

# Bank Credit and Economic Growth in Nepal: An Empirical Analysis<sup>#</sup>

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## Abstract

*This study examines the impact of commercial bank credit to the private sector on the economic growth in Nepal from supply side perspectives. The study has applied Johansen co-integration approach and Error Correction Model using the time series data for the period of 1975-2014. The empirical results show that bank credit to the private sector has positive effects on the economic growth in Nepal only in the long run. Nevertheless, in the short run, it has been observed a feedback effect from economic growth to private sector credit. More specifically, the growth in real private sector credit by 1 percentage point contributes to an increase in real gross domestic product by 0.40 percentage point in the long run. The empirical results imply that, policy makers should focus on long run policies to promote economic growth – development of modern banking sector, efficient financial market and infrastructure so as to increase the private sector credit which is instrumental to promote growth in the long run.*

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**Key Words:** Economic Growth, Bank Credit, Co-integration

**JEL Classification:** E23, G21, C32

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## I. INTRODUCTION

Economic growth is one of the major objectives of macroeconomic policy. It is the crucial means of uplifting living standards as well as achieving economic development. Economists define economic growth from various perspectives. Some economists view that it is an increase in the national income or the level of production of goods and services by a country over a certain period of time. Generally economic growth is defined as an increase in gross domestic product (GDP). Therefore, GDP is considered as proxy of economic growth in the study.

Credit is the aggregate amount of funds provided by commercial banks to individuals, business organizations/industries and government for consumption and investment purposes. Individuals obtain credit for both consumption and investment purposes, business organizations/industries borrow loans to invest in plant and machinery where as government borrows loans to spend for recurrent as well as capital expenditure purposes. More specifically, credit is understood as the provision of resources such as granting a loan by the creditor/lender to the debtor/borrower where the debtor does not reimburse the lender immediately, thereby generating a debt, and instead arranges either to repay or return those resources at a later date (Mishra et al., 2009). Credit is considered as a key to economic growth especially in developing countries as it lubricates the economy. Therefore, the role of bank credit in economic growth has been accepted by many researchers as various economic agents are able to invest money in various investment opportunities.

Economic growth has been one of the major macroeconomic objectives of the government of Nepal. Nepal Rastra Bank (NRB) considers that monetary policy should also support growth. NRB always directs commercial banks to flow their credit to productive sector. Credit channel of monetary policy is considered very important and effective in Nepal. In this channel, money supply is expected to affect real variables through the means of bank balance sheet and availability of credit. A large body of evidence suggests that financial sector development plays a huge role in economic development. Okwo (2012) examined the effect of bank credit to private sector on economic growth in Nigeria and found that bank credit to private sectors has a statistical strong positive relationship with GDP as expected. Bank credit to private sector promotes economic growth through capital accumulation and technological progress by increasing the savings rate, mobilizing and pooling savings, producing information about investment, facilitating and encouraging the inflows of foreign capital, as well as optimizing the allocation of capital (World Bank, 2013). One of the major indicators for measuring financial development of a country is private sector credit to GDP ratio. The role of credit provided by banks to private sector is considered more efficient to support economic growth rather than the credit provided to government. Therefore, private sector credit is taken as the proxy of bank credit here in the study.

Bank credit has significant role in economic growth. Especially in developing countries like Nepal, it caters resource need for economic growth. Hence, NRB and the government have adopted many policies and programs to increase economic growth through the use of bank credit. NRB has been playing a leading role to determine the proportion of bank loans and advances to productive sectors (agriculture, energy, tourism, industry). The main objective of this provision is to stimulate economic growth in the country. However, the relationship between private sector credit and economic growth has not yet been assessed properly in the Nepalese context. In this regard, this study attempts to fulfill the gap. Therefore the main objective of this study is to examine the effects of commercial bank credit to private sector on economic growth from supply side perspectives as well as to suggest ways of improving bank credit to private sector so as to achieve better economic growth in Nepal.

The rest of the paper is structured as follows. The second section describes the theoretical framework. The third section reviews the related literatures. The fourth section presents the status and trend of bank credit to private sector. The fifth section presents the data and methodology and the sixth section shows results of the study. The last section concludes the study.

## **II. THEORETICAL FRAMEWORK**

Bank credit contributes to economic growth in several ways. For example, credit is an important link in money transmission; it finances production, consumption, and capital formation, which in turn affect economic activity. The transmission mechanism of monetary policy can be strengthened, and the monetary policy objectives attained to a large extent, if the financial system is well-operated and regulated. Credit extended to the private sector in an environment of banking discipline will be instrumental in tapping the productive potentialities and development prospects of the economy. It thereby ushers to inculcate economic growth, generating employment opportunities, and strengthening the competitiveness of the economy (Basyal, 2009). It is a means of generating self employment opportunities, strengthening informal activities. Ademu (2006) explained that credit can be used to prevent economic activity from total collapse in the event of natural disaster such as flood, draught, disease or fire. By using credit, farmers increase agricultural production by investing money in seed, fertilizers, tractor, and pump set etc. Industrial production can be increased by using credit. Moreover service sectors need credit to flourish. In fact all components of GDP need credit to grow. In performing the financial intermediation role, it has been argued that by virtue of this function that banks generate economic growth by providing needed resources for real investment (Kinnon, 1973). Sustainable economic growth depends on the ability to raise the rates of accumulation of physical and human capital to use the resulting productive assets more efficiently and to ensure the access of the whole population to these assets (Fitzgerald, 2006). This is possible only by having access to bank credit. Banks perform the act of financial intermediation that collect money from the surplus sector in the form of deposits and lend it to various sectors of the economy leading to economic growth. Extension of credit is one of the major functions of banking institutions.

Neo-classical growth theory states that labor and capital are the major factors of production. I.e.  $Y = f(K, L)$  where  $Y$  denotes aggregate output,  $K$  denotes aggregate capital stock, and  $L$  is the labor force. If technology and human capital are added, then equation becomes :  $Y_{i,t} = AK^\alpha(Lh)^{1-\alpha}$ . ( Mankiw, Romer, and Weil, 1992). Bank credit facilitates to acquire more capital in this production function. When a new technology is available, the labor and capital need to be adjusted to maintain growth equilibrium. To acquire new technology and thus to increase total factor productivity, the role of credit provided by banks would be of immense help. Private sector credit fosters growth through increasing investment and an efficiency/productivity. The capital accumulation channel is particularly important for underdeveloped and emerging countries, while the productivity channel is mostly relevant for advanced countries.

In standard neoclassical theories investment-savings is the engine of growth. In these theories, there are no capital market frictions and thus financial intermediation is not explicitly modeled. However these models assume that savings translate directly to investment and thus one could argue that finance affects growth primarily through capital deepening (investment) (Papaioannou,2007). A different class of theoretical models argues that financial development may foster growth by raising human capital accumulation. In Galor and Zeira (1993) model income inequality and credit market frictions impede growth, since not all individuals can invest in education. They argue thus that financial intermediation can spur growth (and eventually decrease inequality) by fostering human capital accumulation.

### III. LITERATURE REVIEW

A large body of literature is available on the extensive empirical work with regard to the nexus between finance and economic growth. Largely, this task has been performed by King and Levine (1993) and Levine(1997). They showed that financial development has predictive power for future growth and interpret this finding as evidence for a casual relationship that run from financial development to economic growth. Although the literature regarding the role of financial development on economic growth has grown rapidly in recent time, studies that examine bank credit or access to private sector credit and how it affects the economic performance of industries or economic sectors have been overshadowed by the increasing number of empirical studies that largely focus on financial development and growth. Nevertheless, private sector credit is one of the important indicators of financial development. Therefore the literatures on finance-growth nexus are helpful for the study on bank credit –growth nexus. King and Levine (1993) provided the evidence that financial sector proxied by the ratio of bank credit granted to the private sector to GDP, affects economic growth both through the improvement of investment productivity ( better allocation of capital) and through higher investment level. Financial system could impact positively on real economic performance by affecting the composition of savings (Bencivenga and Smith, 1991), providing information (Greenwood and Jovanovic, 1990), and affecting the scope for credit rationing (Boyd and Smith, 1997).

Schumpeter (1971) identified banks' role in facilitating technological innovation through their intermediary role. He argued that the role of bank of channelizing resources from surplus sector to deficient sector plays crucial role in promoting growth. Several others such as (Kinnon 1973), Shaw (1973), Adekanye (1986), Fry (1988), King and Levine(1993), and Adeniyi (2006) have focused on the significance of private sector credit to economic growth. Similarly studies by Gurley and Shaw (1967), Goldsmith (1969), Jayaratne and Strahan (1996), Kashyap and Stein(2000), Beck et al.(2000), Beck et al (2003), Driscoll (2004) etc, found that financial development can foster economic growth by raising saving, improving allocative efficiency of loanable funds, and promoting capital accumulation. In their opinion, well developed financial markets are necessary for the overall economic advancement of less developed and the emerging economies. King and Levine (1993a) said that the banking sector's development in Europe was not only correlated with economic growth but was also a cause of long-term growth. Adekanye (1986) argued, by providing credit; banks are rendering a great social service which leads to increase in production, capital investment and improving living standard. Akpansung (2011) by using two stage least square, found that private sector credit impacts positively on economic growth in Nigeria. However, lending interest rate impedes economic growth. Moreover, that paper recommends the need for more financial market development that favours more credit to private sector with minimal interest rate to stimulate economic growth.

A low rate of expansion of the credit volume is not only a symptom of weak economic growth, but can also be one of its causes (Bundesbank, 2005). Bayoumi and Melander (2008) found that a 2.5 percent reduction in overall credit caused a reduction in the level of GDP by around 1.5 percent. Dey and Flaherty (2005) used a two stage regression model to examine the impact of bank credit and stock market liquidity on GDP growth. They found that banking development is significant determinant of GDP growth. However Koivu (2002) found that growth in credit has not always been sustainable and in some cases it may have led to a decline in growth rates. Murty at al (2012) by using multivariate Johansen co integration approach, examined the long run impact of the bank credit on economic growth of Ethiopia and found that bank credit to the private sector affected economic growth through its role in efficient allocation of resources and domestic capital accumulation. Thus the policy makers should focus attention on long run policies to promote economic growth – the creation of modern banking sector so as to enhance domestic investment, which is instrumental to increasing output per capita and hence promoting economic growth in the long run. Ugoani (2013) examined the power of bank credit on economic growth in Nigerian perspective and found that bank credit has significant relationship with economic growth and socio-infrastructure development. He argues that on the one hand, bank credit is the oil on the wheel of economic growth. On the other, there is strong empirical evidence that the development of sound financial markets and institutions has significant relationships with long term economic growth.

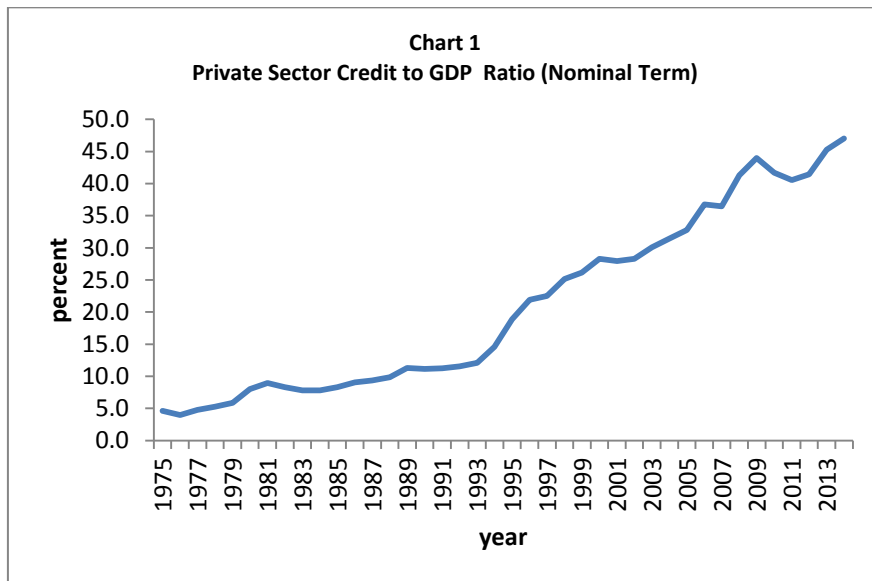
Financial sector plays a key role in channeling savings into productive investment especially in the formal sectors of the economy. The banking sector is well recognized as

a key conduit of financial intermediation in the economy. Access to credit enhances the productive capacity of businesses (Were Nzomi and Rutto, 2012). Private sector credit is considered as proxy of bank credit in many international studies. Beck and Levine (2001) measure bank development as bank credit to private sector divided by GDP. Also the endogenous growth theory sheds light on the role of finance on economic growth. Solow (1956, 1957) in his two factor neoclassical growth model incorporated the role of credit. The supply of credit, both in terms of volume and in terms of credit standards applied on loans to enterprises, have significant effects on real economic activity. In other words, a change in loan growth has a positive and statistically significant effect on GDP (Cappiello, Kadareja, and Sarensen, 2010). In the same way that financial services increase income of poor by expanding the supply of financial services which can be accessed by the poor. It will generate income growth for the poor, thus having a direct impact on poverty reduction (Jalilian & Kirkpatrick, 2001). The role of private sector credit as transmission channel of monetary policy cannot be ignored. Monetary policy may affect real economic activity, and ultimately inflation, via its impact on the banking sector credit through a number of transmission channels (Brunner and Meltzer, 1963 and Bernake, 1983).

#### **IV. THE STATUS AND TREND OF BANK CREDIT TO PRIVATE SECTOR IN NEPAL**

A significant portion of credit in Nepal is provided through the banking system, though there are some institutions such as savings and credit cooperative societies, finance companies, development banks and micro finance institutions. However, availability of time series data for the latter institutions is very limited. Therefore, in this study, private sector credit provided by commercial bank only is taken into consideration.

The ratio of bank credit to private sector and nominal GDP has not increased steadily over the study period in Nepal. Before 1980s, such ratio was very low. The financial sector of Nepal witnessed revolutionary changes in 1980s. A broad based program of reforms was launched since 1980s. The banking sector in Nepal had been transformed from a highly dominated inefficient state-owned sector to a dynamic private sector. NRB and the Government of Nepal took a number of steps to further enhance the pace of this transformation process of the development of financial sector in the country. A substantial increase in private sector credit to GDP ratio took place only after implementation of financial liberalization in early 2000s. The last five years from 2009 to 2014 recorded ratios of 44.0 percent, 41.7 percent, 40.3 percent, 41.2 percent, 45 percent and 47 percent respectively.



Source: Data from Quarterly Economic Bulletin July, 2013 (NRB) and figure from Author's calculation.

It has recorded significant increases only in 2009, 2013 and 2014. The stringent measures adopted by NRB to limit the real estate and margin lending loan of the banking sector, short term nature of loans, low growth of remittances and resulting liquidity crunch, low growth of government expenditure etc. were accountable for the low private sector credit to GDP growth in year 2010 and 2011.

In Nepal, economic growth rate is low compared to other developing countries (Annex 5). Real GDP growth rate is only 3.6 percent in 2013 and 5.2 percent in 2014. Average real GDP growth rate is 4.08 percent over the last twenty years. One of its main reasons is low private sector credit growth. Private sector credit (provided by commercial banks) is only 47 percent in 2014 but it was 21 percent of nominal GDP on average over the sample period. Therefore, to boost the economic growth of the country, private sector credit should be increased to productive sector.

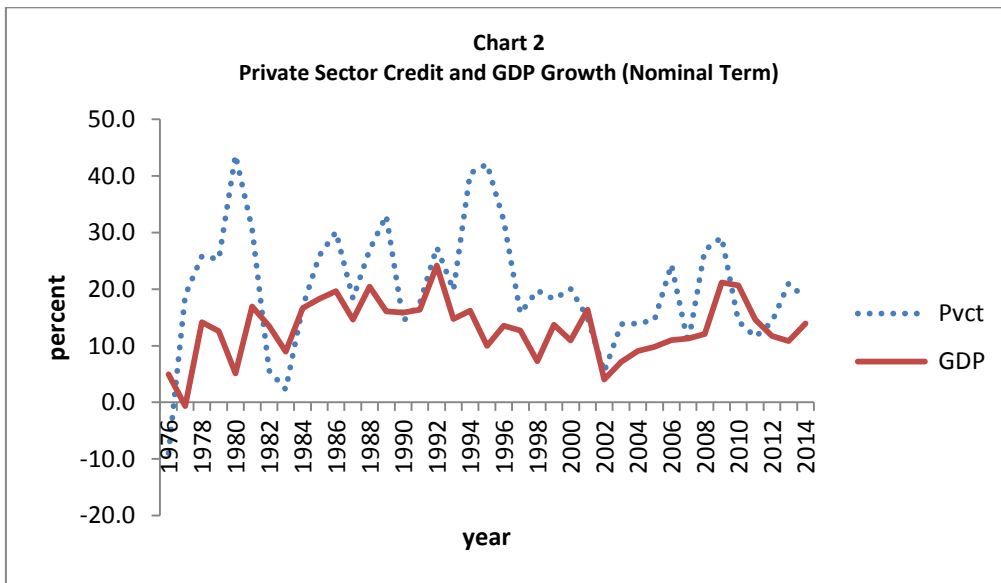
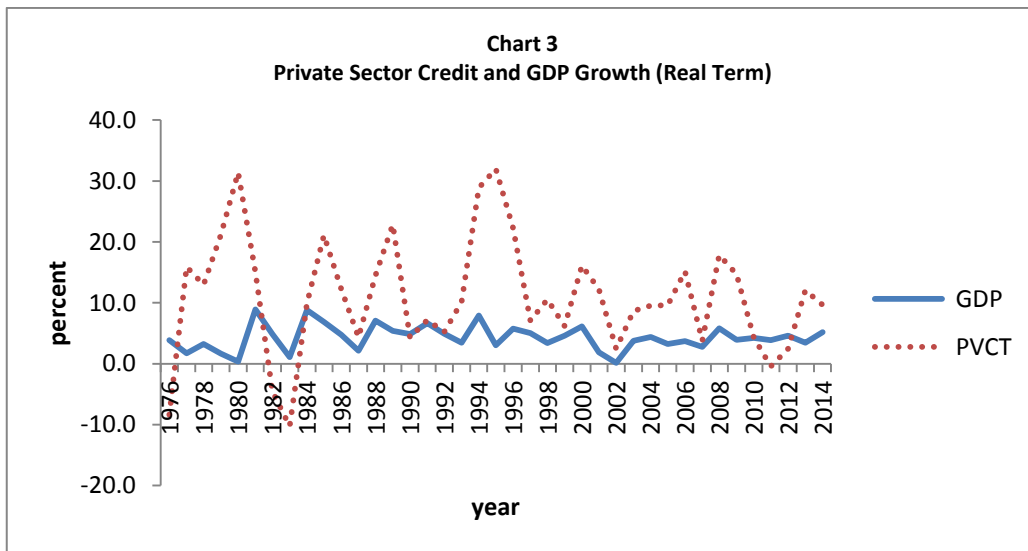


Chart 2 shows that there is positive relationship between nominal private sector credit and nominal GDP. As private sector credit increased, GDP also increased, but at a lower rate. Except some years their growth rate also seems to move in the same direction. Chart 3 also shows that real private sector credit has positive relationship with real GDP during the period 1975-2014.



Up to now, the Nepalese banking system does not seem to have the investment bank for long term loans, venture capital for viable projects, which in turn leads to inadequate economic growth. Moreover, Nepal is experiencing still a significant credit transaction in informal sector despite government's efforts to channel credit to the productive sector

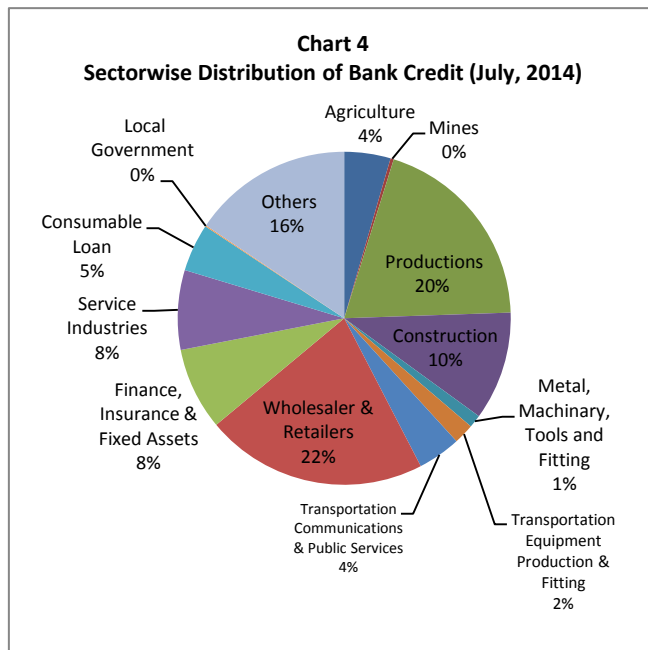


through commercial banks, development banks, finance companies and micro credit development banks.

**Sector wise Distribution of Bank Credit to Private Sector**

Sector wise distribution of private sector credit has great meaning to economic growth. Generally it is assumed that credit to productive sector caters economic growth where as credit to consumption sector can not contribute in this regard. In Nepal, of the total private sector credit provided by commercial banks in July 2014, wholesale and retail trade constituted 22 percent followed by production (20 percent), others (16 percent), construction (10 percent), finance, insurance & fixed assets (8 percent), service industries (8 percent), transportation, communication & public services (4 percent), agriculture sector (4 percent) and metal, machinery, tools & fitting (1 percent).

Though agriculture constitutes 32.40 percent of GDP in Nepal, only 4 percent of total private sector credit was provided in this sector as of 2014. Though Nepal Rastra Bank has made policy provision that banks should provide at least 20 percent of their total loan to productive sector and at least 12 percent of their loan to agriculture, energy and tourism sector, this percent was merely 6 percent only. Commercial banks seem to provide only 5 percent of their total loan to consumption sector (very small figure in total) which helps to establish the relationship between bank credit and economic growth.



**V. DATA AND METHODOLOGY**

Secondary data that captured the whole population of all commercial banks in Nepal for the period 1975 –2014 are used in the study. Secondary data are gathered from Quarterly Economic Bulletin and Quarterly Financial Indicators (NRB).

In Nepal, the bank credit is allocated to both the public and private sector of the economy. However, private sector credit is considered to be more effective to stimulate economic

growth. Several studies such as Beck et al (2005), Levine(2002), Odedokun (1998), King and Levine(1993), Boyreau-Debray (2003), Liang (2007) and Crowley (2008) have suggested that bank credit to the private sector is more significant for economic activities than bank credit to the public sector. Therefore, in this study bank credit to private sector is taken as appropriate variable. Since the paper attempts to assess relationship between private sector credit and economic growth, variables such as bank credit to the private sector ( $\ln rpvt$ ), economic growth ( $\ln rgdp$ ) are taken as the main variables. Government expenditure ( $\ln rgexp$ ) and interest rate ( $ir$ ) have been included in the study as control variables. Mathematically,  $GDP = f(pvct, gexp, ir)$ . Murty et al (2012) suggested this type of variables to examine the effects of private sector credit on growth. Also, Okyo et al (2012) emphasized the interest rate and inflation as control variables in their study. The study has applied co-integration approach error correction model and granger causality for the empirical examination of the relationship between the private sector credit and economic growth.

### ***Empirical Model***

Firstly, we form the following regression equation to estimate the effects of private sector credit on real gross domestic product. Government expenditure and interest rate are taken as control variables.

Where,

$$\ln rgdp_t = \alpha_0 + \alpha_1 \ln rpvt_t + \alpha_2 \ln rgexp_t + \alpha_3 ir_t + \mu$$

$rgdp$  = real gross domestic product

$rpvt$  = private sector credit provided by banks in real terms

$ir$  = interest rate

$rgexp$  = real government expenditures

Unit root test and co-integration tests should be performed first before performing the ordinary least square method. If the variables are found I(1) and co-integrated to each other, then co-integration and error correction test should be run. If the variables are found I(1) but no co-integration found between the variables of interest, then it is better to run OLS. Therefore in this case we first perform the unit root test and co-integration test.

### ***Unit Root Tests***

The pre-requisite of co-integration test is the stationarity test of each individual time series over the sample period. Co-integration analysis has increasingly become the appropriate methodological approach for analyzing time series data containing stochastic trends. Hence before turning to the analysis of the long run relationships between the variables, we should check for the unit root properties of the data, as non stationary behavior is a prerequisite for including them in the co-integration analysis.

Table 1  
**ADF Test Results (Unit Root Tests)**

Intercept					Intercept and Trend			
Variables	Level		First Difference		Level		First Difference	
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value
lnrgdp	-0.2191	0.9275	-6.2461	0.0000	-1.5065	0.8103	-6.1634	0.0000
lnrpvct	-0.5403	0.8722	-4.6902	0.0005	-3.0366	0.1361	-4.738	0.0026
lnrgexp	-1.6497	0.4483	-6.1444	0.0000	<b>3.6743</b>	<b>0.0363</b>	-5.9839	0.0001
ir	-1.3167	0.6119	-4.6169	0.0006	-2.7912	0.2091	-4.5509	0.0043

Source: Author's computation

ADF statistics in the above table shows that all the variables included found to be I(1) with one variable lnrgexp having deterministic trend. Hence, although it can be modeled at first difference with OLS and extracting trend and cycles for trend-stationary variables, this is possible only if variables are not co-integrated. The Johansen co-integration test has been carried out as follows to identify whether there exists a co-integrated relationships.

Table 2  
**Johansen's Cointegration Test (LNRGDP LNRPVCT LNGEXP IR )**

Hypothesized No. of CE(s)	Trace Statistics			Maximum Eigenvalue		
	Trace Statistic	0.05 Critical Value	P-value	Max-Eigen Statistic	0.05 Critical Value	P-value
None*	58.3249	47.85613	0.0039	26.1242	27.58434	0.0759
At most 1*	32.2006	29.79707	0.0259	17.1239	21.13162	0.1662
At most 2	15.0767	15.49471	0.0577	14.1104	14.26460	0.0528
At most 3	0.9663	3.841466	0.3256	0.9663	3.841466	0.3256

\* denotes the rejection of null hypothesis at 5 percent level of significance. Trace test indicates 3 cointegrating equations at 0.05 level whereas maximum Eigen Value test indicates 1 cointegrating equation at 0.05 level.

The Johansson cointegration tests for cointegration shows conflicting results with trace test and maximum eigenvalues test. The trace test indicates a 2 cointegration relation, however, eigenvalue shows none. Hence it is desired to test the cointegration relation only with the variables of interest, credit flow and its impact to GDP. The test results for cointegration between economic growth (lnrgdp) and private sector credit (lnrpvct) are as follows:

Table 3  
**Johansen's Cointegration Test (LNRGDP LNRPVCT)**

Hypothesized No. of CE(s)	Trace.			Maximum Eigenvalue		
	Trace Statistic	0.05 Critical Value	P-value	Max- Eigen Statistic	0.05 Critical Value	P-value
None*	15.6358	15.4947	0.0476	15.5774	14.2646	0.0308
At most 1	0.05843	3.8414	0.8090	0.0584	3.8414	0.8090

Both the results consistently show a single co-integration relationship, at a highest level of confidence which further confirms the earlier test of co-integration with four variables. Hence, it can be decided that there exists a long term relationship between private sector credit and country real GDP.

### ***Causality Test***

A number of studies have been carried out to examine the direction of causality between bank credit and economic growth. Mishra et al (2009) examines the direction of causality that runs between credit market development and economic growth in India through the application of Granger Causality Test and find that credit market development spurs economic growth. Mukhokadhya and Pradhan (2010) assess the causal relationship between financial development and economic growth of seven Asian developing countries and concluded that no general consensus can be drawn about finance growth relationship in developing countries. Odedokun (1989) find the case of unidirectional causality from the real sector to the financial sector and concludes that money is causally prior to income.

Here in the study, Granger Causality Test has been conducted to find out the direction of causality between the bank credit and economic growth. The results show evidence of unidirectional casual relationship from GDP to private sector credit (annex 3, annex 4).

With different lag structure at 2 and 5 lags, the estimated F-stat suggests that private sector lending does not Granger causes the real GDP but the other way is true. Hence, the preliminary relationship is something different than expected. Nepalese economic growth is led by feedback effect from the growth, rather than multiplier effect that of investment. Based on these results, a bivariate error correction model is being estimated in the following sections. Using the representation theorem of Engle and Granger (1987) to establish a link between the co-integration and Error Correction Model (ECM), we can show the long-run relation as:

$$\varepsilon_t = \ln rgdp_t - \mu - \beta_1 \ln rpvc_t, \quad \dots (1)$$

By transforming the equation 1, we can develop an error correction model as:

$$\Delta \ln rgdp_t = \mu_{\ln rgdp} + \alpha_{\ln rgdp} \varepsilon_{t-1} + \sum_{h=1}^l a_{1h} \Delta \ln rgdp_{t-h} + \sum_{h=1}^l b_{1h} \Delta \ln rpvc_t_{t-h} + u_{\ln rgdp_t} \dots (2)$$

$$\Delta \ln rpvc_t = \mu_{\ln rpvc} + \alpha_{\ln rpvc} \varepsilon_{t-1} + \sum_{h=1}^l a_{2h} \Delta \ln rpvc_t_{t-h} + \sum_{h=1}^l b_{2h} \Delta \ln rgdp_{t-h} + u_{\ln rpvc_t} \dots (3)$$

Where,  $u_{\ln rgdp_t}$  and  $u_{\ln rpvc_t}$  are stationary white noise processes for some number of lags  $l$ . The coefficients in the co-integration equation give the estimated long-run relationship among the variables and coefficients on the error correction model (ECM) describe how deviations from that long-run relationship affect the changes on them in next period. The parameters  $\alpha_{\ln rgdp}$  and  $\alpha_{\ln rpvc}$  of the equation (2) and (3) measure the speed of adjustment of private sector credit and economic growth respectively towards the long-run equilibrium

## VI. RESULTS

Estimates of the equation (1) for co-integration

$$\varepsilon_t = \ln rgdp_{t-1} - 8.153 - 0.410 \ln rpvc_{t-1} \dots (4)$$

(0.0087)\*

The error correction estimates of equation (2) and (3) have been presented as follows:

$$\Delta \ln rgdp_t = 0.056 + 0.0553 \hat{\varepsilon}_{t-1} - 0.0149 \Delta \ln rpvc_{t-1} + 0.004 \Delta \ln rpvc_{t-2} - 0.0878 \Delta \ln rgdp_{t-1} - 0.215 \Delta \ln rgdp_{t-2} \dots (5)$$

(0.012) (0.07) (0.046) (0.005) (0.188) (0.199)

Adj. R<sup>2</sup> = 0.054, F-Stat = 0.35

$$\Delta \ln rpvc_t = 0.181 + 0.916 \hat{\varepsilon}_{t-1} + 0.534 \Delta \ln rpvc_{t-1} - 0.0786 \Delta \ln rpvc_{t-2} - 1.39 \Delta \ln rgdp_{t-1} - 1.59 \Delta \ln rgdp_{t-2} \dots (6)$$

(0.0329)\* (0.215)\* (0.125)\* (0.134) (0.505)\* (0.53)\*

Adj. R<sup>2</sup> = 0.59, F-Stat = 9.05

Note: \* Significant at 5 percent or lower level.

Values in parenthesis indicates the standard errors of the respective estimates

The estimates of the model show interesting results. By rearranging the estimates of co-integration equation (4), it can be inferred that one percentage point increase in the real private sector credit may cause the increase in real GDP by 0.41 percentage points over the long run equilibrium relationships. Nevertheless, the short run equilibrium effects are more induced by the feedback effects of GDP growth to the private sector lending, not from the private sector lending to GDP growth, which is against our hypothesis. All the coefficients of error correction estimates with the dependent variable as  $\Delta \ln rgdp_t$  are found to be insignificant including  $\alpha_{\ln rgdp}$ , very low adjusted R<sup>2</sup> value (0.054) and insignificant F-Stat (0.35). In the contrary, with the dependent variable  $\Delta \ln rpvc_t$ , the

error correction estimate is significant showing that the estimate of  $\alpha_{\ln rpvt}$  is 0.916; significant at 5 percent or lower level. It includes relatively high  $R^2$  value (0.593) and F-Stat (9.05). It indicates that any deviation in real GDP in any given time will affect the real private sector lending by 0.916 in the next period and the effect of such deviation in private sector credit to the real GDP is almost zero. Hence, the finding is that, although there is a long-run relationship can be observed from private sector lending to overall growth of the economy, there is no immediate multiplier effect from investment to growth and such a long-run relationship became only possible through feedback effects. Diagnostics tests shows estimations are valid. Residuals Plots move around zero (annex 6). LM Test for Autocorrelation shows no serial correlation in error terms (annex 7). Since p-value is higher while we include up to three lags, we do not reject null, in favor of this, there is no serial correlation in residuals (annex 7).

Spikes of the correlogram graphs are also found to be within the bands (annex 9) and also, all inverse roots of AR Polynomial lie inside the circle (annex 10).

## VII. CONCLUSION

Credit is an important link in monetary transmission as it finances production, consumption, and capital formation, which in turn affect economic growth. Especially in developing countries like Nepal, it caters resource need for economic growth. NRB and the government have adopted many policies and programs to increase economic growth through the use of bank credit. However, the relationship between private sector credit and economic growth has not yet been assessed properly in the Nepalese context.

Applying Johansen co-integration approach and estimating Error Correction Model, the study found that the banks credit to private sector has positive impact on economic growth only in the long run. Nonetheless the short run equilibrium effects are more induced by the feedback effects of GDP growth to the private sector lending, not from the private sector lending to GDP growth, which is against the proposed hypothesis. The empirical results imply that, policy makers should focus attention on long run policies to promote economic growth such as development of modern banking sector, efficient financial market, infrastructures so as to increase private sector credit which is instrumental to promote growth in the long run.

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**APPENDICES**

**1. Co-integration Test (Four Variables)**

Date: 10/20/14 Time: 14:39

Sample (adjusted): 1977 2014

Included observations: 38 after adjustments

Trend assumption: Linear deterministic trend

Series: IR LNRGDP LNRGEXP LNRPVCT

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.497158	58.32488	47.85613	0.0039
At most 1 *	0.362774	32.20065	29.79707	0.0259
At most 2	0.310181	15.07670	15.49471	0.0577
At most 3	0.025108	0.966282	3.841466	0.3256

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.497158	26.12422	27.58434	0.0759
At most 1	0.362774	17.12396	21.13162	0.1662
At most 2	0.310181	14.11042	14.26460	0.0528
At most 3	0.025108	0.966282	3.841466	0.3256

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

## 2. Co-integration Test (Two Variables)

Date: 10/20/14 Time: 14:42  
 Sample (adjusted): 1977 2014  
 Included observations: 38 after adjustments  
 Trend assumption: Linear deterministic trend  
 Series: LNRGDP LNRPVCT  
 Lags interval (in first differences): 1 to 1

### Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.336304	15.63582	15.49471	0.0476
At most 1	0.001536	0.058428	3.841466	0.8090

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.336304	15.57739	14.26460	0.0308
At most 1	0.001536	0.058428	3.841466	0.8090

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

**3. Pairwise Granger Causality Tests (With two lags)**

Sample: 1975 2014

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNRGDP does not Granger Cause LNRPVCT	37	7.57364	0.0020
LNRPVCT does not Granger Cause LNRGDP		0.00338	0.9966

**4. Pairwise Granger Causality Tests (With five lags)**

Sample: 1975 2014

Lags: 5

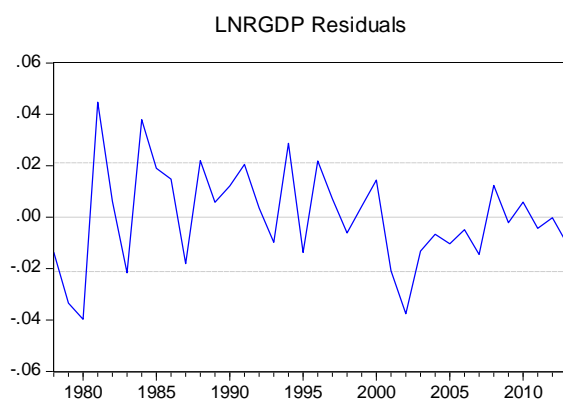
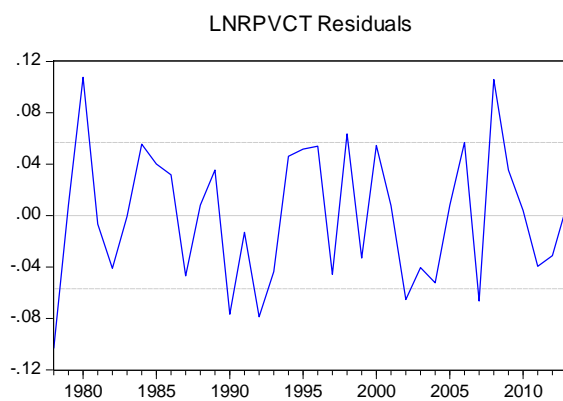
Null Hypothesis:	Obs	F-Statistic	Prob.
LNRGDP does not Granger Cause LNRPVCT	34	3.87323	0.0108
LNRPVCT does not Granger Cause LNRGDP		1.60409	0.1988

**5. Economic Growth in Developing Countries**

Countries	2009	2010	2011	2012	2013	2014
China	9.2	10.4	9.3	7.8	7.7	-
India	8.5	10.5	6.3	4.7	5.0	-
Indonesia	4.6	6.2	6.5	6.3	5.8	-
Malaysia	-1.5	7.4	5.1	5.6	4.7	-
Nepal	4.5	4.8	3.4	4.9	3.6	5.2

Source: World Bank

## 6. Residuals Plots move around zero.



## 7. VEC Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Sample: 1975 2014

Included observations: 36

Lags	LM-Stat	Prob
1	9.450576	0.0508
2	5.579553	0.2328
3	5.590300	0.2319

Probs from chi-square with 4 df.

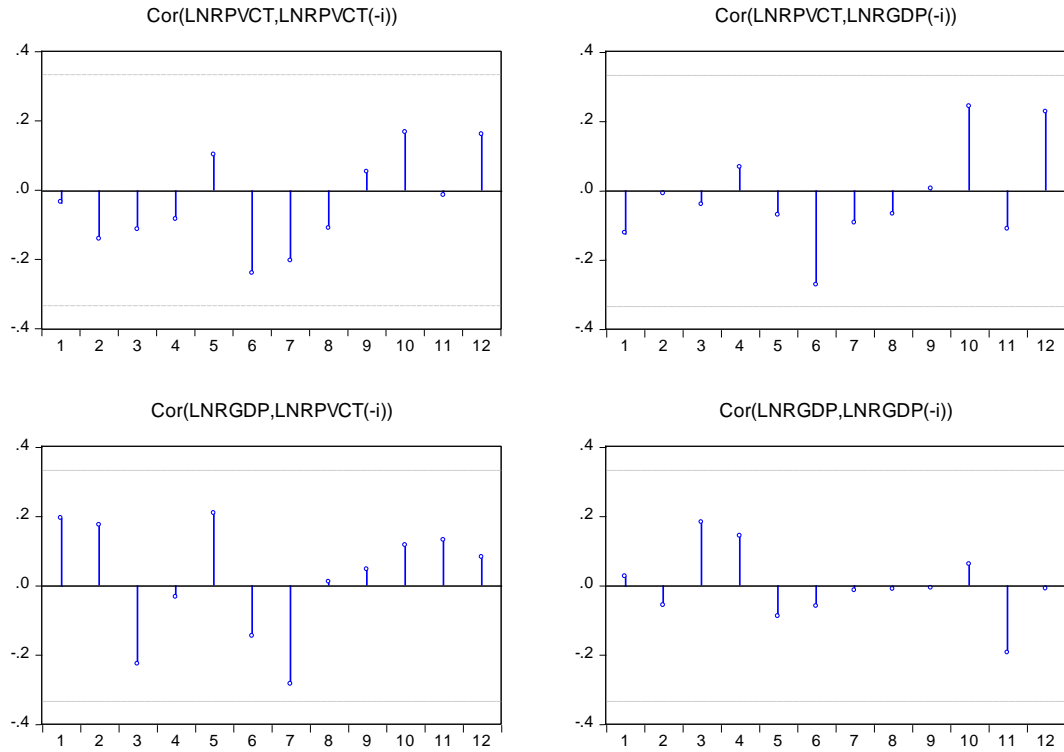
### 8. Vector Error Correction Estimates

Date: 10/20/14 Time: 14:37  
 Sample (adjusted): 1978 2014  
 Included observations: 37 after adjustments  
 Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
LNRGDP(-1)	1.000000	
LNRPVCT(-1)	-0.409841 (0.00877) [-46.7222]	
C	-8.153330	
Error Correction:	D(LNRGDP)	D(LNRPVCT)
CointEq1	0.055931 (0.07941) [ 0.70431]	0.916661 (0.21503) [ 4.26285]
D(LNRGDP(-1))	-0.087868 (0.18502) [-0.47491]	-1.392763 (0.50100) [-2.77997]
D(LNRGDP(-2))	-0.215248 (0.19596) [-1.09841]	-1.595705 (0.53063) [-3.00717]
D(LNRPVCT(-1))	-0.014957 (0.04599) [-0.32525]	0.534695 (0.12452) [ 4.29405]
D(LNRPVCT(-2))	0.003950 (0.04950) [ 0.07980]	-0.078660 (0.13404) [-0.58684]
C	0.056417 (0.01218) [ 4.63310]	0.180577 (0.03297) [ 5.47649]
R-squared	0.054060	0.593335
Adj. R-squared	-0.098511	0.527744
Sum sq. resids	0.013521	0.099137
S.E. equation	0.020884	0.056551
F-statistic	0.354324	9.045982
Log likelihood	93.91664	57.05943
Akaike AIC	-4.752251	-2.759969
Schwarz SC	-4.491021	-2.498739
Mean dependent	0.042574	0.104796
S.D. dependent	0.019926	0.082290
Determinant resid covariance (dof adj.)	1.36E-06	
Determinant resid covariance	9.52E-07	
Log likelihood	151.4944	
Akaike information criterion	-7.432128	
Schwarz criterion	-6.822591	

9.

Autocorrelations with 2 Std.Err. Bounds



10.

Inverse Roots of AR Characteristic Polynomial

