



Co-integration Analysis of Financial Development and Economic Growth in Nepal

Bhim Kumar Thapa

Asst. Professor, Public Youth Campus, FOM, Tribhuvan University, Nepal
Email: bhim.thapa@pyc.tu.edu.np, <https://orcid.org/0009-0001-6982-0483>

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ABSTRACT

This comprehensive study explores the complex dynamics of Nepal's financial development and economic growth, both in the short and long run. The bidirectional nature of this relationship is emphasized, highlighting the interdependence and mutual reinforcement of financial evolution and economic expansion. This analysis identifies significant long term association among key variables including real GDP per capita, private sector credit, gross wealth creation and total business underscoring their lasting impact on economic growth of Nepal. Variable specific dynamic reveal that certain indicators utilize more influence over extended period. Short term adjustment patterns shows variations in the speed of response to deviations from long run equilibrium. Ganger causality tests uncover unidirectional causal relationship, providing information on how shifts in certain financial progress measures affect the growth of the economy. Diagnostic tests verify the model's robustness, validating its reliability. These findings provide valuable knowledge in multifaceted link with financial and economic improvement in Nepal. Future research avenues may include deeper causal analysis, regional and sectoral investigations and the impact of financial inclusion policies.

I INTRODUCTION

Financial development is a crucial component of modern economies, encompasses the improvement and sophistication of financial markets, institutions and systems within a country. It is crucial to economic growth, stability, and progress. Aziz and Duenwald (2002) introduced the financial development influence economic growth by marginal productivity of capital, share saving channels into investment and raise private saving rates, contributing to increased capital accumulation and consequently economic growth. Ansari (2002) expanded on these ideas by delineating six distinct ways in which financial development contributes to progress in the economy. The causal link between financial enhancement and economic advancement varies with nation's development, according to Patrick (1966).

Financial improvement and increasing wealth are causally connected in both ways; financial development may initially and subsequently stimulate economic growth. To achieve its demands, it becomes more reliant on financial development. Numerous studies have shown this association. Luintel and Khan (1999), Greenwood and Smith (1997), and Berthelemy and Varoudakis (1995) showed a bidirectional causal link between innovation in finance and the expansion of the economy.

The establishment of Nepal Bank Ltd., the nation's first commercial bank, in 1937 started improving the country's financial institutions. This signified the start of constructing Nepal's financial infrastructure. Important indicators of Nepal's financial development include the country's GDP growth rate, proportion of private sector credit, broad money supply, and domestic credit (Khatri Chhetri, 2022). (Paudel & Acharya, 2020). Domestic debt and business sector loan to GDP ratios are the most conventional financial deepening metrics (Amin & Hossain, 2017). By enhancing the efficiency of financial services, monetization promotes economic development (Shittu, 2012).

The fundamental inquiry address is: Does the progression of financial growth with the real gross domestic product per capita to rise in Nepal? Within this context, this study endeavor provides responses to the following research questions. Does Nepal's per capita real GDP, accomplish trade, government capital spending, money supply, individual sector credit, domestic credit, and complete trade all show a long-run correlation? Does business financing, overall money supply, gross investment, total trade, and government capital spending affect Nepal's per capita real GDP?

Examining how financial development affects economic growth in the context of Nepal is the main goal of this research. The study's particular goals are outlined below.

- To analyse Nepalese financial development and economic expansion continue to interact.

- To examine the long-run association with economic expansion and financial development in Nepal.
- To explore the Granger causal connection among Nepal's expanding economy and financial improvement.

II LITERATURE REVIEW

Schumpeter (1911) said that a strong financial system facilitates resource shift from unproductive to productive sectors, boosting technological progress. This approach started financial-led growth analysis. Robinson (1952) found that economic expansion increases demand for financing. Goldsmith (1955) linked financial progress to investment efficiency. McKinnon (1973) and Shaw (1973) emphasize financial liberalization's role in domestic saving and investment. King and Levine (1993) shown that financial development boosts economic growth. Further research by Levine and Zervos (1998) demonstrated that financial development causes economic growth, particularly in developing nations. Even after adjusting for human, physical, and trade openness, Beck, Levine, and Loayzaet (2000) indicated that financial industry expansion and economic enhancement were positively correlated. A detailed model demonstrated how financial development enhances economic growth by boosting investment productivity without increasing investment by Greenwood and Smith (1997). Aghion and Howitt (2008) provided a model demonstrating how financial development grows economies across countries and time periods, short- and long-term. Financial development helps new businesses join the market, promoting competition and economic growth, their research found.

Gautam (2014) tested this link between 1975 and 2012 using several methods. Research showed that the development of finance boosts the economy's expansion. Bist and Bista (2018) examined banks and financial institution credit concerns as a proxy for financial growth from 1984 to 2014. It concluded that financial evolution contributing to economic progress in long-term and short-term. The study also found a lack of link between gross national saving and economic progress, indicating Nepal has not used its savings. Rimal (2014) evaluated financial evolution contributing to economic progress. It found that liquid liabilities positively affect growth of financial system, implying that enhancing financial development might boost economic growth. Timsina (2014) examined how commercial bank loan to the private sector affects Nepalese economic development. The results show that private sector financing boosts economic development over time. Short-term economic growth feeds private sector loans.

Many studies have examined the connection with financial growth and economic expansion in a range of scenarios, little is known about the dynamics of long-term co-integration in Nepal. Although this relationship has been researched in Nepal, the co-movements between long-term financial development indicators and economic growth have not been thoroughly examined. This work fills this knowledge vacuum by investigating long-term co-integration link with economic enrichment through financial growth in Nepal using sophisticated econometric approaches. The findings provide scholars and policymakers insightful knowledge about Nepal's sustainable economic development.

Conceptual Framework

Understanding the connection among financial expansion, economic progress and important control factor is the goal of this study's conceptual framework.

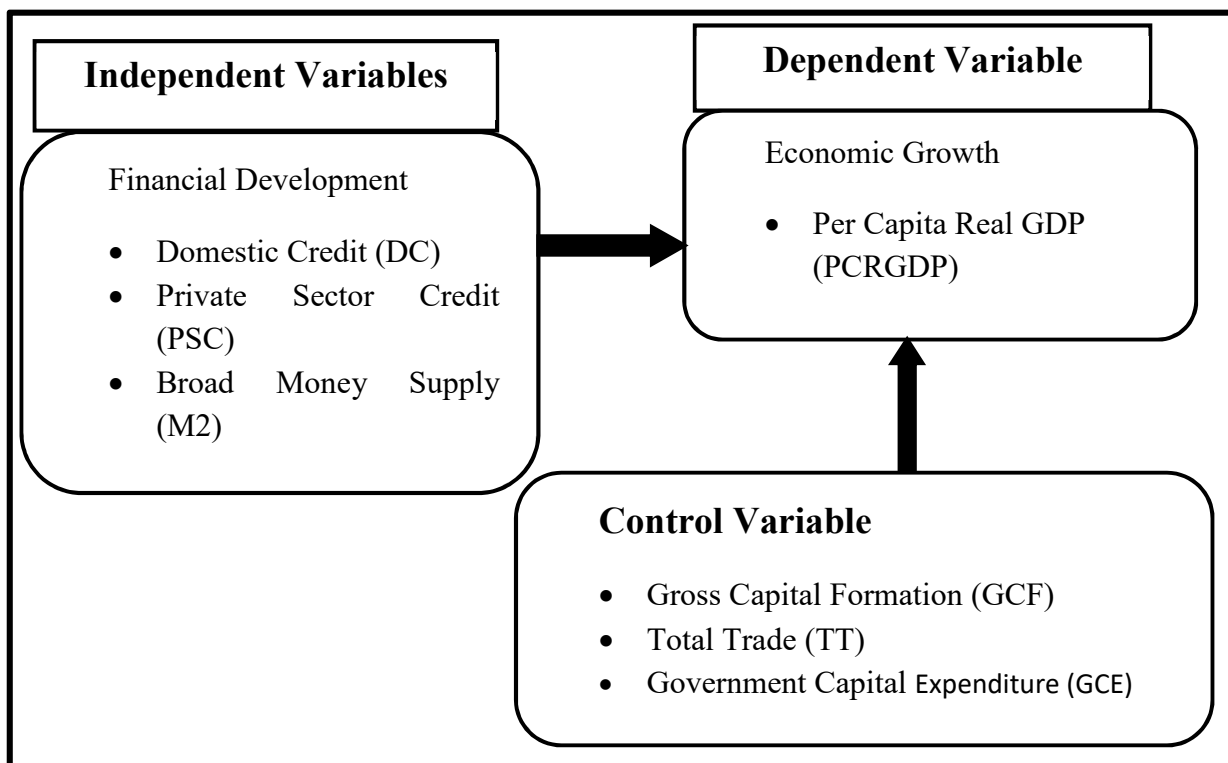


Figure 1 Conceptual Framework

Research Hypotheses

Long-run Relationship:

H₁: Long-term relationships exist between Nepal's real gross domestic product and Nepal's total trade, government capital expenditures, gross capital creation, loan from the private sector and money supply.

Granger causality

H₂: There exists granger cause between domestic credit, private sector credit, wide money supply, gross capital creation, total trade government core expenditure and real GDP in Nepal.

III METHODOLOGY

The methodology utilized quantitative research approach firmly rooted in the positivist framework. This technique was adopted to thoroughly study Nepal's economic enrichment through financial growth. Analytical techniques are employed to examine secondary time-series information during 1975 to 2022 in this research. The Ministry of finance's economic survey reports and the quarterly economic bulletin of the Nepal Rastra Bank (NRB) are the key data sources.

Logarithmic series trend analysis refers to a method used in statistics and data analysis to identify and model patterns in data that do not follow a linear trend but exhibit a logarithmic relationship. Unit root testing must be done on every variable before using the Vector Error Correction Model (VECM) for co-integration analysis. This is an important phase since it helps ascertain if a series has an order of integration that does not exceed one, which is a requirement for the VECM process. Stationary series was first used by Engle and Granger (1987) to describe a linear combination of two or more time series that is made stationary by using the Augmented Dickey-Fuller (ADF) test. The investigation has attempted to determine if fiscal growth driving economic advancement are causative connection (Granger, 1969). In VECM, the process of gradually correcting departures from the long-term equilibrium by a succession of partial short-term modifications is referred to as error correction. According to Engle and Granger (1987), co-integration indicates that these variables will eventually reach a long-term equilibrium, suggesting Granger causality in at least one direction.

Begin with logarithmic series trend, unit root test to assess variable stationarity, followed by Johansen Co-integration test to confirm long-term relationships. Proper model specification involving lag order selection, endogeneity tests, variance influence factor and scrutinize the residuals for serial correlation, Jarque-Bera normality test and CUSUM chart. Conduct Granger causality test responses analysis for dynamic insights.

IV RESULTS AND DISCUSSION

Result

Unit Root Estimation

The nature of time sequence variables was evaluated using the Augmented Dickey-Fuller (ADF) test.

Table 4

First Difference Unit Root Estimation

Factors	First level	Probability
LnPCRGDP	-6.7214	.0000
LnDC	-7.0886	.0000
LnPSC	-6.4313	0.0000
LnM2	-4.7747	0.0003
LnGCF	-8.2785	0.0002
LnTT	-6.2667	0.0000
LnGCE	-4.9739	0.0000

The outcomes of the ADF test have been reported, revealing that at the 5% critical threshold, all p-values are considered significant.

Lag Selection Criterion

The finding presented in table 5 indicate that based on the Schwarz information criterion (SC), a lag length of one is deemed optimal. Subsequently, additional tests and analyses are conducted with this chosen lag length of one.

Table 5

Lag Selection

Lag	SC
0	-5.8337
1	-16.3468*
2	-14.5102
3	-12.9031
4	-13.8464

*Indicates lag order selected by the criterion

Here, SIC values are shown for lag lengths 0–4. The SIC criteria shows that the lowest SIC value (-16.3468) corresponds to a lag length of one, which balances model fit and complexity optimally.

Co-integration Test

Based on the likelihood ratio test, the Johansen test employs two test statistics: the trace statistic and the maximum eigenvalue statistic proposed by Johansen (1988).

Table 6

Trace Rank Test

No. of CE(s)	Eigen Value	Trace value	t value	P value
None*	0.659	168.1	125.61	0
At most 1*	0.599	118.64	95.75	0.001
At most 2*	0.503	76.62	69.82	0.013
At most 3	0.369	44.42	47.86	0.101
At most 4	0.263	23.22	29.8	0.235
At most 5	0.164	9.21	15.49	0.347
At most 6	0.021	0.96	3.84	0.327

Table 7

Maximum Eigenvalue Rank Test

No. CE(s)	Eigenvalue	Max-Eigen Statistic	t value	P value
None*	0.659	49.47	46.23	.02
At most 1	0.599	42.01	40.07	.03
At most 2	0.503	32.2	33.88	.08
At most 3	0.369	21.2	27.58	.26
At most 4	0.263	14.01	21.13	.364
At most 5	0.164	8.24	14.26	.35
At most 6	0.021	0.96	3.84	.33

The Johansen co-integration test results show a considerable co-integration link between the various financial development indicators and the per capita real GDP (PCRGDP). There is an extended equilibrium association between these factors, even though they may be trending in different directions in the short run. The trace statistic indicates that there three co-integrating relationship, while the maximum eigenvalue statistic indicates that there are two co-integrating relationship. Previous research has shown the co-integration of GDP growth and financial stability (Gautam, 2014; Bista & Bista, 2018). According to the research, financial expansion promotes long-run economic enlargement. The long-term equilibrium of the factors is shown by the presence of co-integration.

This further indicates that the variables exhibit Granger causation, although in a limited form, according to Engle and Granger (1987). The disequilibrium correlation is done by the Error Correction Term also known as speed of adjustments. VECM used in the study specified as follows:

Table 8

Long-run Elasticity

Dependent variable: PCRGDP

Regressor	Coefficients	t- value
LnDC	0.3178	[0.563]
LnPSC	-1.9122	[-3.421]
LnM2	-1.0281	[-1.361]
LnGCF	1.5072	[3.242]
LnTT	1.5100	[5.664]
LnGCE	-0.1161	[-0.186]
C	-8.9509	

The table 8, which contains normalized co-integration in the VECM, offers valuable insights into the adjustment pattern of various indices. Among the variables examined, namely private sector credit, gross capital formation and total trade statistical significant is observed based on the t-values presented. This statistical significance allows to draw the following interpretations regarding the coefficients in long-term:

- A 1% upward in private sector credit is associated with a 1.91% growth in PCRGDP.
- A 1% Expansion of gross capital corresponds to a 1.51% decrease in PCRGDP.

- A 1% rise in overall commerce results in a 1.51% decline in per capita real gross domestic product (PCRGDP).

Conversely, the variables domestic credit, broad money supply and government capital expenditure exhibit statistical insignificance as indicated by the t-values. Consequently, the interpretations for these future coefficients are as follows:

- A 1% increase in domestic credit results in a modest 0.32% decrease in PCRGDP.
- A 1% increase in broad money supply is associated with a 1.03% increase in PCRGDP.
- A 1% increase in government expenditure leads to a slight 0.12% increase in PCRGDP.

The outcomes pertaining to the short-run dynamics resulting from the VECM estimates are presented in the table 9.

Table 9

Error Correction Estimates

	Coefficient	S.E.	t value
LNPCRGDP	-0.071	-0.031	-2.273
LNDC	0.055	-0.029	1.910
LNPS	0.149	-0.030	4.904
LNM2	0.066	-0.021	3.136
LNGCF	-0.140	-0.063	-2.214
LNTT	-0.054	-0.054	-0.999
LNGCE	-0.035	-0.037	-0.965

The coefficient in the Error Correction Model (ECM) provides information about the adjustment speed. The coefficient for the lagged ECM at 5% level, expressed as log PCRGDP and equal to -0.0711 , is statistically significant. This coefficient value indicates that approximately 7.11 percent of the imbalance resulting from shocks in previous years expected to reach long-term balance this year. Negative and significant coefficient further confirms the existence of a co-integration association among PCRGDP and GCF, PSC positive and statistical significant, DC positive and statistical insignificant and PSC, TT and GCE are negative and statistical insignificant.

The coefficient related to GCE takes more time to suggest a slower adjustment speed compared to DC, PSC, M2, TT and GCF. This implies that GCE takes more time to response to deviations from the long-run equilibrium and its effects subsequently influence other variables. Conversely DC, TT, M2 and GCF exhibit faster adjustment rates, indicating that these variables are more responsive and adapt more quickly to restore equilibrium within the system.

Table 10

Granger Causality

Hypotheses	No. of Obs	F value	P value	Result
No Granger cause LnDC from LnPCRGDP	47	3.6945	0.0611	Nothing causal
No Granger Cause LnPSC from LnPCRGDP	47	0.0179	0.8941	Nothing causal
No Granger Cause LnM2 from LnPCRGDP	47	5.4889	0.0237	Unidirectional
No Granger Cause LnGCF from LnPCRGDP	47	0.0591	0.8091	Nothing causal
No Granger Cause LnTT from LnPCRGDP	47	0.6505	0.4243	Nothing causal
No Granger Cause LnGCE from LnPCRGDP	47	4.4935	0.0397	Unidirectional

The outcome of a Granger causality analysis, indicates the presence of a unidirectional causality relationship. The findings indicated that in Nepal, there is unidirectional causation between PCRGDP and M2 as well as PCRGDP and GCE. In similar term, change in PCRGDP have a causal impact on broad money supply and alteration in PCRGDP influence government capital expenditure.

The result reveals no causal relationship running between DC and PCRGDP, PSC and PCRGDP, GCF and PCRGDP or TT and PCRGDP in Nepal. This implies that changes in these financial development indicators do not have a significant causal influence on PCRGDP in Nepal.

The study found that all variables' variance influence factors are less than 5, indicates that there is no serious multicollinearity issue among the predictor variables in the regression model. The provided table displays the results of the Breusch-Godfrey serial correlation LM test has found that the probability Chi-Square (1) value, which is calculated as .091. This number fails the reject null hypothesis since it is more than the traditional significance threshold of .05.

This rejection is primarily indicated by p value is .09 which is exceeding the conventional significance threshold of .05. Interpreting the result of a CUSUM chart involves analyzing the plotted data points in relation to the control limits. The outcome of the Jarque-Bera test (p value .45) provides evidence that the conclusion is drawn based on the probability value from the test, which surpasses the critical threshold of .05.

Discussion

The study demonstrate a Strong statistical connection with a 1% upward in private sector credit corresponding to a substantial 1.191 percent rise in per capita real gross domestic product. This finding validates prior research conducted by Olowofeso et al. (2015), Amoo et al. (2017) and Ozili, Adeleke and Udoji (2023), that revealed a significantly favorable connection of economic expansion with financial development.

The study found that 1% gross capital creation promotes real GDP per capita by 1.51%.

This outcome aligns with the findings of prior research conducted by Nweke et al. (2017), Rahman and Ahmad (2019), Topcu et al. (2020) and Rani and Kumar (2019). It is also worth noting that Adhikari (2011) reported similar positively statistical significant findings in this context.

The study shows that long-run influence of total business on economic increment has a significant negative relationship. This finding aligns with earlier research by Akalpler and Hove (2019), Iyoha and Okim (2017), and Musila Yiheyis (2015) suggesting that factors such as increased import, trade deficits and potential unfair trade practices contribute to this negative association and statistically significant.

The analysis finds that domestic credit has a small and statistically negligible effect on economic growth, which is supported by Begum and Aziz (2019) and Jammeh (2022). Broad money supply demonstrates a statistically insignificant relationship with economic growth, consistent with previous research by Ogunmuyiwa and Ekone (2010).

Government capital expenditure shows the positive effect on economic growth, exhibits statistically insignificant positive correlation with per capita real GDP. This suggests that government capital spending isn't a key factor in Nepalese economic development, in line with conclusions from Muritala and Taiwo (2011), Chinweoke et al. (2014), Nweke et al. (2017) and Paudel and Acharya (2020).

Trade openness has an unfavorable and statistically significant effect on economic development, when considered alongside financial development indicators with the study of similar results are Makki and Somwaru (2009), Amna Intisar et al. (2020) and Hye, Wizarat and Lau (2016). Gross fund creation emerges in robust the engine of economic expansion statistically significant negative, in conformity with the conclusions made by Jammeh (2022) and Ozili et al. (2023).

The results of the research that show the connection between financial growth and several economic aspects in Nepal are included in this discussion part.

V CONCLUSIONS AND IMPLICATIONS

Conclusions

The article investigates Nepal's financial progress and economic growth, clarifying the interactions between these important elements at short and long-run levels. The exploration of the connection between financial development and economic growth begins with a visual analysis of the data, offering initial insights into the relationships among key variables. These variables incorporate PCRGDP, DC, PSC, M2, GCF, TT and GCE. The variables are non-stationary at the initial level but become stationary after taking their first differences, as shown by the use of enhanced Dickey-Fuller test for stationarity Evaluation.

The choice of lag lengths for the model is the next crucial stage. In order to choose the best lag structure for the study, lag selection is essential. The Johansen co-integration test is used in this research to investigate the long-term relationships between the variables. This test determines the existence of a sustained correlation between real GDP per capita, private sector credit, gross capital formation and total trade. This study utilized VECM to assess short-term dynamics, highlighting that government capital expenditure adjusts more slowly than other variables in reaction to long-term equilibrium aberrations. In the long run, private sector credit, gross capital formations from the money supply, and overall commerce are important, whereas government capital spending, domestic credit, and the money supply

are less influential. The Granger causality test is another component of this analysis. It shows unidirectional causal linkages between Nepal's gross capital production and real GDP per capita and the country's overall money supply. However, no causal relationships are found between household financing, private borrowing, gross capital creation, total commerce and real GDP per capita.

Implications

The findings of this study offer several valuable implications for future policy, research and economic development. For the betterment of the country, stakeholders may use these implications to drive the links among financial stability and economic progress.

Analyzing the link between financial development and economic growth across various regions, as well as studying the particular dynamics of different sectors within the economy. Nepal can leverage this knowledge to attract domestic and foreign investments, which can further stimulate economic growth. Researchers can evaluate the impact of specific financial inclusion policies and programs to assess their effectiveness in promoting economic growth in Nepal. Future research can search deeper into the causal relationships identified in this study. Investigating the mechanisms through which financial development influences economic growth and vice versa can provide a more detailed understanding.

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