Manipur	LPNSDP	-2.889 (4)	-3.768(1) ***
	LPTCAS	-1.450	-3.436(3) ***
Meghalaya	LPNSDP	-2.258	-3.692 *
	LPTCAS	-1.913	-4.242 *
Nagaland	LPNSDP	-2.611	-4.057(3) *
	LPTCAS	-0.882(3)	-4.541(2) *

STATE	VARIABLE	TEST FOR UNIT ROOTS IN LEVEL (APPROPRITAE LAG)	TEST FOR UNIT ROOTS IN FIRST DIFFERENCE (APPROPRITAE LAG)
Orissa	LPNSDP	-1.266(2)	-5.791(1) **
	LPTCAS	-1.846	-3.453 ***
Pondicherry	LPNSDP	-2.979(3)	-2.742 ***
	LPTCAS	-2.504(1)	-3.517 ***
Punjab	LPNSDP	-2.122	-6.193 (1) *
	LPTCAS	-3.632	-5.754(2) **
Rajasthan	LPNSDP	-4.398	-7.910 **
	LPTCAS	-3.757	-4.738 **
Tamil Nadu	LPNSDP	-1.290(2)	-7.387(1) **
	LPTCAS	-3.021(2)	-4.845 *
Tripura	LPNSDP	-2.474	-4.17 *
	LPTCAS	-1.497	4.49(1) *
Uttar Pradesh	LPNSDP	-2.026	-4.189 *
	LPTCAS	-1.851	-4.251 *
West Bengal	LPNSDP	-.1586	44.420 *
	LPTCAS	-1.783	-5.244 *

Note: Where lags are not mentioned (in brackets) it means 0 lag is the optimal lag and the results refer to the DF test. The optimal lag length is determined on the basis of Akike and SBC criteria. For non-zero optimal lag, the results are on the basis of Augmented DF test.

* Refers to significance at 95% level, ** Refers to significance at 99% level and*** Refers to significance at 90% level.

Appendix-2
Results of Co-integration Test

Region	Likelihood Ratio	Presence of Cointegration
Andaman & Nicobar Islands	18.592*	
	4.965	Yes
Andhra Pradesh	25.049*	
	6.953	Yes
Arunachal Pradesh	23.025*	
	6.248	Yes
Assam	22.021*	
	5.332	Yes
Bihar	15.944	
	4.098	No
Delhi	18.335*	
	5.650	Yes
Gujarat	18.586*	
	4.878	Yes
Haryana	16.980	
	6.598	No
Himachal Pradesh	29.049*	
	12.102	Yes
Jammu & Kashmir	9.639	
	1.779	No
Karnataka	18.526*	
	7.283	Yes
Kerala	25.049*	
	6.953	Yes
Madhya Pradesh	19.988*	
	6.679	Yes
Maharastra	31.240*	
	5.027	Yes
Manipur	17.605	
	4.451	No
Meghalaya	13.863	
	5.949	No
Nagaland	19.635*	
	5.322	Yes
Orisa	24.999*	
	6.473	Yes

Pondicherry	13.444 3.220	No
Punjab	24.142* 6.433	Yes
Rajasthan	27.411* 4.059	Yes
Tamil Nadu	29.052* 8.371	Yes
Tripura	18.772* 6.404	Yes
Uttar Pradesh	21.986* 4.270	Yes
West Bengal	27.426* 1.600	Yes

Note: The 1%, 5% and 10% critical values for the LR statistics are 24.67,19.96 and 17.85 respectively.
* Denotes rejection of the null hypothesis that there is no co-integration.

APPENDIX-3
Error Correction Mechanism

STATE	DEPENDENT VARIABLE	F-Statistics	INDEPENDENT VARIABLE		
			$(DLPNSDP)_{t-1}$	$(DLPTCAS)_{t-1}$	$(ECM)_{t-1}$
Andaman & Nicobar Island	DLPNSDP	0.651	-0.349 (-1.116)	-0.106 (0.087)	0.044 (1.087)
	DLPTCAS	1.517	-0.238 (-0.278)	-0.257 (-1.072)	-0.095 (-2.303)
Andhra Pradesh	DLPNSDP	-.117	-0.158 (-0.643)	-.0.2370. (-.749)	072 (1.389)
	DLPTCAS	3.336	(0.126) 0.023	-0.188 (-0.804)	-0.077 (-4.593)
Arunachal Pradesh	DLPNSDP	3.691	0.363 (-1.667)	-0.032 (-0.536)	-0.218 (-3.745)
	DLPTCAS	2.835	-1.265 (-1.334)	-0.116 (-0.445)	0.129 (3.251)
Assam	DLPNSDP	2.087	-0.380 (-1.858)	.001 (0.035)	-0.118 (-1.956)
	DLPTCAS	2.531	-0.494 (-0.371)	-0.415 (-1.868)	-0.048 (3.327)
Delhi	DLPNSDP	-0.382	-0.138 (-0.402)	0.165 (2.426)	0.177 (0.791)
	DLPTCAS	8.018	-0.392 (-0.513)	-0.028 (-0.189)	0.491 (-3.712)
Gujarat	DLPNSDP	2.216	-0.456 (-1.840)	-0.203 (-0.395)	0.044 (1.127)
	DLPTCAS	1.111	-0.210 (-1.741)	0.035 (0.142)	-0.026 (-4.077)
Himachal Pradesh	DLPNSDP	-1.433	-0.047 (-0.166)	0.33 (0.325)	0.014 (0.091)
	DLPTCAS	4.042	-1.170 (-2.195)	0.107 (0.568)	-0.380 (-4.128)
Kerala	DLPNSDP	0.638	0.301 (1.071)	0.101 (0.529)	0.006 (0.395)
	DLPTCAS	1.177	-0.234 (-0.579)	-0.359 (-1.303)	-0.015 (-4.088)

STATE	DEPENDENT VARIABLE	F-Statistics	INDEPENDENT VARIABLE		
			$(DLPNSDP)_{t-1}$	$(DLPTCAS)_{t-1}$	$(ECM)_{t-1}$
Madhya Pradesh	DLPNSDP	2.622	-0.523	0.107	0.008
			(-2.384)	(0.609)	(0.494)
	DLPTCAS	1.510	-0.065	-0.113	-0.056
			(-0.212)	(-0.462)	(-4.046)
Maharastra	DLPNSDP	0.852	0.003	0.217	0.040
			(0.010)	(2.220)	(0.195)
	DLPTCAS	8.560	-1.040	0.293	-0.599
			(-2.460)	(2.156)	(-6.244)
Nagaland	DLPNSDP	1.746	-0.133	0.140	0.003
			(-0.509)	(1.700)	(0.127)
	DLPTCAS	8.920	-0.945	-0.209	-0.216
			(-1.466)	(-1.023)	(-4.255)
Orissa	DLPNSDP	21.22	0.333	0.100	-2.023
			(1.421)	(1.168)	(-5.144)
	DLPTCAS	2.750	-0.278	0.857	0.139
			(-0.694)	(0.147)	(1.539)
Rajasthan	DLPNSDP	6.097	-0.781	0.866	-0.355
			(-3.391)	(2.214)	(-1.073)
	DLPTCAS	0.074	-0.624	0.261	-0.245
			(-3.415)	(0.839)	(-2.759)
Tamil Nadu	DLPNSDP	5.874	0.110	-0.329	-0.443
			(0.530)	(-2.149)	(-4.447)
	DLPTCAS	0.781	0.307	-0.198	0.255
			(0.760)	(-0.665)	(3.984)
Tripura	DLPNSDP	-1.118	0.252	-0.003	-0.042
			(1.081)	(0.048)	(-1.218)
	DLPTCAS	4.612	-0.474	-0.305	-0.070
			(-0.571)	(-1.333)	(-3.842)
Uttar Pradesh	DLPNSDP	-0.710	-0.315	0.058	0.244
			(-1.014)	(0.379)	(0.973)
	DLPTCAS	1.296	-0.414	-0.190	-0.376
			(-0.743)	(-0.692)	(-4.063)
West Bengal	DLPNSDP	1.488	-0.184	-0.038	0.072
			(-0.571)	(-0.449)	(2.471)
	DLPTCAS	0.094	-0.357	-0.103	-0.019
			(-0.286)	(-0.310)	(-1.680)

(Figures in parentheses indicate the t-values)

STATE	DEPENDENT VARIABLE	F Statistics		INDEPENDENT VARIABLE			
			$(DLPNSDP)_{t-1}$	$(DLPNSDP)_{t-1}$	$(DLPTCAS)_{t-1}$	$(DLPTCAS)_{t-1}$	$(ECM)_{t-}$
Karnataka	DLPNSDP	1.573	-0.897	-0.566	-0.183	0.112	0.162
			(-2.306)	(-1.351)	(-0.904)	(0.721)	(2.304)
	DLPTCAS	1.083	-0.390	0.544	0.488	-0.114	-0.015
			(-0.627)	(0.811)	(1.504)	(-0.458)	(-1.048)
Punjab	DLPNSDP	4.083	-0.211	-0.580	-0.009	-0.029	-0.155
			(0.896)	(-3.022)	(-0.238)	(-0.879)	(-4.180)
	DLPTCAS	1.321	0.133	2.778	0.547	-0.252	0.015
			(0.066)	(1.699)	(1.595)	(-0.893)	(0.048)
West Bengal	DLPNSDP	2.980	-0.659	-0.722	-0.057	-0.084	0.199
			-1.980	-2.476	-0.813	-1.162	3.719
	DLPTCAS	0.164	0.547	0.245	-0.050	-0.031	0.147
		0.330	0.169	-0.143	0.088	0.551	

(Figures in parentheses indicate the t-values)

Notes:

1. Committee on Financial Sector Reforms (Chairman: Shri M.Narasimham) gave the blue print of financial sector reforms in India in 1992.
2. For a discussion of various financial development ratios like financial interrelations ratios see Rangarajan (1997).
3. External Finance Premium is the difference in cost between funds raised externally (by issuing debt, say) and funds generated internally by retained earnings.
4. The classification of sectoral allocation of credit is as per RBI's Basic Statistical Reeturns-1 and 2. For instance, credit to agriculture includes both direct and indirect finance, credit to industry includes mining and quarrying, food manufacturing and processing, beverages and tobacco, textiles, paper, paper products and printing, leather and leather products, rubber and rubber products, chemical and chemical products etc. Services sector credit is inclusive of credit to transport operators, professional and other services, personal loans, trade, and finance.
5. Agriculture includes agriculture, forestry and fishing and logging. Industry includes mining and quarrying, manufacturing (registered and non-registered) and services include electricity gas and water supply, transport, storage and communication, trade hotels and restaurants, banking and insurance, real estate, ownership of dwellings and business services, public administration and other services.
6. Causality runs from output to credit for Meghalaya.

References

Barro, Robert, J. (1991), "Economic Growth in a Cross-Section of Countries." *Quarterly Journal of Economics*, Vol. 106, pp. 407-43.

Bhat, N.S. (1997)."Directed Credit Flows and Productivity off Commercial Bank Resources in the Indian Economy", *The Indian Economic Journal*, Vol.44 (1), pp.101-107.

Bencivenga, V.R. and. Smith, B.D. (1991), "Financial Intermediation and Endogenous Growth", *Review of Economic Studies*, Vol. 58, pp. 195-209.

Bernanke, B and Gertler M. (1995),"Inside the Black Box: The Credit Channel of Monetary Policy Transmission", *Journal of Economic Perspectives*, Vol. 9 (4), pp. 27-48.

Dickey, D. A. and Fuller, W. A. (1979), "Distribution of the Estimators for Autoregressive Time-Series with a Unit Root", *Journal of the American Statistical Association*, Vol. 74, pp. 427-431.

Dickey, D. A. and Fuller, W. A. (1981),"Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica*, Vol. 49, pp. 1057-1072.

Engle, R. F. and Granger, C. W. J. (1987), " Cointegration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, Vol.55 (2), pp. 251-276.

Galibs, V. (1977), " Financial Development and Economic Growth in Less Developed Countries: A Theoretical Approach", *Journal of Development Studies*, Vol.13 (2), pp.58-72.

Goldsmith, R.W. (1969), "Financial Structure and Development", *New Haven, CT, Yale University Press.*

Granger, C. W. J. (1969), " Investigating Causal Relations by Econometric Models and Cross-Spectral Methods", *Econometrica*, Vol. 37, pp. 424-438.

Gregorio, J. D. and Guidotti, P. E. (1995), "Financial Development and Economic Growth", *World Development*, Vol.23, No.3, pp.433-448.

Gupta, K.L.(1984), "Finance and Economic Growth in Developing Countries' *Croom Helm*, London.

Ikhide I.S. (1996), " Commercial Bank offices and the Mobilisation of Private savings in selected sub-Saharan African countries", *The Journal of Development Studies*, Vol.33 (1), pp 117-132

Gurley, J.G. and Shaw, E.S. (1960), "Money in a Theory of Finance", *Brookings institution, Washington, DC.*

Johansen, S. (1988), " Statistical analysis of cointegration vectors", *Journal of Economic Dynamics and Control*, Vol.12, pp. 231-54.

Jung, W. S. (1986), "Financial Development and Economic Growth : International Evidence", *Economic Development and Cultural Change*, Vol. 34, No. 2, PP. 333-346

King, Robert G. and Levine Ross, (1993). "Finance and Growth: Schumpeter Might Be Right." *Quarterly Journal of Economics*, Vol.108 (3), pp. 717-738.

King, R. and Levine R. (1993), "Financial intermediation and economic Development", in C. Mayer and X. Vives (eds), *Capital Markets and Financial Intermediation*, Cambridge, Cambridge University Press.

Levine, Ross, (1996a). "Financial Development and Economic Growth." *The World Bank, Washington, D.C. Policy Research Working Paper*, 1678.

Levine, Ross, (1996b). "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature*, Vol.35, pp.688-726.

Levine, R., Loayza N.and Beck T. (2000), "Financial Intermediation and Growth: Causality and Causes", *Journal of Monetary Economics*, Vol.46, pp .31-77.

McKinnon, Ronald I., (1973), " Money and Capital in Economic Development", *Washington, D.C. Brookings Institution.*

Neils Hermes, (1994), " Financial Development and Economic Growth: A Survey of The Literature", *International Journal of Development Banking.* Vol.12 (1), pp 3-22.

Odedokun, M.O. (1998), “Financial Intermediation and Economic Growth in Developing Countries” *Journal of Economic Studies*, Vol.25 (3), pp.203-224.

Osterwald-Lenum, M. (1992), " A Note With Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics, *Oxford Bulletin of Economics and Statistics*, Vol. 54, pp. 461-472.

Partick, H.T. (1966a), "Financial Development and Economic Growth in Underdeveloped Countries", *Economic Development and Cultural Change*, Vol.14, pp.174-189.

Rangarajan, C. (1997), "Essays on Money and Finance", *UBS Pulishers*, New Delhi, India.

Roubini, Nouriel and Xavier Sala-i-Martin (1992), "Financial Repression and Economic Growth." *Journal of Development Economics*, Vol. 39 (1), pp. 5-30.

Reserve Bank of India (2001a), *Report on Currency and Finance*, 1999-2000. Reserve Bank of India (2001b). *Annual Report*, 2000-01.

Reserve Bank of India (2002a), *Report on Currency and Finance*, 2000-01.

Reserve Bank of India (2002b). *Annual Report*, 2001-02.

Rousseau, Peter L. and Watchel, Paul, " Financial Intermediation and Economic Performance: Historical Evidence from Five Industrialized Countries", *Journal of Money, Credit and Banking*, Vol 30(4), pp. 657-677.

Shaw, G.S. (1973), "Financial Deepening in Economic Development", *Oxford University Press*, New York.

Skaggs, Neil T. (1999), " Adam Smith on Growth and Credit", *Journal of Economic Studies* Vol.2 (6), pp. 481-496.

St. Hill, R.L. (1992), “Stages of Banking and Economic Development”, *Savings and Development*, Vol. 16, No. 1, PP. 65-94.