

Financial Development and Economic Growth in Nepal: An ARDL Bound Test Approach

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Financial Development and Economic Growth in Nepal: An ARDL Bound Test Approach

Pradeep PANTHI¹

Abstract

This study empirically examines the dynamic relationship between financial development and economic growth in Nepal using annual time series data from 1985 to 2016. The financial development is measured by domestic credit to the private sectors, domestic credit to the private sectors by banks, broad money (M2) and net domestic credit, separately. All are ratios to GDP. The economic growth is measured by real GDP per capita. The bound test approach of cointegration under autoregressive distributed lag (ARDL) model reveals that Nepal's financial development and economic growth are cointegrated with bi-directional causality in the long-run. Thus, the study concludes that financial development and economic growth positively and significantly impact each other. The causal effects running from financial development to economic growth are portent then economic growth to financial development. However, the speed of adjustment towards long-run equilibrium, directing from economic growth to financial development is reasonably robust. There is one-directional reverse causality running from economic growth to financial development in the short-run. Therefore, the study suggests policymakers to prioritize policies to develop a well-functioning financial sector to enhance economic growth, especially for developing countries like Nepal.

JEL Classifications: G21, C22, F43, O11, O16

Keywords: Financial Development, Economic Growth, ARDL, Nepal

1 Introduction

The acquisition and interaction of production factors and technological transformations explain the countries' variances in economic growth and productivity. Besides this, financial intermediation is also evolving as a critical channel of economic growth and productivity in the present globalized world where labour and capital are moving across the countries rapidly (P. Demetriades and Law 2006). The financial sector plays an essential role in the economic

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development process by allocating resources to productive areas. It helps to monitor investment, facilitates trade, manages risk, mobilizes savings, facilitates markets, increases the velocity of resources, and increases economic inclusiveness in the society (King and Levine 1993a). Thus, a stable and well-developed financial sector robustly determines variances in many countries' economic development (Levine 1997). Many researchers have accepted that a sound and vibrant financial sector stimulates economic growth (Christopoulos and Tsionas 2004; Levine 1997; Levine, Loayza, and Beck 2000). However, it does not mean that expanding the financial sector always gives higher economic benefits (P. O. Demetriades and Hussein 1996; Rajan and Zingales 2003). Each country has its specific economic features concerning their fiscal policies, financial policies and structures, and institutional quality. Indeed, an optimal and well-functioning financial sector always accelerates its economic activities (Durusu-Ciftci, Ispir, and Yetkiner 2017).

Many cross-country studies have revealed valuable and comprehensive ideas and the consequences of the finance-growth relationship. However, they cannot appropriately capture country-specific fundamental nature and dynamics due to differences in legal origins, institutions, and policies that differ across countries (Arestis and Demetriades 1997; Arestis, Demetriades, and Luintel 2001). For such reasons, country-specific case studies are equally important to examine the finance-growth relationship, especially for developing countries where a comprehensive range of financial reform and liberalization is a significant policy issue.

According to the World Bank's income classification of economies as of July 2020, Nepal has recently uplifted into the lower-middle-income country with Gross National Income (GNI) per capita of 1090 Us dollar in 2019. However, Nepal has developed a diversified financial system by enacting the financial reform and liberalization policies since the mid-1980s with significant policy reforms and structural reforms (Ozaki 2014). The government introduces the private sector and foreign joint ventures actively in the domestic financial system. In the result, broader diversification of financial sector in terms of size, ownership, operations, and investment and building central bank independence, improving its monitoring and regulating strength has been achieved at a certain level (Bhetuwal 2007; Ozaki 2014; M. B. Shrestha and Chowdhury 2006). Despite these outcomes, creating a well-functional financial sector with strong corporate governance, improved financial inclusion, and building the financial sector's resilience strength to cope with external shocks are still challenging for Nepal. The domestic civil war from 1996 to 2006

and the prolonged political transition has deteriorated the development and diversification of the Nepalese financial sector. Therefore, examining the causal dynamics of financial development and economic growth of Nepal is very important for policymakers as Nepal has implemented the federal administration system after the promulgation of new constitutions in 2015.

Some existing studies have already examined the relationship between Nepal's financial development and economic growth (Bhetuwal 2007; Kharel and Pokhrel 2012 ; Gautam 2014; Timsina 2014). However, most of these studies are either equipped with traditional econometric methods or motivated by 'finance leading growth' hypothesis. They do not consider their two-way causal dynamics for the long-run and short-run. Depending on these issues, this study attempts to enrich the available literature of the finance-growth relationship by providing new empirical evidence, evaluating a Nepalese perspective. For this, the study establishes two different hypotheses. The principle hypothesis assumes that financial development is the function of economic growth and reverse hypothesis assumes that economic growth is the function of financial development. The bound test approach of cointegration under the autoregressive distributed lag (ARDL) model examines the cointegration form and long-run dynamics. The error correction model (ECM) under ARDL is used to estimate short-run dynamics. Finally, one period lagged error correction term (ECT) confirmed the speed of adjustment towards long-run equilibrium.

The organization of this paper is as follows. Section 2 explains a summary of financial reform and development in Nepal. Section 3 briefly explains the literature review, section 4 presents data and proxy measures, and section 5 explains the econometric approaches and empirical models. Section 6 presents empirical analysis and discussions, section 7 highlights the conclusion and recommendation, and section 8 presents brief options for future research. Results obtained from these analyses might help to set clear policies in financial sector development, especially for developing countries like Nepal.

2 Financial Reform and Development in Nepal

2.1 Financial Reform in Nepal

After facing an economic crisis in the early 1980s, Nepal introduced the first step of liberalization on the economy (Maskay and Subedi 2009). The government and International Monetary Fund (IMF) made a Stand-By Agreement (SBA) in 1985, which introduced the first

phase of financial reform under the Economic Stabilization Program (ESP) (Ozaki 2014). The program was intended to devalue Nepalese currency, restrict public expenditure and bank credits, liberalize industrial licensing, promote export, and control import. The Structural Adjustment Program (SAP) of the World Bank in 1987 is implemented for further liberalization. Only two state-owned banks dominated the banking industry by holding 70% of the financial sector's total assets before implementing SAP (Ozaki 2014). Policies such as indirect monetary control, interest rate deregulation, the open market economy, liberal exchange rate, import licensing system, auction system of government securities made a fundamental change in financial system (P. O. Demetriades and Luintel 1996). The World Bank helped restructuring and strengthening of state-owned banks, amendment of the income tax act, commercial bank act, central bank act, and national industrial development corporation act and establishment of credit information bureau.

In 1999, IMF and the World Bank jointly conducted Financial Sector Assessment Program (FSAP) and stated that the Nepalese financial system was still fragile, vulnerable and risky concerning fundamental norms and principles of Basel Accords-1988 (Maskay and Subedi 2009). Therefore, the second stage of financial reform was initiated after 2002. The IMF helped implement the Poverty Reduction and Growth Facility (PRGF) program in 2003 and supported a tenth five-year plan of Nepal. Their programs include improving accounting and auditing standards, developing institutional and legislative frameworks and privatization, and restructuring state-owned financial institutions. The World Bank helped implement the Financial Sector Restructuring Project (FSRP) in 2004 to restructure the financial sector by reengineering the central bank, reforming and privatizing state-owned banks and capacity building. Asian Development Bank (ADB) helped to implement the Rural Finance Sector Development Cluster Program (FSDCP) in 2006 to improve regulatory and supervision framework of the rural financial sector, to restructure and reform financial institutions, to establish national banking training institute, to strengthen debt recovery tribunal, and to develop microfinance credit information services. As a result, the enhancement of supervision and monitoring strengths of the central bank with maintaining its independence and diversifying the financial sector in terms of size, ownership, operations, and investment has been achieved within a short period in Nepal.

2.2 Financial Development in Nepal

The establishment of the first commercial bank in 1937 for capital accumulation and promotion of trade and industry introduced the formal institutional development of Nepal's modern financial system. The central bank was established at 1956 under the Nepal Rastra Bank (NRB) Act-1955 and became the first central monetary authority to monitor financial institutions and issue Nepalese currency. Three other state-owned financial institutions were established at 1959, 1966 and 1968 to promote the industrial and commercial sectors and the agricultural sector, separately. First policy initiation was enacted with 'Banking Development Plan' in 1968. The central bank introduced regulations and directed credit program in 1974. Due to these significant institutional and policy set-ups, commercial bank branches increased from 80 in 1970 to 241 in 1980. Despite these preliminary changes, the domestic credit level to the private sector was only 8.57% of GDP in 1980.

The entrance of the private sector and foreign joint ventures after 1985 generated a wave of banking sector expansion and development in Nepal (G. K. Shrestha 2004). Nepal Stock Exchange (NEPSE) was established in 1993 to facilitate investment in the corporate sector. Greater ranges of depository institutions from commercial banks to microfinance institutions were allowed to operate in Nepal from 1992 (Maskay and Subedi 2009). In the result, the Nepalese financial sector got diversification in terms of size, ownership, operations, and investment. Therefore, commercial bank branches increased from 241 in 1980 to 430 in 2001. However, the domestic credit to the private sector was increased from 8.57% in 1980 to only 21.42% of GDP in 2001. The domestic civil war from 1996 to 2006 became the primary cause of these stagnations of Nepal's financial sectors.

The amendment of Nepal Rastra Bank (NRB) act at 2002 intending to reform and govern the financial sector granted full autonomy to the central bank to supervise and regulate the financial sector. The promulgation of the Bank and Financial Institution Act (BAFIA) in 2006 became an umbrella act of bank and financial institutions (BFIs) in Nepal. It divides BFIs in four-levels with their specific authorities of financial activities. In a result, the establishment of BFIs increased rapidly from 98 in 2000 to 272 in 2011. However, the central bank experienced difficulties in the supervision and control of BFIs due to their urban-centric operation and stiff competition. Therefore, the central bank restricted new licensing of BFIs and enacted financial consolidation

policy through merger and acquisition in 2013. In a result, the number of BFIs are significantly reduced to 162 in 2020. However, the Nepal government has enacted policies to ensure access to financial services in all the wards of local municipalities with the presences of BFIs. Therefore, the branch expansion of BFIs in semi-urban areas and rural areas are increasing aggressively in recent years by which commercial bank branches increase from 430 in 2001 to 4219 in 2020 (MoF 2020). Various acts related to the financial sector such as Money Laundering Prevention Act-2008, Banking Offence and Punishment act-2008, Payment and Settlement Act-2017, Foreign Exchange Regulation Act-2019 are also gradually issued. In a result, the domestic credit to the private sector is increased from 21.42 % in 2001 to 88.07 % of GDP in 2019. The stock market capitalization was also increased from 8% in 2002 to 47.6% of GDP in 2019.

Despite these developments, the key indicators of financial access and stability are still low in Nepal. For example, the ownership of bank account at a formal financial institution of an adult is 45.38% as of 2017. The Lerner index, a critical indicator of bank competition, decreased from 0.359 in 1996 to 0.273 only in 2014. In another side, the Nepalese financial sector is dominated by bank-based financial institutions only. Almost 57.6% of the Nepalese financial system's total assets belong to commercial banks only as of mid-January 2020. Besides this, the distribution of financial institutions is not balanced across the nation. Province No. 3 consist of 26% of the total branches of the BFIs whereas, Karnali province, a far-western region of Nepal consists only 3.9% only (MoF 2020). The financial sector's contribution to developing small and medium-scale enterprises (SMEs) and credit expansions in highly potential sectors like tourism, green energy, and agro-processing industries is still low in Nepal. Therefore, the central bank is enforcing commercial banks to expand their credit portfolio to the agricultural sector, energy sector and SME sectors by maintaining a minimum threshold of 15%, 10% and 15% of their total credit (NRB 2020). Nepal's central bank has set a clear vision of achieving sustainable and inclusive economic growth by *“maintain macroeconomic and financial stability through proactive and effective monetary and financial policies”* in their term in the third strategic plan 2017-2021. For this, the financial sector must mobilize available resources in the most productive and feasible sectors in the economy efficiently by increasing financial access and boosting the economy's financial stability.

3 Review of Literature

Historically, Schumpeter's (1911) influential studies and Hicks (1969) raised the financial sector's implication to encourage innovations through proper resource allocation in the economic development process. In contrast, Robinson (1952) and Goldsmith (1969) explained that economic development processes promote entrepreneurial activities and stimulate the financial sector. These two perspectives from the pioneer economists have raised a diverse opinion among researchers in finance-growth relationship literature. They have raised three debatable hypotheses about the finance-growth relationship. The most contradictory hypotheses are 'finance leading growth' hypothesis and 'growth leading finance' hypothesis. The third hypothesis asserts their mutual relationship of leading each other. Very few pieces of evidence show non-causality between them. However, Patrick (1966) focused on both hypotheses and stated that the financial sector leads to economic growth in the preliminary phases of economic development and reverse in post-stage economic development. Shaw (1973) and McKinnon (1973) raised the implication of government regulations for repression and liberalization of the financial sector. They stated that financial liberalization enhances savings, encourage domestic investment, and boost economic growth. Revisiting these policy arguments, Lucas (1988 p.6), stated that "*the financial sector's role in economic growth is over-stressed*" in previous studies. Chandavarkar (1992) raised neglected questions about the financial sector's needs and obstacles in developing countries concerning financial repression policies. King and Levine's (1993a) substantial effort confirms that the financial system promotes entrepreneurship by mobilizing savings in innovative and productive activities by diversifying risk and enhancing economic growth. Later on, King and Levine (1993b) supported Schumpeter's (1911) viewpoint empirically, arguing that financial sector development significantly determines the strength of accumulating capital, productivity, and efficiency of economic activities. The seminal works of Ross Levine and his co-authors with empirical pieces of evidence and broad literature stated that there exist cross-country variances on economic growth concerning size, depth, policies, and access of the financial sector (Levine 1997, 2005; Levine and Zervos 1998).

However, some evidence shows that finance-growth relationship varies concerning economic development stages of the countries (Blackburn and Hung 1998; Christopoulos and Tsionas 2004; P. O. Demetriades and Hussein 1996; Hassan, Sanchez, and Yu 2011; Levine,

Loayza, and Beck 2000; Minea and Villieu 2010). For example, Christopoulos and Tsionas (2004) claim that financial intermediation constitutes higher returns on economic activities in the middle stage of economic development. However, Hassan et al. (2011) said that economic growth gives more benefits to the financial sectors in the preliminary economic development phase, especially in vulnerable countries. Despite these diverse opinions, many researchers believe in the constructive linkages between financial intermediation and economic activities because they grow together, causing each other (Calderón and Liu 2003; Gregorio and Guidotti 1995; Jung 1986; Kar et al. 2011).

Few studies have examined the finance-growth relationship according to the firm's financial structure. Firms obtaining finance from external sources and optimizing their capital structure through financial intermediation, especially in countries with a more developed financial system, positively enhance productivity and growth (Arestis, Demetriades, and Luintel 2001; Rajan and Zingales 1996). The capital market based financial structure determines the sizeable economic growth for advanced economies but not for developing economies (Luintel et al. 2016). The capital market and credit market have an encouraging influence on real sector growth, but the credit market's contribution makes the more significant influence (Durusu-Ciftci, Ispir and Yetkiner 2016). However, an over-expansion of the financial sector or beyond optimum level might introduce volatility and diminish economic growth (Arcand, Berkes, and Panizza 2012, 2015; Law and Singh 2014; Beck, Degryse, and Kneer 2014; Samargandi, Fidrmuc, and Ghosh 2015).

Therefore, there is no clear consensus about the finance-growth relationship's causality directions (Martin Čihák et al. 2013). All countries may not benefit equally from the expansion of the financial sector. Instead, the benefits depend on regulatory and supervisory strengths and the effectiveness of the financial policies regarding services, stability, structure, and access (Barajas, Chami, and Yousefi 2013). Hence, the financial sector's success highly relies on its efficiency and effectiveness and the regulatory authorities' supervision and monitoring strength.

In Nepal's case, Demetriades et al. (1996) studied the role of banking sector policies and their coexistence and estimated its effect on financial deepening. They further tested 'finance leading growth' hypothesis but did not consider the 'growth leading finance' hypothesis. G. K. Shrestha (2004) studied financial sector reform program of Nepal and emphasized on their proper implementation. M. B. Shrestha, and Chowdhury (2006) has constructed a financial liberalization

index for Nepal but did not examine its impact on financial development. Bhetuwal (2007) has studied the causal relationship between financial liberalization index and various proxies of financial development. Kharel and Pokhrel (2012) have examined the causal relationship between Nepal's financial structure and economic growth and reveal that credit market promoted economic growth rather than the capital market in Nepal. Timsina (2014) has examined Nepal's economic growth effects through 'finance leading growth' hypothesis but missed to evaluate the reverse effects. Study of Gautam (2014) stated that reverse causality runs from economic growth to financial development in the long-run in Nepal, suggesting that further reform and expansion is needed for the efficiency and effectiveness of Nepal's financial sector. A recent study of Bist and Bista (2018) has tried to address the two-way dimensions of the finance-growth relationship addressing significant structural breaks of Nepal's financial development and economic growth. However, their study depends on only one indicator of financial development.

Therefore, there is clear space to explore the two-way dynamics of the finance-growth relationship employing various financial development measures concerning the effect of Nepal's real sector and the external sector. Hence, this study tries to fulfil this gap by enriching the available literature with new empirical evidence using dynamic estimation methods in Nepalese context.

4 Data and Proxy Measures

4.1 Data

This study's main objective is to examine the cointegrating association and causality dynamics between Nepal's financial development and economic growth for the policy recommendation. For this, the study examines annual data of 32 years from 1985 to 2016 obtained from world development indicators (WDI). The study periods cover an era of financial liberalization, policy reform and structural reform in the Nepalese economy. Since Nepal is still under financial liberalization process and should have a stable financial system to cope with internal and external shocks, we believe that obtained results in this study may have various advantages to formulate financial sector development policies for developing countries like Nepal. Table 1 presents the list of selected variables, their indications and short definitions. The graphical representation of the trend of these variables at their level values is presented in Appendix A.

Table 1 List of Selected Variables and Their Short Definition

Variables	Indication	Short Definition
Economic Growth	LnGDPPC	GDP per capita (constant 2010 US\$)
Financial Development (1)	LnDCP	Domestic credit to the private sector (ratio to GDP)
Financial Development (2)	LnDCB	Domestic credit to the private sector by banks (ratio to GDP)
Financial Development (3)	LnBM	Broad money (ratio to GDP)
Financial Development (4)	LnNDC	Net domestic credit (ratio to GDP)
Control Variable: 1	LnGDS	Gross domestic savings (ratio to GDP)
Control Variable: 2	LnTRD	Merchandise trade (ratio to GDP)
Control Variable: 3	LnGOV	General government final consumption expenditure (ratio to GDP)
Control Variable: 4	LnINF	Inflation, GDP deflator (annual rate)

Note: Ln refers to the natural logarithm.

4.2 Proxy Measures

4.2.1 Economic Growth

There are particular proxy measures of economic growth. This study measures economic growth, calculating annual changes in real GDP per capita (GDPPC). As Mankiw (1995) explained, the study follows the neoclassical growth model to measure economic growth. Thus, economic growth for the one year is defined as:

$$\Delta \text{LnGDPPC}_t = \text{LnGDPPC}_t - \text{LnGDPPC}_{t-1} \dots \dots \dots (1)$$

Where, LnGDPPC is the natural logarithms of GDP per capita constant 2010 US dollar, and t represents the number of time-series observations.

4.2.2 Financial Development

Financial development is a multidimensional phenomenon concerning depth, access, efficiency and stability of financial system including financial institutions and markets of an economy (Almarzoqi, Ben Naceur, and Kotak 2015; Beck et al. 2008; M. Čihák et al. 2012). However, the financial depth variables, such as narrow money and broad money supply (King and Levine 1993b, 1993a; Arestis and Demetriades 1997; Levine, Loayza, and Beck 2000; Kar, Nazlioglu, and Ađir 2011) from monetary aggregates, total bank credit and deposit from financial institutions (Christopoulos and Tsionas 2004; Luintel and Khan 1999), and stock market capitalization and stock traded from financial markets (Arestis, Demetriades, and Luintel 2001; Levine and Zervos 1998), and their GDP ratios are most common among researchers. This study prefers to use a bank-based financial indicator and broad form of monetary aggregates following

(Levine, Loayza, and Beck 2000; King and Levine 1993a, 1993b) to measure Nepal’s financial development because Nepal has bank-based financial system rather than market-based. They are the domestic credit to the private sector (DCP), domestic credit to the private sector by banks (DCB), broad money (M2) as net liquid assets (BM) and net domestic credit (NDC). All of them are ratio to GDP. A high level of domestic credit to the private sector indicates higher credit access for the private sector, indicating the strength of capital formation of an economy. Levine (2005) stated that if a financial sector allocates more credit to the private sectors, they engage in researching firms, enhancing their corporate governance and control, and mobilizing savings by managing investment risks, and facilitating transactions. A high level of the domestic credit to the private sector by banks indicates the higher dependence of the private sector on the banking sector than the non-banking sector (Hassan, Sanchez, and Yu 2011). It indicates a higher level of financial development because of five special functions of banks suggested by Levine (1997). The higher level of the broad money (M2) measured as net liquid assets implies higher financial intensity and mobility and explains the strengths of channelling liquid funds from surplus sector to deficit sectors in an economy (Hassan, Sanchez, and Yu 2011; Khan and Senhadji 2003). A higher level of net domestic credit (NDC) indicates general credit mobilization’s strengths to the government, non-financial public sector, and the economy’s private sector.

The study has followed the neoclassical growth model to measure financial development, as Mankiw (1995) explained. Thus, financial development for the one year is defined as:

$$\Delta \text{LnFD}_t = \text{LnFD}_t - \text{LnFD}_{t-1} \dots \dots \dots (2)$$

Where, LnFD is the natural logarithms of four proxies of financial development, i.e. DCP, DCB, BM, NDC, used separately and t represents the number of time-series observations.

4.2.3 Other Control Variables

This study has used four additional variables to control the relationship between financial development and economic growth. They represent the magnitude of the real sector and the external sector of an economy. A steady economic growth heavily depends on domestic savings, which can be converted into investment activities through financial intermediation (Pagano 1993). The financial intermediation plays a crucial role to channel those savings into investment. So, financial development and economic growth are expected to benefit from the level of gross

domestic savings. So, this study uses gross domestic savings (GDS) ratio to GDP to control the estimations.

On the other hand, many countries are profoundly dependent on international trade to accelerate their economic activities, determining the real sector's magnitude. Nepal is heavily dependent on international trade. Inward remittance channelling from financial institutions is mostly used to finance imports because of low domestic production. Therefore, the merchandise trade as a sum of exports and imports ratio to GDP is also used as trade openness (TRD) to control the estimations.

Beside this, Nepal's frequently changing governments exercise budgetary spending through fiscal policies to influence the economy. The size of the fiscal budget and policies may affect financial and economic activities of an economy. Therefore, the general government final consumption expenditure ratio to GDP as the size of government (GOV) is also used. Finally, inflation reflects the price distortion's effects on an economy and may affect economic and financial activities. Hence, the annual rate of GDP deflator as inflation (INF) is also used to control the estimations. Since the data are in various scales, this study uses natural logarithm transformation for consistent results. The coefficients are considered as their elasticities.

5 Econometric Approaches and Empirical Models

The study uses a dynamic regression model. The bound test approach under the Autoregressive Distributed Lag (ARDL) model developed by (Pesaran and Shin 1998; Pesaran, Shin, and Smith 2001) is used to confirm cointegrating form and long-run level relationship whereas error correction model (ECM) is being used for short-run causality and confirmation of speed of adjustment towards long-run equilibrium.

5.1 Bound Test Approach Under ARDL Model

The ARDL model is a standard time series model that examines the relationship between a dependent variable and independent regressors both contemporaneously and historically by using current values and regressors' lagged values. ARDL model is a specific framework of ordinary least square (OLS) regression equation applicable for both stationary, non-stationary and mixed nature of time series variables. It performs F-test for the existence of long-run form and

cointegration and provides a short-run dynamic form of error correction with a long-run equilibrium through simple linear transformation (M. B. Shrestha and Bhatta 2018).

In particular, this study's principle estimation model assumes that financial development is the function of economic growth in Nepal. Thus, real GDP per capita is the dependent variable, and the four proxies of financial development (used separately) and other control variables are explanatory variables.

Thus, the principal estimation model for economic growth under ARDL (p, q, r, s, t, u) is expressed by:

$$\begin{aligned} \Delta \text{LnGDPPC}_t = & \alpha \\ & + \sum_{i=1}^p \lambda_{1i} \Delta \text{LnGDPPC}_{t-i} + \sum_{j=0}^q \lambda_{2j} \Delta \text{LnFD}_{t-j} + \sum_{k=0}^r \lambda_{3k} \Delta \text{LnGDS}_{t-k} + \sum_{l=0}^s \lambda_{4l} \Delta \text{LnTRD}_{t-l} \\ & + \sum_{m=0}^t \lambda_{5m} \Delta \text{LnGOV}_{t-m} + \sum_{n=0}^u \lambda_{6n} \Delta \text{LnINF}_{t-n} + \delta_1 \Delta \text{LnGDPPC}_{t-1} + \delta_2 \Delta \text{LnFD}_{t-1} \\ & + \delta_3 \Delta \text{LnGD}_{t-1} + \delta_4 \Delta \text{LnTRD}_{t-1} + \delta_5 \Delta \text{LnGOV}_{t-1} + \delta_6 \Delta \text{LnINF}_{t-1} + \varepsilon_t \dots \dots \dots (3) \end{aligned}$$

On the contrary, the reverse estimation model assumes that economic growth is the function of financial development. Thus, the four proxies of financial development are used separately as the dependent variable, and real GDP per capita and other control variables are explanatory variables.

Thus, reverse estimation model for financial development under ARDL (p, q, r, s, t, u) is expressed by:

$$\begin{aligned} \Delta \text{LnFD}_t = & \alpha + \sum_{i=1}^p \beta_{1i} \Delta \text{LnFD}_{t-i} + \sum_{j=0}^q \beta_{2j} \Delta \text{LnGDPPC}_{t-j} + \sum_{k=0}^r \beta_{3k} \Delta \text{LnGDS}_{t-k} + \sum_{l=0}^s \beta_{4l} \Delta \text{LnTRD}_{t-l} \\ & + \sum_{m=0}^t \beta_{5m} \Delta \text{LnGOV}_{t-m} + \sum_{n=0}^u \beta_{6n} \Delta \text{LnINF}_{t-n} + \gamma_1 \Delta \text{LnGDPPC}_{t-1} + \gamma_2 \Delta \text{LnFD}_{t-1} \\ & + \gamma_3 \Delta \text{LnGD}_{t-1} + \gamma_4 \Delta \text{LnTRD}_{t-1} + \gamma_5 \Delta \text{LnGOV}_{t-1} + \gamma_6 \Delta \text{LnINF}_{t-1} + \varepsilon_t \dots \dots \dots (4) \end{aligned}$$

Where Δ represents the first differenced value. LnGDPPC indicates real GDP per capita, LnFD indicate the four proxies of financial development. They are LnDCP, LnDCB, LnBM and LnNDC . The other control variables are LnGDS, LnTRD, LnGOV and LnINF . The coefficients $\lambda_1 - \lambda_6$ and $\beta_1 - \beta_6$ provide the coefficients for short-term $\delta_1 - \delta_6$, and $\gamma_1 - \gamma_6$

provides the long-run coefficients. p, q, r, s, t, represents the optimum number of lags selected automatically based on Akaike (1974) Information Criteria (AIC). The existence of cointegration or long-run relationship is being confirmed under bound test approach. If the F-statistic is higher than the upper bound critical value, it ascertains the joint significance of the regressors' coefficients for the long-run cointegration.

Once the cointegrating relationship between a dependent variable and independent regressors are confirmed, then equation 3 and 4 took the following form of the level relationship for the long-run.

$$\text{LnGDPPC}_t = \alpha + \delta_1 \text{LnFD}_t + \delta_2 \text{LnGDS}_t + \delta_3 \text{LnTRD}_t + \delta_4 \text{LnGOV}_t + \delta_5 \text{LnINF}_t + \text{ECT1}_t \dots \dots \dots (5)$$

$$\text{LnFD}_t = \alpha + \delta_1 \text{LnGDPPC}_t + \delta_2 \text{LnGDS}_t + \delta_3 \text{LnTRD}_t + \delta_4 \text{LnGOV}_t + \delta_5 \text{LnINF}_t + \text{ECT2}_t \dots \dots \dots (6)$$

In which, ECT is the error correction term.

5.2 Error Correction Model (ECM) Under the ARDL Model

If cointegration exists between two variables, there might exist at least one directional causality or bi-directional causality (Engle and Granger 1987). Therefore, this study further confirms the short-run causality between proxies of financial development and economic growth using the error correction model (ECM). The ECM is restricted to only two critical financial development variables, used separately and the proxy of economic growth. It provides partial information for adjustment and allows to estimate short-run elasticities. However, the estimation of short-run coefficients on error correction model (ECM) heavily depends on the optimum lags selected for the estimations.

Thus, The ARDL estimation equations of 3 and 4 took the following ECM equations for the short-run relationship.

$$\begin{aligned} \Delta \text{LnGDPPC}_t = & \alpha \\ & + \sum_{i=1}^p \lambda_{1i} \Delta \text{LnGDPPC}_{t-i} + \sum_{j=0}^q \lambda_{2j} \Delta \text{LnFD}_{t-j} + \sum_{k=0}^r \lambda_{3k} \Delta \text{LnGDS}_{t-k} + \sum_{l=0}^s \lambda_{4l} \Delta \text{LnTRD}_{t-l} \\ & + \sum_{m=0}^t \lambda_{5m} \Delta \text{LnGOV}_{t-m} + \sum_{n=0}^u \lambda_{6n} \Delta \text{LnINF}_{t-n} + \delta_1 \text{ECT1}_{t-1} + \varepsilon_t \dots \dots \dots (7) \end{aligned}$$

$$\Delta \ln FD_t = \alpha + \sum_{i=1}^p \beta_{1i} \Delta \ln FD_{t-i} + \sum_{j=0}^q \beta_{2j} \Delta \ln GDPPC_{t-j} + \sum_{k=0}^r \beta_{3k} \Delta \ln GDS_{t-k} + \sum_{l=0}^s \beta_{4l} \Delta \ln TRD_{t-l} + \sum_{m=0}^t \beta_{5m} \Delta \ln GOV_{t-m} + \sum_{n=0}^u \beta_{6n} \Delta \ln INF_{t-n} + \gamma_1 ECT2_{t-1} + \varepsilon_t \dots \dots \dots (8)$$

In which, Δ represents the first differenced value. The coefficients $\lambda_1 - \lambda_6$ and $\beta_1 - \beta_6$ provides the coefficients for short-term. p, q, r, s, t, u represents the number of lags selected automatically based on Akaike (1974) Information Criteria (AIC). $ECT1_{t-1}$ and $ECT2_{t-1}$ represent the one-period lagged value of error correction terms. Equation (7) gives the idea about the short-run causality of financial development and other control variables to economic growth and equation (8) gives the idea about the short-run causality of economic growth and other control variables to financial development. Finally, the coefficient of one period lagged value of ECT confirms the long-run causality and specify the speed of adjustment towards equilibrium.

6 Empirical Analysis and Discussions

6.1 Descriptive Statistics

Table 2 presents a summary of statistics. All indicators have 32 years of observations from 1985 to 2016 as data are in balanced form. The maximum real GDP per capita is 732.00 US dollar, and the minimum is 317.77. There exist significant changes on the proxies of financial development over the period.

Table 2 Summary of Statistics

	GDPPC	DCP	DCB	BM	NDC	GDS	TRD	GOV	INF
Mean	478.27	0.32	0.32	0.54	0.45	0.11	0.35	0.09	0.09
Median	458.91	0.28	0.27	0.51	0.39	0.11	0.37	0.09	0.08
Maximum	732.00	0.81	0.81	1.09	0.86	0.16	0.45	0.12	0.18
Minimum	317.77	0.10	0.09	0.28	0.27	0.04	0.21	0.08	0.03
Std. Dev.	124.20	0.20	0.20	0.22	0.18	0.02	0.07	0.01	0.04
Observations	32	32	32	32	32	32	32	32	32

Source: Author's calculation.

The maximum domestic credit to the private sector is 81%, and broad money is 109% of GDP. The level of savings also varies across time from 4% to 16% of GDP. Trade openness varies from 21% to 45% of GDP. The government final consumption expenditure has remained between 8% to 12% of GDP. The maximum inflation exists at 18%, and the lowest is 3 % over the period.

It indicates that Nepal has gone through many volatile movements but not with the severe inflationary or deflationary condition. So, the result obtained from the estimated model using these variables gives a clear picture of Nepal's finance-growth relationship.

6.2 Correlation Matrix

Table 3 presents the correlation matrix. Each proxy of financial development is positively correlated and significantly correlates with real GDP per capita. So, they are used one by one separately. Other control variables, i.e. size of government and trade openness, are also positively correlated with real GDP per capita, but gross domestic savings and inflation negatively correlate with real GDP per capita. The correlation between the proxy of trade openness with proxies of financial development and economic growth may show a multicollinearity issue. So, the Lagrange Multiplier (LM) test is performed after the estimations to detect the multicollinearity issues.

Table 3 Correlation Matrix

Correlation	LnGDPPC	LnDCP	LnDCB	LnBM	LnNDC	LnGDS	LnTRD	LnGOV	LnINF
LnGDPPC	1.00								
LnDCP	0.97	1.00							
LnDCB	0.97	1.00	1.00						
LnBM	0.99	0.98	0.98	1.00					
LnNDC	0.97	0.98	0.98	0.98	1.00				
LnGDS	-0.31	-0.24	-0.24	-0.33	-0.29	1.00			
LnTRD	0.69	0.75	0.75	0.69	0.62	0.01	1.00		
LnGOV	0.63	0.64	0.64	0.65	0.73	-0.30	0.15	1.00	
LnINF	-0.34	-0.34	-0.34	-0.34	-0.24	0.12	-0.47	-0.02	1.00

Note: Variables are transformed into a natural logarithm intended as 'Ln'.

Source: Author's calculation.

6.3 Test of Stationarity

This study uses multivariate time series data under the ARDL estimations. ARDL model does not require selected variables to be the same order of integration. They could be either stationary or non-stationary at their level values. However, all the variables must have the same order of integration at the maximum of their first differenced values (Pesaran, Shin, and Smith 2001). This study confirms the stationarity and non-stationarity features of the series with the help of the mostly and widely used unit root test methods. They are Augmented Dickey-Fuller (ADF) test, Phillips and Perron (PP) test, and Kwiatkowski, Phillips and Schmidt-Shin (KPSS) test. Table 4 presents the summary of unit root test results with two different model specifications. The first

model specification considers intercept only, and the second specification considers both trend and intercepts. Results show that the selected variables have mixed properties (stationary and non-stationary) in their level values. However, they all are stationary at their first differenced values in intercept specification. These results indicate that variables have the same order of integration at their first differenced value, i.e. I(1). So, the results provide sufficient backup to use ARDL bound test method for above-designed equations.

Table 4 Summary of Unit Root Test

Sample period:1985 to 2016		Lag selection Criteria: Akaike Information Criterion (AIC), Automatic			
Variables	Test Methods	Intercept Only		Trend and Intercept	
		Level Value	1 st Difference Value	Level Value	1 st Difference Value
LnGDPPC	ADF-Fisher χ^2	1.224	-5.204***	-3.477***	-5.527***
	PP-Fisher χ^2	1.340	-5.184***	-1.263	-5.521***
	KPSS LM-Stat	0.745	0.311**	0.161	0.062***
LnDCP	ADF-Fisher χ^2	-0.182	-3.583***	-3.444	-3.476
	PP-Fisher χ^2	-0.244	-4.232***	-2.179	-4.153***
	KPSS LM-Stat	0.732	0.054***	0.056***	0.050***
LnDCB	ADF-Fisher χ^2	-0.269	-3.503***	-3.351	-3.395
	PP-Fisher χ^2	-0.322	-4.308***	-2.199	-4.219***
	KPSS LM-Stat	0.732	0.052***	0.057***	0.050***
LnBM	ADF-Fisher χ^2	0.806	-5.353***	-2.695	-5.433***
	PP-Fisher χ^2	3.566**	-5.948***	-1.922	-7.422***
	KPSS LM-Stat	0.751	0.384***	0.135***	0.325
LnNDC	ADF-Fisher χ^2	0.654	-4.739***	-2.280	-3.931***
	PP-Fisher χ^2	0.746	-4.700***	-2.322	-4.851***
	KPSS LM-Stat	0.718	0.204***	0.151	0.049***
LnGDS	ADF-Fisher χ^2	-1.615	-3.797***	-1.774	-3.766***
	PP-Fisher χ^2	-1.615	-3.905***	-1.774	-3.962***
	KPSS LM-Stat	0.253***	0.201***	0.104***	0.113***
LnTRD	ADF-Fisher χ^2	-1.851	-7.440***	-2.407	-7.509***
	PP-Fisher χ^2	-1.676	-7.551***	-2.251	-7.922***
	KPSS LM-Stat	0.498	0.116***	0.154	0.093***
LnGOV	ADF-Fisher χ^2	-0.443	-8.374***	-2.746	-8.663***
	PP-Fisher χ^2	-1.237	-8.641***	-2.676	-16.901***
	KPSS LM-Stat	0.444***	0.402***	0.186	0.500
LnINF	ADF-Fisher χ^2	-3.188***	-7.729***	-3.436	-3.222
	PP-Fisher χ^2	-3.134***	-16.846***	-3.406	-16.932***
	KPSS LM-Stat	0.307**	0.323***	0.139***	0.313

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively.

Source: Author's calculation.

6.4 Cointegration Results

Table 5 reports the summary of results of the ARDL bound test approach for the cointegration. The results indicate that the calculated F-statistic is higher than the upper bound

value when the proxy of economic growth, i.e. real GDP per capita is the dependent variable in four models of principle estimation equations. It indicates that financial development and other regressors have a long-run relationship with economic growth of Nepal. On the other hand, calculated F-statistic is higher than the upper bound value, when four proxies of financial development are used as the dependent variable separately in the three out of four models of the reverse estimation equations. It indicates that economic growth and other regressors have a long-run relationship with three proxies of Nepal's financial development. Therefore, the bound test approach of cointegration under the ARDL model confirms that Nepal's financial development and economic growth have two-way cointegration vector in the long-run. The level relationship further confirms their significance and direction of causality between them in the long-run.

6.5 Estimation Results

After confirming the cointegrating relationship between proxies of financial development and economic growth, the long-run level relationship is estimated. The real GDP per capita is the dependent variable in principle estimation models, and four proxies of financial development are the dependent variables in the reverse estimation models. The long-run results of principle estimation models are reported in table 6, and the results of reverse estimation model are reported in table 7, respectively.

Table 5 Bound Testing for the Existence of a Level Relationship

Models	Detail	ARDL	F-Statistics	Bound Value						Outcomes	
				10%		5%		1%			
				Lower	Upper	Lower	Upper	Lower	Upper		
Principle Estimation Model: Economic growth is the function of financial development.											
Model 1 LnDCP→LnGDPPC	Dependent Variable Regressor:	Real GDP Per Capita (LnGDPPC) LnDCP LnGDS LnTRD LnGOV LnINF	(1,0,1,2,0,0)	18.417***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 2 LnDCB→LnGDPPC	Dependent Variable Regressor:	Real GDP Per Capita (LnGDPPC) LnDCB LnGDS LnTRD LnGOV LnINF	(1,0,1,2,0,0)	18.635***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 3 LnBM→LnGDPPC	Dependent Variable Regressor:	Real GDP Per Capita (LnGDPPC) LnBM LnGDS LnTRD LnGOV LnINF	(2,0,0,2,1,2)	4.729***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 4 LnNDC→LnGDPPC	Dependent Variable Regressor:	Real GDP Per Capita (LnGDPPC) LnNDC LnGDS LnTRD LnGOV LnINF	(1,0,1,2,0,0)	13.358***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Reverse Estimation Model: Financial development is the function of economic growth.											
Model 1 LnGDPPC→LnDCP	Dependent Variable Regressor:	Domestic Credit to Private Sector (LnDCP) LnGDPPC LnGDS LnTRD LnGOV LnINF	(1,1,1,2,0,0)	5.563***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 2 LnGDPPC→LnDCB	Dependent Variable Regressor:	Domestic Credit from Banks (LnDCB) LnGDPPC LnGDS LnTRD LnGOV LnINF	(1,1,1,2,0,2)	4.015**	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 3 LnGDPPC→LnBM	Dependent Variable Regressor:	Broad Money:M2 (LnBM) LnGDPPC LnGDS LnTRD LnGOV LnINF	(1,0,0,0,0,0)	5.609***	2.08	3.00	2.39	3.38	3.06	4.15	Cointegrated
Model 4 LnGDPPC→LnNDC	Dependent Variable Regressor:	Net Domestic Credit (LnNDC) LnGDPPC LnGDS LnTRD LnGOV LnINF	(1,1,1,1,0,2)	2.772	2.08	3.00	2.39	3.38	3.06	4.15	Inconclusive

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively.

Source: Author's calculation.

6.5.1 Principle Estimation Model: Economic growth is the function of financial development.

Table 6 reports the long-run estimation results of equation (5), where the first differenced value of real GDP per capita ($\Delta\text{LnGDPPC}$) is the dependent variable as a measure of economic growth. The results indicate that all the proxies of financial development are positive and significant to cause real GDP per capita except broad money. It indicates that higher the level of financial development, higher would be the economic growth in the long-run. For example, one unit increase in domestic credit to private sector ratio to GDP causes 0.993-unit increase in real GDP per capita in the long run. Therefore, economic growth is financial development elastic in Nepal.

Table 6 Long Run Coefficients for Economic Growth

Dependent Variable:	$\Delta\text{LnGDPPC}$	$\Delta\text{LnGDPPC}$	$\Delta\text{LnGDPPC}$	$\Delta\text{LnGDPPC}$
Lag selection method:	Akaike info criterion (AIC)		Sample:	1985 to 2016
Maximum lags:	2 (Automatic selection)			
Models:	Model 1	Model 2	Model 3	Model 4
Sample (adjusted):	1987 to 2016	1987 to 2016	1987 to 2016	1987 to 2016
Selected Model:	(1, 0, 1, 2, 0, 0)	(1, 0, 1, 2, 0, 0)	(2, 0, 0, 2, 1, 2)	(1, 0, 1, 2, 0, 0)
Variable	Coefficient	Coefficient	Coefficient	Coefficient
LnDCP	0.993*** (0.247)			
LnDCB		0.984*** (0.243)		
LnBM			1.275 (1.123)	
LnNDC				1.251*** (0.431)
LnGDS	0.417 (0.255)	0.413 (0.252)	0.568 (0.931)	0.420 (0.357)
LnTRD	-1.398** 0.570	-1.400** (0.566)	-0.633 (1.192)	-0.639 (0.534)
LnGOV	-1.346** (0.620)	-1.357** (0.618)	0.967 (1.974)	-1.047 (0.744)
LnINF	-0.091 (0.065)	-0.090 (0.064)	0.061 (0.249)	-0.091 (0.087)
Constant	3.590** (1.383)	3.557** (1.381)	10.744 (7.319)	4.975*** (1.491)
LM Test F- Stat. (Prob.)	2.487(0.111)	2.576(0.104)	1.484(0.258)	2.539(0.107)
Ramsey Test F-Stat. (Prob.)	0.061(0.808)	0.088(0.770)	0.697(0.416)	0.116(0.737)
Included observations (after adjustments)	30	30	30	30

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively. Standard errors are in parentheses.

Source: Author's calculation.

Results also indicate that gross domestic saving is insignificant to cause real GDP per capita. Trade openness is mostly negative and significant to cause real GDP per capita in model 1 and 2. One possible reason behind this could be the import-based economic feature of Nepal. However, trade openness is insignificant to cause real GDP per capita in model 3 and 4. Size of the government is negative and significant to cause real GDP per capita in the long run in model 1 and 2. Inflation has a mostly negative but insignificant impact on real GDP per capita of Nepal.

Table 7 Error Correction Coefficients for Economic Growth

Dependent Variable:	$\Delta \text{LnGDPPC}$	$\Delta \text{LnGDPPC}$	$\Delta \text{LnGDPPC}$	$\Delta \text{LnGDPPC}$
Models:	Model 1	Model 2	Model 3	Model 4
Sample:	1985 to 2016	1985 to 2016	1985 to 2016	1985 to 2016
Selected Model:	(1, 0, 1, 2, 0, 0)	(1, 0, 1, 2, 0, 0)	(2, 0, 0, 2, 1, 2)	(1, 0, 1, 2, 0, 0)
Variable	Coefficient	Coefficient	Coefficient	Coefficient
$\Delta \text{LnGDPPC}(-1)$			-0.389** (0.178)	
ΔLnGDS	0.014 (0.010)	0.014 (0.010)		0.012 (0.012)
ΔLnTRD	-0.010 (0.019)	-0.009 (0.019)	-0.013 (0.024)	0.024 (0.021)
$\Delta \text{LnTRD}(-1)$	0.130*** (0.022)	0.129*** (0.022)	0.084*** (0.023)	0.100*** (0.026)
ΔLnGOV			-0.038 (0.036)	
ΔLnINF			0.001 (0.006)	
$\Delta \text{LnINF}(-1)$			-0.011* (0.006)	
ECT(-1)*	-0.112*** (0.009)	-0.112*** (0.009)	-0.052*** (0.008)	-0.097*** (0.009)
R-squared	0.631	0.635	0.575	0.516
Adjusted R-squared	0.589	0.593	0.464	0.460
SE of regression	0.011	0.011	0.013	0.013
Sum squared resid.	0.003	0.003	0.004	0.004
Log-likelihood	93.864	94.017	91.718	89.791
Durbin-Watson stat.	2.502	2.512	2.261	2.309
Akaike info criterion	-5.991	-6.001	-5.648	-5.719
Included observations	30	30	30	30

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively. Standard errors are in parentheses.
Source: Author's calculation.

The short-run estimation results of equation (7) are reported in Table 7. The first differenced value of real GDP per capita ($\Delta \text{LnGDPPC}$) is the dependent variable, and four different proxies of financial development and other control variables are independent regressors. The estimation results indicate that none of the proxies of financial development causes real GDP per capita in

short-run. It means that financial development is not short-run elastic to the economic growth of Nepal. The results also indicate that one year lagged value of trade openness has a positive and significant impact on real GDP per capita. It means trade openness has short-run positive effects on economic growth in Nepal. However, the size of government and inflation does not significantly affect economic growth in the short-run except model 3.

6.5.2 Reverse Estimation Model: Financial development is the function of economic growth.

Table 8 reports the long-run estimation results of equation (6) where the first differenced value of three proxies of financial development (ΔLnDCP , ΔLnDCB , ΔLnBM) are the dependent variables.

Table 8 Long Run Coefficients for Financial Development

Dependent Variable:	ΔLnDCP	ΔLnDCB	ΔLnBM
Lag selection method:	Akaike info criterion (AIC)		Sample:
Maximum lags:	2 (Automatic selection)		
Models:	Model 1	Model 2	Model 3
Sample (adjusted):	1987 to 2016	1987 to 2016	1986 to 2016
Selected Model:	(1, 1, 1, 2, 0, 0)	(1, 1, 1, 2, 0, 2)	(1, 0, 0, 0, 0, 0)
Variable	Coefficient	Coefficient	Coefficient
LnGDPPC	0.868** (0.355)	0.807* (0.414)	1.281*** (0.224)
LnGDS	-0.461* (0.223)	-0.514* (0.261)	-0.095 (0.107)
LnTRD	1.543*** (0.319)	1.720*** (0.413)	0.226 (0.201)
LnGOV	1.916*** (0.538)	2.025*** (0.627)	0.784 (0.497)
LnINF	0.053 (0.068)	0.125 (0.098)	-0.073 (0.072)
Constant	-1.351 (3.223)	-0.46 (3.858)	-6.783** (2.464)
LM Test F- Stat. (Prob.)	0.360(0.703)	0.353(0.708)	0.329(0.723)
Ramsey Test F-Stat. (Prob.)	0.102(0.754)	0.041(0.843)	1.830(0.189)
Included observations (after adjustments)	30	30	31

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively. Standard errors are in parentheses.

Source: Author's calculation.

The results indicate that real GDP per capita is positive and significant to cause all proxies of financial development in Nepal. It indicates that higher the level of economic growth, higher would be financial development in the long-run. For example, one unit increase in real GDP per capita causes 0.868-unit increase in the domestic credit to the private sector ratio to GDP in the long run. Therefore, financial development is also economic growth elastic in Nepal. Results

indicate that gross domestic saving is negative and significant to cause financial development in model 1 and 2. It indicates that savings are not mobilized through the financial system for credit expansion in Nepal. Trade openness is significant to cause proxies of financial development in model 1 and 2 but insignificant in model 3. The government's size is significant and positive to cause financial development proxies in model 1 and 2. Inflation is insignificant to cause all proxies of financial development. It indicates that Nepal has not faced hyperinflation by which the financial activates are not adversely affected in Nepal.

Table 9 Error Correction Coefficients for Financial Development

Dependent Variable:	ΔLnDCP	ΔLnDCB	ΔLnBM
Models:	Model 1	Model 2	Model 3
Selected Model:	(1, 1, 1, 2, 0, 0)	(1, 1, 1, 2, 0, 2)	(1, 0, 0, 0, 0, 0)
Variable	Coefficient	Coefficient	Coefficient
$\Delta \text{LnGDPPC}$	3.339*** (0.451)	2.890*** (0.452)	
ΔLnGDS	-0.105* (0.056)	-0.104* (0.058)	
ΔLTRD	0.233** (0.104)	0.227** (0.106)	
$\Delta \text{LnTRD}(-1)$	-0.419** (0.165)	-0.353* (0.178)	
ΔLnINF		0.026 (0.029)	
$\Delta \text{LnINF}(-1)$		-0.061** (0.028)	
ECT(-1)*	-0.606*** (0.085)	-0.551*** (0.089)	-0.380*** (0.054)
R-squared	0.717	0.753	0.385
Adjusted R-squared	0.672	0.689	0.385
SE of regression	0.063	0.063	0.045
Sum squared resid.	0.099	0.090	0.060
Log-likelihood	43.166	44.533	52.856
Durbin-Watson stat.	2.245	1.951	2.128
Akaike info criterion	-2.544	-2.502	-3.346
Included observations:	30	30	30

Notes: ***, ** and * indicates significance at 1%, 5%, and 10%, respectively. Standard errors are in parentheses. All are transformed into a natural logarithm.

Source: Author's calculation.

The short-run estimation results of equation (8) are reported in Table 9 where the first differenced value of four different proxies of financial development (ΔLnDCP , ΔLnDCB , and ΔLnBM) are used as the dependent variable, separately, and real GDP per capita along with other control variables are independent regressors. The estimation results indicate that real GDP per capita is

significant and positive to cause all financial development proxies, except broad money in the short-run. It indicates that if the economy grows, there could be quick demand for credit in short-run in Nepal. However, gross domestic savings has adverse effects on financial development in the short-run as its first differenced value has adverse and significant effects on two proxies of financial development in model 1 and 2. The merchandise trade has a significant and positive effect on financial development in the short-run, but one period lagged value of merchandise trade has adverse effects on economic growth in model 1 and 2. The inflation also has a negative and significant impact on financial development in model 1. It means that financial development reacts negatively with inflation in the short-run. However, the size of government does not affect the financial development in the short-run.

7 Conclusion and Policy Recommendation

This study examines the dynamic relationship between Nepal's financial development and economic growth using time series data of 32 years from 1985 to 2016. The ARDL bound test approach is used to estimate the cointegration form and long-run elasticities. ECM is used to estimate short-run elasticities and speed of adjustment towards long-run equilibrium is confirmed by one period lagged value of error correction term (ECT). Economic growth was measured by GDP per capita (constant 2010 US dollar), four different bank-based financial indicators were used to measure financial development. Four additional variables were used to control the estimations. This study's estimation results are mostly robust concerning data, econometric approach, model specification, proxies of financial development, economic growth, and other variables. For the post estimations, the Lagrange Multiplier test and the Ramsey test to assess the multicollinearity and stability of the estimations have been done. The cumulative sum (CUSUM) and its squares are presented in appendix B and show the absence of model specification problems.

Based on the estimation results, this study confirms that Nepal's financial development and economic growth are cointegrated with bi-directional causality in the long-run. It means they are moving together in the long-run. These findings are consistent with the arguments of coexistence of financial development and economic growth-enhancing each other as concluded by Calderón and Liu (2003); Gregorio and Guidotti (1995); Jung (1986); and Kar et al. (2011). All measures of financial development are significant and positive to enhance economic growth in the long run.

Thus, the study concludes that the Nepalese financial sector is well-functioning, especially with the backbone of financial reform and liberalization enacted after the 1980s.

Additionally, the positive and significant coefficients of real GDP per capita to cause financial development proxies in the reverse direction also indicate that economic growth is equally important to enhance Nepal's financial development. It also justifies that economic growth triggers financial development in the preliminary phase of economic development, as Hassan et al. (2011) concluded. The long-run coefficient of the domestic credit to the private sector and domestic credit to the private sector by banks ratios to GDP to cause real GDP per capita are very close. It justifies that the Nepalese financial sector is dominated by the banking sector rather than the non-banking financial sector. So, there is a large space to develop non-banking financial sectors in Nepal. The one-directional reverse causality from real GDP per capita to proxies of financial development in the short-run indicates that there could be quick demand for financial intermediation if the economic growth rises in the economy.

Trade openness is mostly negative and significant to cause real GDP per capita of Nepal. The reason could be Nepal's import-based economic features, mostly triggered by the higher import of consumable goods with the backup of remittance inflows. Therefore, the trade integration policies must be guided by the export promotion and import substitutions economic policies in Nepal. However, trade openness is positive and significant to cause the proxies of financial development in Nepal. It indicates that trade liberalization might boost the financial sector in developing countries.

The gross domestic savings ratio to GDP, which is most volatile throughout the study period is insignificant to cause real GDP per capita in Nepal. It indicates that Nepal's economic growth does not depend on the level of domestic savings of Nepal. Things are clear that volatile savings are not intended to divert into investment. The government should formulate long-run policies which support to mobilize domestic savings into investment activities to achieve steady growth. A better investment environment is a prerequisite condition for saving mobilization on an economy. The negative and significant coefficients of gross domestic savings towards two proxies of financial development also indicate that Nepal's financial market does not benefit from gross domestic savings. Things are clear that the government should set policies to stabilized savings that can be converted into the capital formation through financial intermediaries.

Size of the government is mostly negatively and significant to cause economic growth in Nepal. It suggests that a reduction in general expenditure in the government budget tends to raise economic growth. This argument may suggest that the government should have a sensitive budget allocation on general administrative expenditure versus capital expenditures such as infrastructure, education, and health. However, the size of government is significant and positive to foster financial development in Nepal. It means fiscal expansion gives opportunities to expand credit activities in Nepal. However, over expansion of fiscal spending through general expenditure might introduce volatility in an economy.

Inflation is insignificant to cause economic growth and financial development in Nepal. It suggests that Nepal has not faced hyperinflation during the study period. However, high inflation might narrow down the financial and economic activities of an economy. So, the government should have control over inflation to have a stable financial system in the economy.

8 Future Research

For future research and for addressing possible weaknesses of this study, it is possible to increase the number of observations beyond 32 years. Further, the study may be broken down into different phases, such as before and after liberalization to get a different conclusion. This study has not used any dummy variables to represent Nepal's significant political, economic, and fiscal structural breaks. So, the use of an appropriate dummy may give more robust results. The study prefers bank-based financial indicators to measure financial development. It can be extended by using indicators from the capital market also. The other aspects of financial development, such as access, efficiency, and stability, are also equally important, thus can be used. The economic growth can be measured by other indicators also. Finally, this study uses a dynamic regression model. Further research can be done by using other econometric methods by developing various model specifications.

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Availability of Data and Materials

The data used in this research are publicly and electronically available in the database of the World Bank. The raw results and estimation outputs obtained by the licensed version of Eviews10, university edition are available upon request to the author.

Competing Interests

The author declares no competing interests regarding this research.

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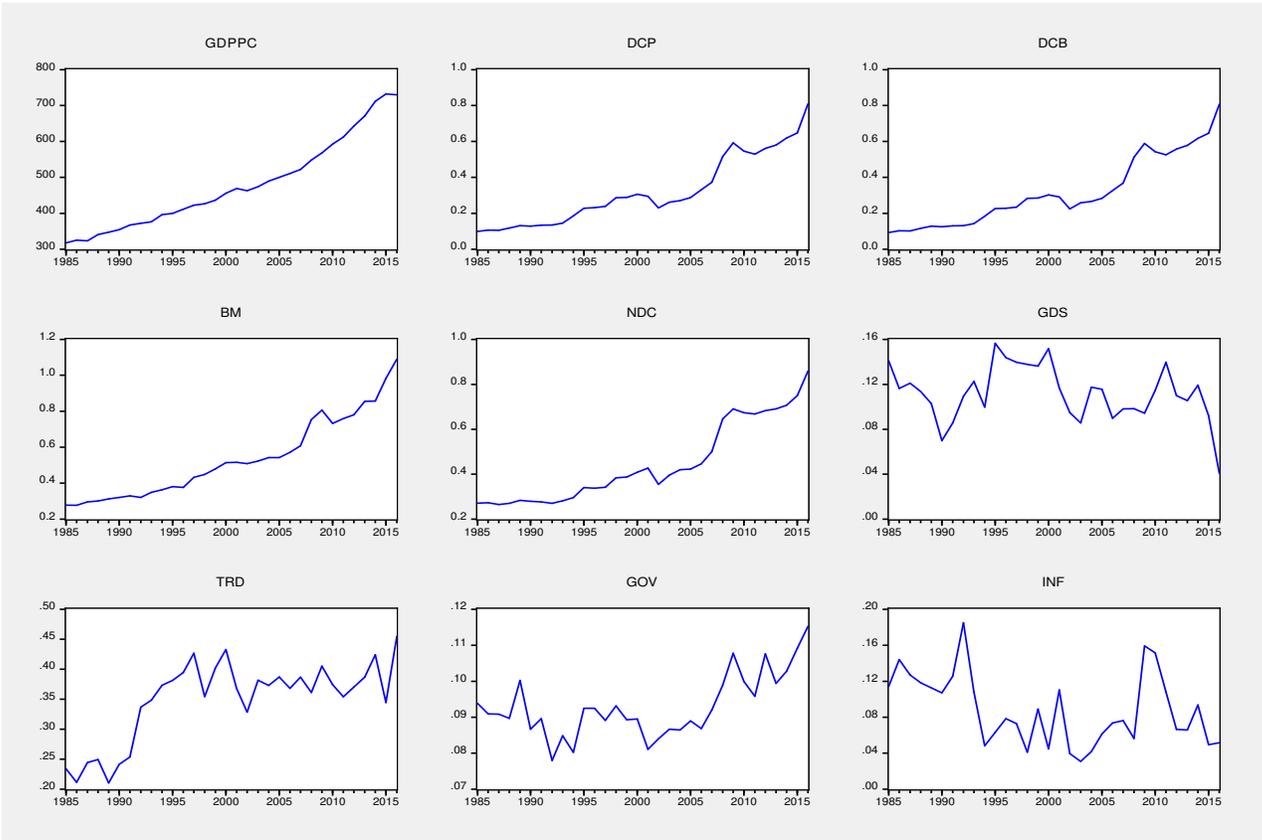
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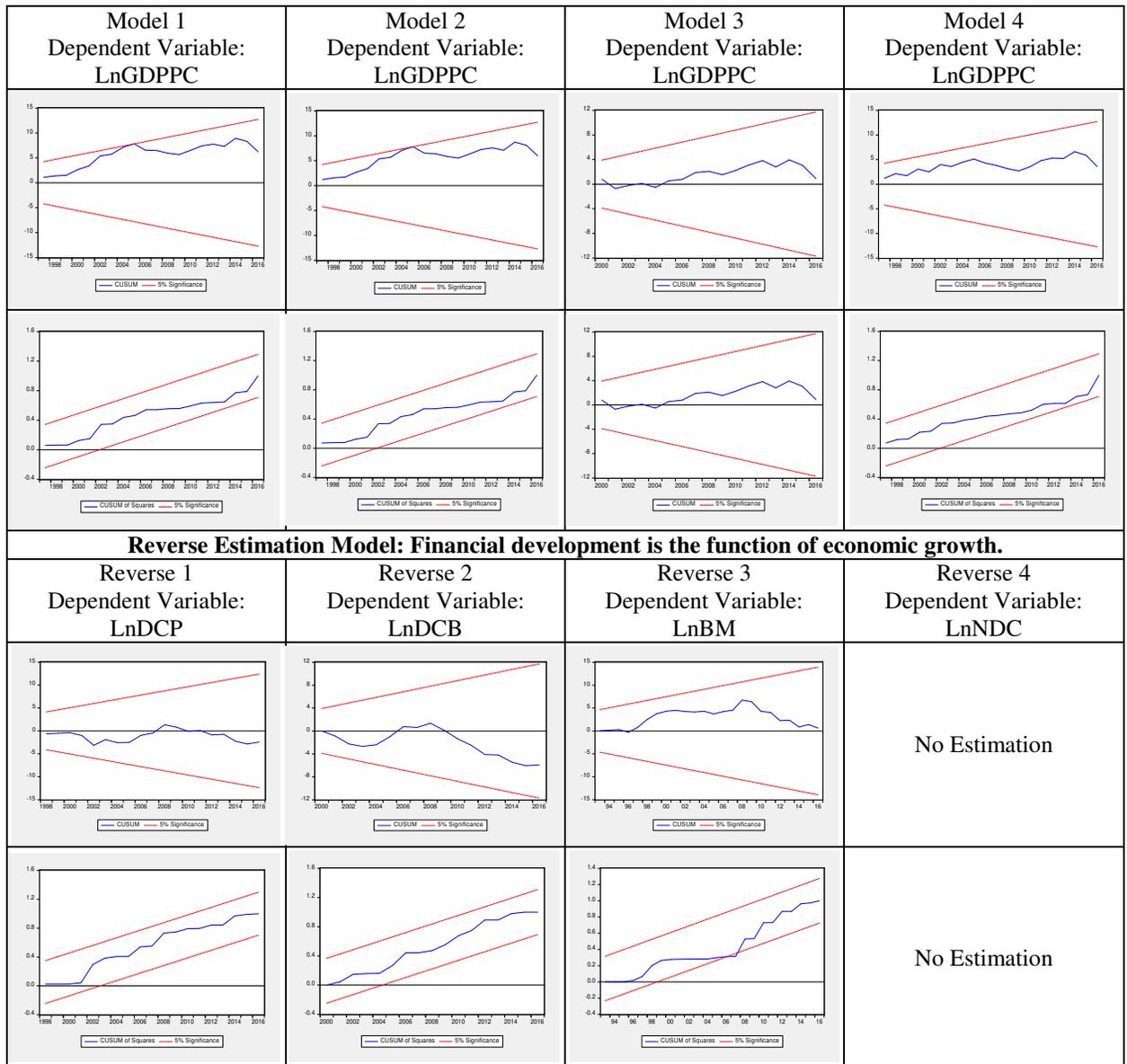
Appendix A Graphical Representations of Selected Variables in Their Level Values



Source: Author's adaptation from Eviews 10 using data of World Development Indicators (WDI).

Appendix B Plots of CUSUM and CUSUM Squares Tests

Principle Estimation Model: Economic growth is the function of financial development.



Source: Author's adaptation from Eviews 10.

Supplementary Files

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- [AppendixAB.docx](#)