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ARTICLE

Domestic Savings, Investment, and Economic Growth: an Empirical Evidence from Nepal using VEC Model

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ABSTRACT

This study examines the relationship between domestic savings, investment, and economic growth in Nepal by using time series data covering from the period 1975 to 2019. The vector error correction model (VECM) has been used to investigate the long-run and short-run causal relationship between the variables. The Johansen cointegration test results confirmed that there is a long-run relationship between savings, investment, and economic growth. Therefore, further analysis has to be set for the VEC model to analyze both long-run and short-run causality. The VECM equation result is -0.1363 which is the adjustment speed of disequilibrium towards the equilibrium in long run. The coefficient of savings and investments are positive with economic growth which also indicates that both variables have a positive impact on economic growth in the short run. The results of the Jarque-Bera test show the residual distribution is normally distributed. For the model stability test, the study performed recursive estimation applying CUSUM and CUSUM of square, and both tests move within the 5 percent level of upper and lesser bound significance indicating that the model is stable over the observation period. Overall, the study suggests that in Nepal, domestic savings and investment growth have a positive contribution to economic growth. The central bank, planning commission, and ministry of finance should focus on stimulating the capital formation and productive sector investment for sustainable economic growth in Nepal.

1. Introduction

Economic growth is defined as the increment in the inflation-adjusted market value of the goods and services produced by an economy in a particular time period. Economic growth represents the country's socioeconomic wellbeing and quality of life in terms of financial value. This is an indicator to show how the nation economically developed and stable [65]. Generally, economic development or growth is measured as the percentage increase in the real gross domestic products (GDP). Economic deeds are interconnected with almost all the activities that human

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being performed and the economic theory is the central theory of development, politics, policy practicing, productions, distributions, consumptions, and many more theories existing and was practiced in the past as well.

The current globalized market has focused on physical facilities to be benefited from the globalized and borderless market using a high level of advanced technologies and quality products as possible. All the countries across the world have been prioritizing how to improve people's living standards and mobilized resources equitably across the country. As the prime objective to achieve economic prosperity goals of the nation, the governments have to launch different programs and policies to improve living standards and economic growth. Especially to continue economic growth, financial regulatory institutions and stakeholders launches economic packages such as domestic saving stimulation, increase in consumptions, income level, and many more which contributes to the aggregate economic growth and income level of the county [25].

The neoclassical growth models of [59,36,54] have believed there is the central role of saving on economic growth. These models emphasized on capital accumulation as the major sources of investment to improve productivity and production growth. The economists [24,54] also believes the domestic capital accumulation is the central player and leads all the activities that have been taken place in the market. The monetarism school of thought also states that the money supply is the most important driver of economic growth which is directly connected to the capital formation and input factor of productions. There are many factors which impact economic growth such as inflation rate, cost of production, factors of productivity, government policy, economic size, growth in capital formation and saving, trade openness, natural resources, available infrastructure, and many. This paper will be focusing on only saving and investment factors which directly influence the capital formation and economic growth.

Long-term economic growth depends on capital formation and capital formation depends on the saving behavior of people in the economy. There are many studies have done to understand the economic growth and savings in different countries in different ways and they have concluded a high rate of saving leads to rapid economic growth [43,41,39]. To increase the production of goods and services, the country needs a huge amount of financial resources to invest from domestic and external sources. External sources help to fulfill immediate financial gaps but for industrial stability and sustainable growth domestic source is vital.

In general, increasing aggregate savings push to higher investment and lead to higher GDP growth in the short run. It means that a higher saving rate leads to a higher amount of capital formation and a higher amount of capital formation result in a large amount of capital investment. A large amount of investment injects into the economy that increases the production, employment, and income level of the people. The empirical study of [3] suggests that when the economy grows, the economy contributes to a growth in the household disposable income. The marginal propensity to saving theory also supports that increase in personal disposable income results in a high amount of saving [66].

Financial system development and stability helps to promote capital formation and economic growth sustainability [22]. The study also says the savings is positively associated with productivity growth in poor countries but it has a negative impact on rich countries [1]. Domestic savings matters for innovation, entrepreneurship, and technology transfers in least developed and developing countries. In contrary, domestic entrepreneurs are already familiar with advance technology and do not need to attract external investment on innovation and technology. Thus, domestic savings does not matter for growth. But for the least developed and developing countries, a low range of savings can be a constraint for domestic capital formation and investment which ultimately gives a low economic growth and income.

National saving comes from the domestic, firms, and government saving. Therefore, private firms' savings play a crucial role in capital formation. The question comes why do private firms retained cash? This question had already been answered [63] by comparing marginal benefits against marginal costs. As with personal saving, firms also considered the estimated future uncertainty and future opportunities. [28] Suggested that managerial ownership reduces the incentives for value-destroying actions and has a negative influence on cash reserves with different objectives which also supported by [30].

The major objective of this paper is to examine the relationship between domestic saving, investment, and economic growth in Nepal. For the rest of the paper, section 2 will be discussing the economic overview of Nepal followed by literature review, data & methodologies, empirical analysis result, and summary and conclusion in sections 3, 4, 5, and 6 respectively.

2. Economic Overview of Nepal

Nepal is geo-strategically located on the Southern lap of the Himalayas between India and China. These two countries are the world's largest economic market with 1.37 billion and 1.40 billion of pupations. If you look at Nepal only, there is 30 million of populations with about

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$31 billion of GDP. To understand Nepal's economy and its nature, it is very much important to add current major economic information and historical knowledge.

2.1 Economic Growth

Economic growth of the country indicates the economic prosperity and welfare of the people and nation. GDP per capita growth represents the distributions of average economic valued output of the nations among the people. Thus, it is calculated diving total monetary value of gross domestic product by total population at current price in the particular time point i.e. every year. GDP per capita growth best represents the economic growth proxy among the various macroeconomic indicators.

The given figure shows the historical trend of annual GDP per capita growth of Nepal. This trend line also shows three years moving average and five year moving average from the year 1961 to 2019. Overall moving trend is upward moving however continuous fluctuation during the time observed time period.

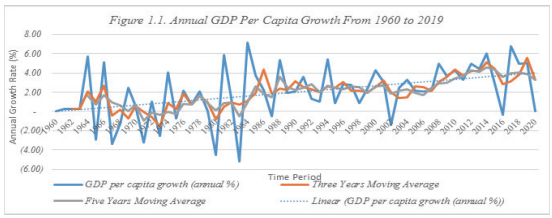

Figure 1. Annual GDP per capita growth of Nepal from 1960 to 2019

Source: Author's own calculation based on World Bank database using Microsoft excel 2013.

2.2 Sectorial Composition of GDP

Nepal's economic records found only after the 1960s. Prior to the year 1960s, there are very few informal data records found but the validation of the data is not sure. For the economic policy and program evaluation, research, policy purpose and concerned stakeholders use the data archive from the 1960s onwards. Therefore, here is also mentioned major composition of gross domestic product (GDP) in terms of percentage in this study. The major economic drivers of the Nepalese economy have given in Figure 2. In a broad category. The contribution of the major economic sectors to the gross domestic product (GDP) and its trend from history to now has given in the figure.

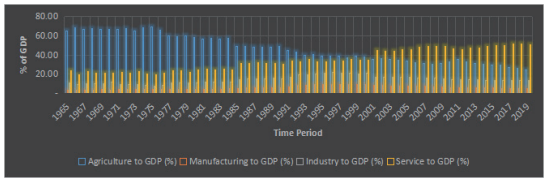

Figure 2. Major economic drivers of Nepal

Source: Author's own calculation based on World Bank database using Microsoft excel 2013.

Figure 2 shows that shows the historical economic composition trend line of Nepal. Figure 2 shows that the major contributor to the gross domestic product was the agriculture sector which was 64.58 percent in the year 1965. After 10 years later in the 1965, agriculture, forestry and fishing's contribution to the economy rose to 69.1 percent which was the all-time highest contribution of the economy during the observation period. With the introduction of new economic areas and globalization in the service and manufacturing sector, the agricultural sector's contribution to the economy has been falling down gradually and stuck at only 24.26 percent only in 2019 which is the lowest value addition in the GDP from this sector. The service sector contribution to the GDP has been growing the same as opposition to the agriculture, forestry, and fishing's contribution. Only 23.17 percent of contribution in the year 1965 reached 50.61 percent in the year 2019. The average growth rate in service sector contribution is 4.13 percent over the period of 55 years from 1965 to 2019. From the Figure 2, Nepalese economy has shifted to service oriented economy from the agronomy.

The manufacturing and industrial sector are still at the very initial stage of the advanced economy. These two sector's contribution to the economy has not changed much as it would be with modern technological advancement and globalization. In sum, the major contribution of the GDP of the nation is the service sector which accounted for more than 50 percent followed by agriculture, industry, manufacturing, and other sectors. This also concludes that the Nepalese economy is service-oriented which used to be an agriculture-based economy.

2.3 Structure of Output

The structure of output indicates the entire economic structure of the country. There are many macroeconomic indicators to show the economic system, size, characteristics, and movement on a particular trend. Nepalese economy can be categorized in three sector economy in term of output in broad i.e. Agriculture, industry and service industry.

Figure 3 shows the overall output structure of the Nepalese economy from the year 2000 to 2019. The data illustrated in the figure have taken from the year 2000 to 2019 because of the data consistency and representation of the current dynamics economy.

Figure 3 shows how the output structure of Nepal has

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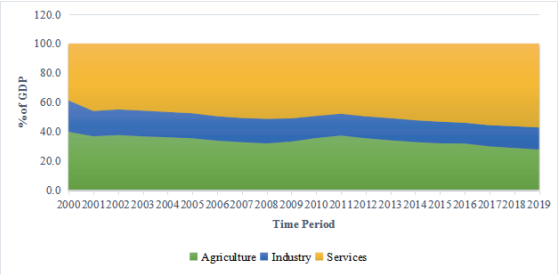

Figure 3. Structure of output of Nepal

Source: Author's own calculation based on Asian Develo-pment Bank database using Microsoft excel 2013.

been changing over the period of years 2000 to 2020. The contribution to the total output from agriculture sector which is 39.6 percent followed by service with 38.9 percent and industry with 21.5 percent in the year 2000. Indeed, the agriculture and industry sector's contribution to the output structure is declining to 27.9 and 15.1 percent in the year 2019 respectively. However, service sector contribution has been expanded and reached 57.4 percent in the year 2019.

2.4 Balance of Payment

After the successful People's Movement of 1990 and dismantle of Party-less monarchical autocracy Nepal entered the global trending liberalization and start force to promote an open market. As a result of liberalization and globalization, Nepal started to gain global advantages. In another word, the global market became one of the pillars of the Nepalese economy. Especially, remittance inflow, foreign direct investment, and foreign aids have increased significantly [40]. The worker's remittance is the most important factor of the economy which accounted for 25.1 percent of the economy as of monetary survey 2017/18. However, the worker's remittance has declined in the fiscal year 2019/20 and contributes only 19 percent of the economy because of the worldwide spreading of deathly virus COVID-19 in the year 2020. The overall, balance of payment status of Nepal from the year 2000 to 2019 has been given in Figure 4.

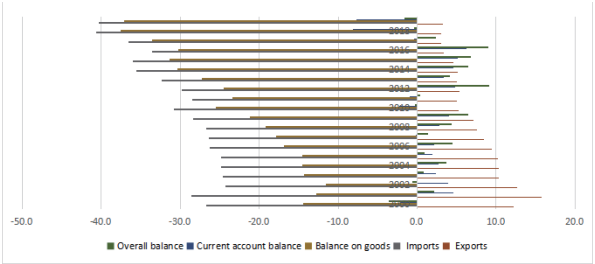

Figure 4. The balance of payment's status in Nepal from the year 2000 to 2019

Source: Author's own calculation based on Asian Develo-pment Bank database using Microsoft excel 2013.

Figure 4 shows the overall external trade of Nepal from the year 2000 to 2019 including an overall balance of payments, current account balance, balance on goods, imports, and exports. The overall balance of payments indicates the overall economic transaction of the economy with the rest of the world. Nepal's balance of payment rises by 2.8 percent on average during observation i.e. 2000 to 2019. The highest growth of BOP was in the year 2012 accounted for 9.2 percent and the lowest growth was in 2000 which was the adverse rate of 3.5 percent.

The highest growth in exports was in the year 2001 with 15.8 percent and the lowest growth was in the year 2017 and 2018 which was just 3.1 percent. Growth in exports indicates the expansion of domestic products in foreign markets. The overall growth in imports trade is negative by an average of 30.2 percent. The data and figure indicate that imports of goods and services to the economy have been declining over the observation period. This is a good signal of strengthening of Nepalese market to meet the domestic demand by itself. The figure balance on goods shows the net foreign trade status of the economy which is influenced directly by the imports and exports. Thus, there is no required to illustrate more about it. Similarly, the national current accounts report the aggregate foreign trade. The current account has grown by 1.3 percent over the period from 2000 to 2019.

2.5 Bank and Financial Institutions

Bank and financial institutions have a very crucial role in saving mobilization and domestic capital formation [49]. Nepalese financial sector has been gradually developing with the application of BASEL-III and the adoption of advanced financial technologies to provide security and quick financial services to the customers. Although Nepal has no long history of the modern financial services industry, it has done a quick progress in comparison to other similar aged industries. Modern banking technologies such as banking software, Automated Teller Machine (ATM), E-banking, debit, and credit cards, connect IPS, and QR code are available in Nepal as well.

Nepal Bank Limited is the first financial institution in the country which was established in 1037 A.D. Even there was no central bank prior to the year 1956. To regulate and maintain stability in the financial and money market, the government of Nepal founded the country's central bank in 1956 as per the Nepal Rastra Bank Act 1955. From the incorporation of the central bank, it started to work as a regulatory institution of the financial sector and overall financial and economic advisory body for the government of Nepal. Another commercial bank named Rashtriya Banijya Bank was established in 1965

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after 9 years of NRB foundation. However, the private banking institution had come into operation in 1984 after structural changes in financial sector policies, regulations, and institutions development in 1980. In the early 2000s, the Nepalese banking and financial sector had changed drastically with the economic globalization and liberalization policy of Nepal. The current banking and financial institutions incorporate under the central bank regulations and Bank and Financial Institution Act-2017 have been presented in Figure 5.

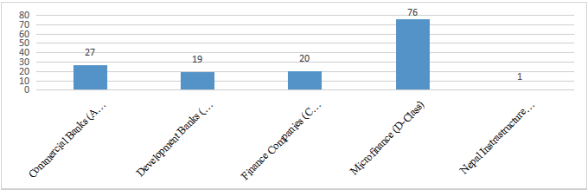

Figure 5. Number of Bank and Financial Institutions of Nepal as per Classification
Source: Nepal Rastra Bank as per the January 2021.

Figure 5 shows the number of banking institutions operating in Nepal as per the classification of Nepal Rastra Bank regulations as of January 2021. The government of Nepal has focused on financial sector stability and to make them strong. NRB has been pressurizing banks to maintain a high level of paid-up capital either way. Therefore, banks have been going through both force and voluntary mergers with each other in the same and different category banks. The number of commercial banks is only 27 which was 32 in 2014. The major changes happened in the development banks due to merger and acquisition policy. Other C and D class financial institutions also decreased due to this policy and there is still under the process of merger and acquisition between and among the all classes banking and financial institutions. In the economy, there is another special category bank named Nepal Infrastructure Development Bank has been operating with the objective of financing the big national pride projects and infrastructure development across the country.

3. Literature Review

This section gives a brief review of existing researches related to domestic saving, investments, and economic growth across the academic world. The study of [60] examined causality between financial development and economic growth for 10 Sothern African Development Community countries for the period 1994 to 2013. The study employed the vector autoregression (VAR) approached to conduct Granger causality tests to determine the direction of causality relationship between financial development and economic growth. The study used broad money and direct credit as measures of financial development and the study also concludes there is a causal link between financial development and economic growth. [44] used time series methods to investigate the long and short-run dynamics and interrelationship between savings and current account balance in the USA for the period 1947Q1 to 2017Q3.The study controls the impact of the non-linear dynamics of GDP growth over the business cycle. Similar study has been done by [11,61] in different countries.

Study of [8] founds the financial system development has a negative impact on local economic growth in China over 1990-1999 because the banking sector was mainly supporting the loss making state owned enterprises in the 1990s by using provincial level data over 1986-2002. [33] suggested a positive correlation between financial system development and economic growth by using 80 countries over 1960-1989. The study of [55] has supported the financial access help to promote saving channelize and growth using panel dataset covering 74 countries. [67] Study investigates the impact of financial development on economic growth at city level in China by using 286 Chinese cities over the period 2007-2014. The result of cross sectional regression suggested the negative impact on growth. Similarly, GMM estimators for dynamic panel data also suggested there is no significant effect on economic growth. The study also investigates the relationship between domestic saving and economic growth and convergence hypothesis in Thailand. The study analyzed causality of saving on economic growth by using time series annual data from 1960 to 2010. The results of Granger causality suggest the economic growth rate does not matter on domestic saving. The results of OLS also suggest that there is no significant impact of domestic saving on economic growth in Thailand. [38] examined the relationship between the growth of domestic savings and economic growth in China by using cointegration and causality on the data of four provinces from the period of 1955-2004. The study concludes a long-run relationship with between household savings and enterprise savings. Likewise the study also shows the bilateral causality exists between the domestic savings growth and economic growth.

To conduct a descriptive analysis of long and short-run correlations among saving, investment and economic growth for the 123 countries from the period of 1961-1994. [3] estimate a flexible dynamic model. The study found there is a positive impact of lagged saving on economic growth. The study also concluded the inverse granger causality between investment and economic growth. The pattern of domestic saving in Asian

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economies is analyzed by [25]. Their study has pointed out that the three major determinants of household saving including age structure of population, level of income and financial system development in the country.

The study of [16] had found the close relationship between domestic saving and investment by using time series data. In between the period of 1960s and 1970s observation shows substantial effect of domestic saving on the investment and capital formation within a country [17]. The study also found that there is no spurious impact of an omitted economic growth on saving and investment. However, the budget deficit has an inverse impact on private investment and saving. The study had employed data of 23 OECD countries for the year 1981 through 1986. The data are also categorized into two sub-period: 1961-1973 and 1974-1986 for the comparison of periodic results.

The optimal accumulation of capital and the welfare effects of government debt in neoclassical growth models have invested by [4]. They have expanded the Solow growth model and [14] overlapping generations model by adding firms with market power in the original model. The expended Solow model calibration suggests that the US economy is dynamically efficient and the real interest rate earned by savers is below the net marginal product of capital. Likewise expanded Diamond model with market power also indicates the government Ponzi schemes can have a distinct impact on welfare than they do under completion. The study linked between market power and real interest rate that provide a new lens to view fiscal policy and optimal national saving and investment which connects to the economic growth suffers by crowding out capital due to the low-interest rate. The crowding out issues in the economy because of low real interest rate has also observed by [6,18] through a large randomized control trial on US households. [57] explained that household saving constitutes a large proportion of gross domestic saving by applying autoregressive distributed lag (ARDL) model. The study applied Bayesian Vector Autoregressive (BVAR) with a quarterly data to examine the determinants of household saving in South Africa. As per the [54] inverse elasticity rule, tax on goods should be inversely related to the demand elasticity. The study of [29] investigate the determinants of household saving by employing ordinary least square (OLS) methods on primary survey data of 490 households in between 1958-1959. The survey was focused on income age, education, and interest rate. The study result concludes that income and age had a significant impact on household saving while education had no significant contribution. [2] used household budget survey data from 2003 to 2008 to estimates the structural components of household savings. The cross-sectional data analysis results found that increased female labor force participation, higher would be the employment rate, income level, and savings. However, the study results on inverse relationship of age, inflation rate, and interest rate on household saving. The study of [53] used descriptive statistics to analyses household saving patterns in Australia between 2003 and 2009. The study found that income had a positive impact while wealth had a negative effect on domestic savings.

Likewise, [31] analyzed the factor affecting personal saving in USA for the period of 1950 to 2007 by using OLS estimation and Arellano-Bond difference GMM estimation technique. The study found that the coefficient of lagged private saving, tax, and real estate loans were negative with personal saving. [31] also found there was negative growth on economics. This implies that the personal saving would be higher during the economic dynamics and low personal saving when economy is in good conditions. The study had been used lag saving, tax, young dependency, credit outstanding, employment, real estate loan, GDP, interest rate, social security, current account as the explanatory variables and saving as the explained variable in the basic model. The similar results of findings by [50,13] in Nepalese cases as well. The study of [13] use primary survey data from province five of Nepal and analysis data using OLS methods to investigate the financial literacy and personal financial planning. The study concluded that well financial awareness and financial services access helps to make proper allocation of income including savings, investment and consumption.

The inter linkages between domestic saving and real economic activities growth have examined in India by [37] with employing Autoregressive Distributed Lags (ARDL) model. The study result confirmed to have important policy implication role to boost domestic savings in India and consequently sustaining high economic growth. [57] also used life cycle hypothesis of saving (LCH) to set analytical framework for the household saving and economic growths which was first time introduced by [45]. The study assessed the stationarity by using Augmented Dickey-Fuller (ADF) unit root rest. The lag order was chosen using Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). The study of [48] accesses the relationship between savings and total and non-oil economic growth of Iran and found a positive and significant impact on both total and non-oil economic growth. The study analyzed the long-run causality among the selected variables such as savings, total economic growth, and non-oil economic growth of Iran with the annual data for the period 1972-2010 and they have

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used Autoregressive Distributed Lag Model (ARDL) for empirical results. The ARDL results also show a long-run counter causal relationship between savings and economic growth.

[62] conducted a study to examine the relationship between domestic saving and economic growth in North Africa using a Vector Error Correction Model (VECM) with the data of 1946 to 1992. The study concluded that private savings has bi-directional causality on economic growth. The study of [46] took 13 countries having different levels of income during the period of 1960-2001 to investigate the causality relationship between savings and economic growth. The study had divided selected countries into four groups according to the income levels: low income, less than the average, more than the average, and high-income level countries. The study used a Granger Causality Test and found the causality relations and directional variations among different groups of countries. Similarly, another study by [23] investigated the relationship between protective savings and economic growth by using the Autoregressive Conditional Heteroskedstic (ARCH) model with annual data from the year 1955-1990. The study concluded that increasing saving boost domestic capital formation which provides investment funds and growth on industrial productions.

Similarly, [58] research the relationship between savings and economic growth in Indian cases, and the study results concluded the significant impact on GDP. He checks the long-run effects of savings on GDP through the Engel-Granger Co-Integrated test. Another Indian study of [58] analyzed the short-run relation between saving and economic growth variable using an ARDL model for the period 1950 to 2002. The results found that there is a bi-directional relationship between savings and economic growth. The results also indicate that higher the propensity to savings increase capital accumulations and higher domestic capital accumulations will lead to higher income level and economic growth as a whole. A similar study of [42] from Mexico also supports Indian study results by using Vector Autoregressive (VAR) method for the annual data for 1960 to 1996. The domestic savings contribution on capital formation is most contributing factors during the stud period. The time series analysis results also suggested bi-directional causality between the private savings and economic growth. Empirical analysis of [52] suggests that the economic impact of unstable oil supply has a significant impact on economic growth. The positive shocks on oil price increases domestic saving through the wealth increments and also income level.

From the above existing reviews, the study concluded there is both evidence of positive and adverse relationship between savings, investment, and economic growth across the world but no clear evidence to justify that how Nepal's case moves towards. Therefore, this study is important to conduct how Nepal's domestic savings, investment, and economic growth impact each other. Based on the existing study's conclusions, the study has developed the following directional framework.

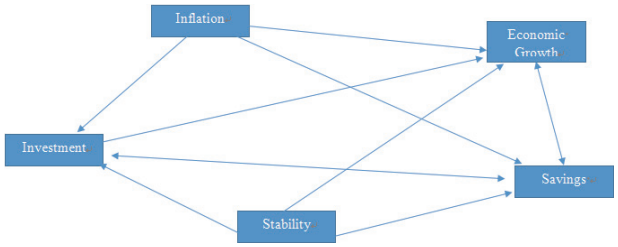

Figure 6. Directional framework

Source: Author's own development based on existing literature reviews.

4. Data and Methodology

This section presents the data sources and methodologies used in this paper. The research design, data nature, sources, study period, data analysis model, and tools to analyze the data are major factors associated with research work.

4.1 Data and Data Sources

This paper has employed time series data covering from the period 1975 to 2019. Annual time series data for the gross domestic savings, fixed capital formation, real gross domestic product per capita income, and inflation are extracted from the World Bank's World Development Indicators (WDI)-2020. Figure 7 shows the time series plot of the major variables.

An Empirical Framework

This study investigates the relationship between savings, investment, and economic growth in Nepal by applying time series econometric analysis method using the general form of the model specified below:

$$GDP_t = \alpha_0 + \alpha_1 DS_t + \alpha_2 FCF_t + \emptyset X_{it} + \varepsilon_t \quad (4.1)$$

$$DS_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 FCF_t + \emptyset X_{it} + \varepsilon_t \quad (4.2)$$

$$FCF_t = \alpha_0 + \alpha_1 DS_t + \alpha_2 GDP_t + \emptyset X_{it} + \varepsilon_t \quad (4.3)$$

Where, GDP denotes the gross domestic product per capital in current price and also a proxy of economic growth in this model. DS and FCF are the major endogenous variables as the percentage of domestic savings to GDP and fixed capital formation to GDP in current price. The calculation methods of the GDP, DS, and FCF are given in the equations 4.4, 4.5, and 4.6. X is the vector of exogenous variables which has an intuitively

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significant impact on economic growth, savings, and investment variables. Here in this model has employed inflation and economic stability as exogenous or control variables. Alpha a_0 is the intercept on each model and a_1 and a_2 represents the coefficient parameters of savings and investments respectively. ϕ is the notation of coefficient parameter of exogenous control shocks in the model and is denotes error terms in the model.

4.2 Definition and Measurement of Variables

Economic Growth (GDP)

Real gross domestic product per capita (GDP) is the measure of economic growth in this research study. The World Bank defines real GPD per capita as gross domestic product divided by the mid-year population, adjusted for inflation as measured by the GDP deflator. The data are in current US dollars. This indicator gives how the economy grows in connection to the population thus it is a conventional measure of economic growth. An increase in a country's GDP related to populations suggests an improvement in the economic living standard of people in the country. On the other hand, high per capita GDP is the high level of income and higher propensity to savings and investment in the country. In this thesis, growth of GDP per capita has used as the proxy of economic growth as many existing researches have been used [34,32,35]. Equation 4.4 has been used to calculate the proxy indicator of economic growth (GDP), particularly for this study.

$$GDP_t = \frac{GDP_t - GDP_{(t-1)}}{GDP_{(t-1)}} \quad (4.4)$$

Where, t denotes the particular time point of the series and (t-1) is the previous years' time point. This is the simple mathematical calculation of GDP per capita growth for the conventional proposed. As the basic time series data consists of non-stationary in nature. Thus, the application of this helps to remove stationary problems as well.

Domestic Saving (DS)

Gross domestic savings defined as gross domestic product less consumption by private sectors and government [65]. A high gross domestic saving rate usually indicates a country's high potential to invest and economic growth [19]. According to [36] arguments, a higher propensity to savings accelerate economic growth. In line with existing Horica and Hagiwara (2012) and many other economic researchers, this study has been employing the percentage of domestic savings to gross domestic savings as the proxy of saving. This study has assumed that there is a causal connection between economic growth and savings growth rate. The calculations of the domestic savings proxy (DS) for the study has employed the following equation.

$$DS_t = \frac{\left\{\left(\frac{GDS}{GDP}\right)_t - \left(\left[\!\left[\frac{GDS}{GDP}\right]\!\right]_{t-1}\right\}}{\left(\left[\!\left[\frac{GDS}{GDP}\right]\!\right]_{t-1}\right)} \quad (4.5)$$

Where, DS_t denotes growth in percentage of domestic savings to GDP in time t from the time period (t-1). The remaining are defined as in previous equations.

Fixed Capital Formation (FCF)

From the Keynesian perspective, capital formation is the key driver of economic activities and sustainable growth. Therefore, this research also used gross fixed capital formations as a proxy of investment. In financial and economic research many studies have been employed fixed capital formation as a proxy of investment in their study [39,10,26]. In line with the existing literature and intuitive analysis, this study has also employed the percentage of fixed capital formation to GDP growth as an investment proxy which is calculated by using the following equation.

$$FCF_t = \frac{\left\{\left(\frac{FCF}{GDP}\right)_t - \left(\left[\!\left[\frac{FCF}{GDP}\right]\!\right]_{t-1}\right\}}{\left(\left[\!\left[\frac{FCF}{GDP}\right]\!\right]_{t-1}\right)} \quad (4.6)$$

Where, FCF_t denotes the growth in percentage of fixed capital formation to GDP in a particular time t from the time period (t-1). The rest of the indicators are defined in previous equations.

Inflation Rate

Inflation is a continued increase in the general price level of goods and services in an economy over a period. Inflation has been measured by the consumer price index (CPI) and used as exogenous variables in the model. Previous studies of [7,47] have used CPI as a proxy of inflation and found that the theoretical and empirical evidence of market uncertainty and negative growth in economic activities due to high inflation rate. This statement also supported by [5] and also highlighted that inflation reduced propensity to savings and capital accumulation for the industrial investment. Therefore, this study has been expecting a negative relationship between inflation and economic growth in the economy.

Economic Stability

Economic stability is a very crucial condition for the sustainable economic growth and prosperity of the country. Economic activities and market are fluctuating

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due to many economic and non-economic agents and shocks. Economics shocks can be occurred because of political instability, natural calamities, border disputes and policy shifts in the economy. Economy can grow and sustain only when the economy is in normal condition and can perform freely interacting between demand and supply sides of economic agents. Therefore, this study has used a binary or dummy variable to incorporate economic stability in Nepal. In this study dummy variable has been defined as value (1) for economic turbulences or economic shocks due to negative impact on economic and other wise value (0) for normal economic operational year. The major political and socio-economics shocks happened during the observation period in Nepal. Similarly, summary descriptive statistics of the major variables are presented in the Figure 7 presents the time series plot of the major variable including GDP, DS, FCF, and CPI used in this study. All the values in the time series plot are in fractional form. The data series are covered from the year 1975 to 2019.

Figure 7. Time series plot of GDP, DS, FCF and CPI from the year 1975 to 2019 in Nepal.

Source: Author's own calculations using Gretl software based on WDI data from the World Bank.

Figure 7 shows there is a common and positive trend between GDP, DS and FCF. If you observed in GDP, DS, and FCF plots, we can see parallel fluctuation with different ranges. But FPIC fluctuation trend is quite opposite during the observation period.

Time Series Model Specification

In this sub-section, the time series empirical analysis method applied in this thesis is examined in more detail. The basic time series model for the impact of savings and investment on economic growth is given by equation 4.1, the impact of economic growth and investment on savings by equation 4.2, and the impact of savings and economic growth on investment by equation 4.3. However, the research model should be more specific according to the data nature and objective of the study. Therefore before move to the time series model specification, it is necessary to test some basic requirements.

Structural Stability Test

The time series analysis will begin with a stability test by using multiple regression and the CUSUM test at a 5 percent level of significance. The multiple regression analysis helps the researcher to control the different components that simultaneously impact the target variable. As suggested by [64], addition of more factors that affect the dependent variables in the model better explained the dependent variable. Therefore, multiple regression analysis is helpful for setting a good model to explain the variation in the target variable.

The CUSUM test and CUSUM of squares test at 5 percent level of significant results shows that both the estimate lies in between the upper bound and lower bound. From the CUMUM and CUSUMS test results, the model does not require to go through the structural breaks during the observation period. Thus, this the model will not use structural break in the time series analysis.

Testing for the Stationary

In traditional empirical analysis methods in econometrics are standing on the assumption that the time series variables are stationary. With the development of emerging econometric techniques, those stationary assumptions became invalid for economic growth studies using time series data and the research also found that most of the time-series data are non-stationary. According to [15,27] argument, non-stationary variables can cause spurious regression results and increase the confidence intervals for the estimated coefficient parameters. Therefore, this thesis study has been used Augmented Dickey-Fuller (ADF) test equations for the stationary check on each variable. The ADF test hypothesis will be rejected if the probability value (P-value) is greater than five i.e. P>5 %. The null hypothesis H0: the series has the presence of unit root. The rejection of H0 indicates the data series is stationary at level. If the data series do not reject H0 at level based on Akaike Information Criterion (AIC) maximum lag difference, the test assumption can be included at level with intercept and time trend and also can apply the first difference at the given significance level.

H0: a = 0, there is existence of unit root

H1: a < 0, There is no unit root

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Test for the Cointegration

Another test will be done to examine the cointegration between and among the variables. This econometric technique is used to find whether the variable has long-run time relations or not. The null hypothesis of H0: there is no cointegration (No long-run relationship between variables) is rejected indicates the variables have cointegration. If the p-value > 5, reject the H0. For the test of cointegration, there two popular methods: the Engle-Granger estimation and Johansen estimation test. In this study, the Johansen Cointegration test applied for the test. If the cointegration test fails to reject H0, the analysis process can apply a simple VAR model for short-run dynamics. But if it is rejected, the process should estimate both the long-run and short-run model which is called Vector Error Correction Model or VECM Model.

H0: a = 0, there no cointegration between variables

H1: a < 0, There is cointegration between variables

After the time series model design investigation, this study has set the following time series data analysis research model to meet the research objective set in this study.

Vector Error Correction (VEC) Model

As per the Johansen cointegration test results, if the null hypothesis (H0) is rejected, the suitable time series analysis model is the vector error correction model (VECM) which defined both long-run and short-run association between the series. Therefore, this study has been employing the multivariate regression model to test the long-run and short-run causal impact between endogenous variables. This study has set the following expanded model of equation 4.1 to 4.3 basic regression models.

$$\Delta GDP_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta GDP_{t-i} + \sum_{i=0}^{q} \beta_{2j} \Delta DS_{t-j} + \sum_{k=0}^{r} \beta_{3k} \Delta FCF_{t-k} + \delta_1 GDP_{t-1} + \emptyset X_{it} + \delta_2 DS_{t-1} + \delta_3 FCF_{t-1} + \varepsilon_t \quad (4.7)$$

$$\Delta DS_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta DS_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta GDP_{t-j} + \sum_{k=0}^{r} \beta_{3k} \Delta FCF_{t-k} + \emptyset X_{it} + \delta_1 DS_{t-1} + \delta_2 GDP_{t-1} + \delta_3 FCF_{t-1} + \varepsilon_t \quad (4.8)$$

$$\Delta FCF_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta FCF_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta DS_{t-j} + \sum_{k=0}^{r} \beta_{3k} \Delta GDP_{t-k} + \delta_1 FCF_{t-1} + \emptyset X_{it} + \delta_2 DS_{t-1} + \delta_3 GDP_{t-1} + \varepsilon_t \quad (4.9)$$

Where, α represent the intercept of the model and β and δ represents the coefficient parameter in short-run dynamics and long-run coefficient in the model. Likewise, Δ indicates the lag difference operator to adjust short-run dynamics in the models, and ϕ represents the coefficient parameter of exogenous variables (Xit) used in the model. The exogenous variables such as inflations and economic stability are manually converted as a stationary series applying the first difference technique before running the model.

The following Vector Error Correction Model (VECM) has been set for the analysis of long-run and short-run causality and speed of adjustment for the equilibrium. The values (p, q, r) are the selected number of lags for the cointegrating equations based on AIC. As suggested by Engle and Granger (1987), the short-run dynamic model can be rewritten as an error correction model (ECM) of the following equations:

$$\Delta GDP_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta GDP_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta DS_{t-j} + \sum_{k=0}^{r} \beta_{3k} \Delta FCF_{t-k} + \emptyset X_{it} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad (4.10)$$

$$\Delta DS_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta DS_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta GDP_{t-j} + \sum_{k=0}^{r} \beta_{3k} \Delta FCF_{t-k} + \emptyset X_{it} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad (4.11)$$

$$\Delta FCF_t = \alpha + \sum_{i=1}^{p} \beta_{1i} \Delta FCF_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta DS_{t-j} \sum_{k=0}^{r} \beta_{3k} \Delta GDP_{t-k} + \emptyset X_{it} + \gamma_1 ECT_{t-1} + \varepsilon_t \quad (4.12)$$

ECT is the error correction term produced from the OLS residuals through the following long-run cointegrating regression estimates. The rest of the parameters included in the estimate equations defines as in previous equations.

$$\Delta GDP_t = \alpha + \delta_1 \Delta GDP_{t-1} + \delta_2 \Delta DS_{t-1} + \delta_3 \Delta FCF_{t-1} + \varepsilon_t \quad (4.13)$$

$$\Delta DS_t = \alpha + \delta_1 \Delta DS_{t-1} + \delta_2 \Delta GDP_{t-1} + \delta_3 \Delta FCF_{t-1} + \varepsilon_t \quad (4.14)$$

$$\Delta FCF_t = \alpha + \delta_1 \Delta FCF_{t-1} + \delta_2 \Delta DS_{t-1} + \delta_3 \Delta GDP_{t-1} + \varepsilon_t \quad (4.15)$$

The error correction term (ECT) is defined as:

$$ECT_{t-1} = \Delta GDP_{t-1} - \alpha - \delta_2 \Delta DS_{t-1} - \delta_3 \Delta FCF_{t-1} \quad (4.16)$$

$$ECT_{t-1} = \Delta DS_{t-1} - \alpha - \delta_2 \Delta GDP_{t-1} - \delta_3 \Delta FCF_{t-1} \quad (4.17)$$

$$ECT_{t-1} = \Delta FCF_{t-1} - \alpha - \delta_2 \Delta DS_{t-1} - \delta_3 \Delta GDP_{t-1} \quad (4.18)$$

To find the causal relationship between saving, investment, and economic growth in Nepal's case, the study will try to prove the relationship from various tests based on VECM estimated results. The additional test for residual serial correlations LM test, residual normality test, Heteroskedasticity test, impulse response test, variance decomposition test, and finally CUSUM test for the model stability over the study period. The CUSUM test was also performed based on initial OLS for the structural break existence in the procedure. But base on VECM estimation will give overall model stability and also helps to justify regression results produced by the estimated research design and model.

5. Empirical Analysis Results and Discussion

This section presents the times series data analysis results and interpretations.

Test for the stationary

In time series regression analysis, a critical assumption is that the time series under concern is stationary in data.

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A time series is to be stationary if its mean and variance are constant over the time period and the value of the covariance between two-time points depends only on the distance between the two time periods [20,21]. As suggested by [21], the study has been tested stationary in the variables. The stationary has not test for dummy variable as it is already a binary variable.

The presence or absence of unit root is tested by using the Augmented Dickey-Fuller (ADF) Test Equations. The results of ADF unit root rest has done at level and first difference to confirm the presence of unit root in the data series which is reported in Table 1.

The Augmented Dickey-Fuller test results at level shows there is no presence of unit root for the series GDP, DS, and FCF as the null hypothesis has rejected at 5 percent level in both assumption with intercept and intercept with trend. The hull hypothesis is H0: there is presence of unit root in the series. The null hypothesis has failed to reject CPI in the given assumptions. On the other hand, at first difference results shows there is no unit root presence in the data series with both intercept only and with intercept and time trend assumptions. Therefore, the ADF unit root rest concluded that the data has mixed of stationary and non-stationary.

Johansen Cointegration Test

Using the Akaike information criterion for the optimal lag selection, a suitable lag length of 1 is selected and set the multivariate cointegration equations. The multivariate Johansen cointegration results have been reported in Table 2.

The hypothesized equations have been rejected null hypothesis i.e. H0: There is no cointegration or there is no long-run relationship between and the variables. It means there is a long-run relationship among the series and the time series analysis model should be estimated both long-run and short-run through the Vector Error Correction (VEC) models which is also supported by the Johansen normalization results as given in Appendix 4.3. The results show that in the long-run, DS and CPI have a negative impact on GDP while FCF has a positive impact on an average, ceteris paribus. The normalized coefficients of DS and FCF are statistically significant at the 1 % level. The conclusion of the result is that the null hypothesis of no cointegration is rejected against the alternative of a cointegrating relationship in the model.

Vector Error Correction Model Results

As suggested from the Johansen cointegration test results, the null hypothesis of no cointegration between the variables have been rejected. The Johansen cointegration results show there exists of long-run relationship between the series. Therefore, the study has employed the Vector Error Correction Model (VECM) for the investigation of long-run and short-run causal relationship between the endogenous variables. The results for the long-run cointegration between gross domestic product per capita growth as dependent variable and growth in domestic savings and fixed capital formation is

Table 1. ADF Unit Root Test Results for the GDP, DS, FCF, and CPI.

Variables	Level		Remarks	First difference		Remarks
	Intercept	Intercept and Trend		Intercept	Intercept and Trend	
GDP	0.000	0.000	Stationary	0.000	0.000	Stationary
DS	0.038	0.028	Stationary	0.002	0.006	Stationary
FCF	0.000	0.000	Stationary	0.000	0.000	Stationary
CPI	0.081	0.244	Non-Stationary	0.000	0.000	Stationary
Null hypothesis H0: The series has the presence of unit root and the P-values reported at level and first difference are Mackinnon (1996) one-sided p-values.						

Source: The results reported are the author's own calculation by using E-views software.

Table 2. Johansen Multivariate Cointegration Test Results

Hypothesized no of CEs	Eigenvalue	Trace Statistic	0.05 Critical Value	P-Value	Remarks
None*	0.48919	86.95098	47.85613	0.00000	Cointegration
At most 1*	0.44259	58.06539	29.79707	0.00000	Cointegration
At most 2*	0.33714	32.93371	15.49471	0.00010	Cointegration
At most 3*	0.29883	15.25279	3.84147	0.00010	Cointegration

*Note: Gross domestic product per capita growth, gross domestic savings, gross fixed capital formation, and inflation are included in the cointegration equation. The trace test indicates 4 cointegrating equations based on linear deterministic trend assumption at 0.05 level. The model assumptions have taken from Akaike Information Criteria. * denotes rejection of the hypothesis at the 0.05 level. The probability value is based on Mackinnon-Haug-Michelis (1999). The null hypothesis is H0: There is no cointegration (No long-run relationship between variables). The data results are calculated by using E-views software.*

Source: The results reported are the author's own calculation by using E-views software.

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presented in Table 3.

Table 3. Results of Vector Error Correction Estimates with the observation from 1977 to 2019 after adjustment

Cointegrating equation:	Cointegrating Equations Estimates		
GDP (t-1)	1.000000		
DS (t-1)	0.134233 (4.19070)		
FCF (t-1)	-0.890713 (-9.50219)		
Constant	0.028347		
Error Correction:			
Cointegrating Equation	-0.136269 (-0.35251)	3.493654 (1.29771)	2.125429 (2.50459)
(t-1)	-0.612861 (-2.71920)	-1.800696 (-1.14720)	-1.185852 (-2.39674)
(t-1)	0.002960 (0.06925)	-0.710366 (-2.38648)	-0.098803 (-1.05302)
(t-1)	0.115774 (0.57309)	1.549513 (1.10135)	0.459692 (1.03654)
CPI(t-1)	-0.004105 (-0.29081)	-0.092347 (-0.94028)	-0.011881 (-0.38342)
Stability	0.001801 (0.05710)	0.259399 (1.18066)	0.027318 (0.39445)
Constants	0.003514 (0.19060)	-0.081825 (-0.63722)	-0.004644 (-0.11472)
R-squared	0.289285	0.322039	0.396306
F-statistics	2.442208	2.850068	3.938817

Source: The results reported are the author's own calculation by using E-views software.

The results of the cointegration equation in Table 3 show the clear cointegration as the endogenous variables are significant at a 5 percent level of significance. It indicates that there is both long-run and short-run causal relationship between the endogenous variables. The second part of Table 3 presented error correction estimates and short-run model output. The major concern in this table is estimated VECM with the target variables. The coefficient of the cointegration equation is negative i.e. -0.136269. The error correction coefficient gives the speed of adjustments within which the model will restore its equilibrium following any disturbances but the adjustment coefficient at first difference of GDP is not significant. The EC coefficient -0.136269 means that the speed of disequilibrium is 13.63 percent. In another word, the previous year deviation for the long-run equilibrium is corrected at the speed of 13.63 percent.

However, the coefficient of adjustment for the DS and FCF are positive and only FCF is significant at a 5 percent level of significance. The positive coefficient of adjustment indicates the lack of adjustments towards long-run equilibrium in any disequilibrium situation. The coefficient of DS is 0.00296 which means the percentage change in growth in domestic savings rate is associated with a 0.296 percent increase in GDP per capita growth on average ceteris paribus in the short-run. Likewise, coefficient of FCF is 0.115774 which indicates that the percentage growth in FCF is associated with an 11.57 percent increase in GDP per capita growth on average ceteris paribus in the short-run.

Further, for the long-run and short-run causality, we need to perform VAR model estimation based upon the error correction model. Therefore, the vector error correction model estimates' output is presented in Table 4.

Table 4. Results of VECM estimates

	Coefficients	Std. Error	t-Statistic	Probability
Dependent variable: GDP Per Capita Growth				
C(1)	-0.136269	0.386564	-0.352513	0,7265
C(2)	-0.612861	0.225383	-2.719195	0.01
C(3)	0.00296	0.042741	0.06925	0.9452
C(4)	0.115774	0.202018	0.573085	0.5701
C(5)	0.003514	0.018438	0.190601	0.8499
C(6)	-0.004105	0.914116	-0.290805	0.7729
C(7)	0.001801	0.031547	0.057098	0.9548
R-squared	0.289285			
Adj. R-squared	0.170833			
F-statistics	2.442208			
Pro (F-statistic)	0.043917			

Source: The results reported are the author's own calculation by using E-views software.

Table 4 presents the least Squares (Gausss-Newton/ Marquardt steps) output based on VEC model estimates. Here in the model, C (1) represents the long-run coefficient which is negative but not significant. It indicates that there is no long-run causality between GDP per capita growth and growth in domestic savings and investment. The coefficient should have a negative sign showing the ability to bounce back to the equilibrium. On the other hand, the positive sign indicates the movement away from the equilibrium in the long-run.

For the short-run, the coefficient of C (2) is negative 0.6129 which indicates that a one percent increase in itself will lead to a decline in GDP per capita growth by 0.6129 percent which is also significant at the five percent level of significance. Similarly, C (3) is the coefficient of savings which is 0.00296. It shows that one percentage increase in DS will lead to increase in GDP by 0.00296 and vice-versa. The coefficient of investment in short-run is C (4) which is 0.11577. The results shows that one

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percentage increase in investment will lead to increase in GDP by 0.11577 percent and vice-versa. The coefficients of C (6) and C (7) are exogenous variable representing inflation and economic stability. The coefficient of C (6) is negative with -0.0041 which indicates that one percentage increase in inflation rate will lead to decline in GDP by 0.0041 percentage in short-run. Likewise, economic stability is coefficient of C (7) is positive which is 0.0018 but not significant. The results show that economic stability has a positive impact on GDP in comparison to unstable economic environment. This means the stable economic environment is positively associated with the economic growth in Nepal.

The coefficient of C (5) is intercept term which is the value of dependent variable when all the included variable in the model is zero. Another interest in the table is R-square which shows the explanation power of the model. The value of R-squared is 0.2893 indicates that this model can explain the objective by 28.93 percent on average ceteris paribus.

Results of Cholesky Variance Decomposition Factors

These estimates give the general idea about the long-run and short-run causality between the dependent and independent variable but more investigation is needed to justify the idea generated from the VECM estimated results in a given condition. Therefore, the study also performs the variance decomposition test to support ratify the conclusion from the VECM estimate result and the results are presented in a graphical form in Figure 8.

This study has been employed the Cholesky Decomposition model and the results are presented in the multiple-Graphs format and table for the convenience of the readers. This test gives the descriptive eye view of the influencing power to each variable in the long-run and short-run. The time period has taken 10 years due to which is generally accepted as most of the countries are taking 10 years of time period for the census survey. Here, this might not be applicable but 10 years period can be normal to feel the long-run socio-economic shocks in the country.

Figure 8 shows there is very low influencing power to GPD per capita growth by DS and FCF in short-run. In year 1 both DS and FCF have zero influencing power to the GDP which means GDP can influence by GDP itself. But in year two, the influencing power increases 0.789 and 2.886 of DS and FCF respectively. As the observation period increases, the influencing power of both variable are declining. It means that both variables are strongly exogenous in year one. However, if you see the second row's figure, the 25.88 percent of DS influence by GDP and 74.12 percent of DS influence DS itself in year zero where FCF is strongly exogenous with zero influence to DS. But in long-run the influencing power of FCF rose up to 5.097 percent in 10th years of observation. Finally, the explanatory power to FCF in year 1 are 69.91 percent and 14.62 percent of GDP and DS respectively. The variance composition results of FCF shows there is direct impact of GDS and DS influencing power to FCF with time and inverse impact of itself with time period.

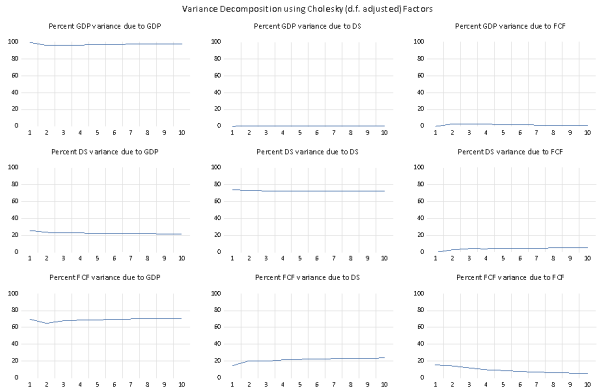

Figure 8. The Results of Cholesky Variance Decomposition Factors

Source: The results reported are the author's own calculation and plots by using E-views software.

Results of Normality Test

For the VECM estimate residual test, the following Figure 9 has been presented below.

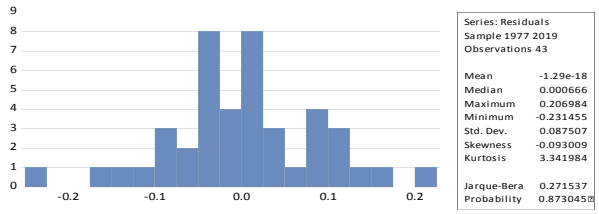

Figure 9. Results of normality test from the VECM estimates

Source: The results reported are the author's own calculation and plots by using E-views software.

For the diagnostic test of residual distribution, normal histogram normality test methods have employed with necessary information. The interest is in the value of the Jarque-Bera probability value in the figure. As a rule of thumb, if the p-value of JB is greater than five percent, we reject the hull hypothesis and accept the alternative hypothesis. In this case, the probability value is 0.8730 which is greater than 0.05. The result indicates that the residual distributions are normally distributed.

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Results of Serial Correlation Test

To test the presence of serial correlation test, the study performed the Breusch-Godfrey Serial Correlation LM Test and the result found there is no serial correlation in the model. As the null hypothesis H0: no serial correlation at up to 1 lag is accepted which means the model has no serial correlation. These results also support by the Durbin-Watson statistic as the value of DW=1.957 which is closed to 2.0. Therefore, the study concluded that there is no serial correlations presence.

Another residual test has been done for the Heteroskedasticity test. The result of Heteroskedasticity fails to reject the null hypothesis of no Heteroskedasticity. The keen interest in analysis the heteroskedasticity also in Durbin-Watson statistic value. The DW value is 2.037 which is also closed to 2.0. Therefore, the analysis results concluded that there is no presence of any Heteroskedasticity in the data. On the other hand, if the probability of Chi-Square distribution is greater than 5 percent then we can say that there is no Heteroskedsticity in the data. In this way, with the help of this test, the study result can be concluded that the regression results of the model are not spurious.

Results of Model Stability Test

The results will be valid and applicable only if the model is stable over the observation time period. Thus, for the model stability diagnostic purposed, the study used performed recursive estimation applying the CUSUM Test and CUSUM of Squares test method. The results of CUSUM and CUSUM of squares are presented in Figure 10 and 11 below.

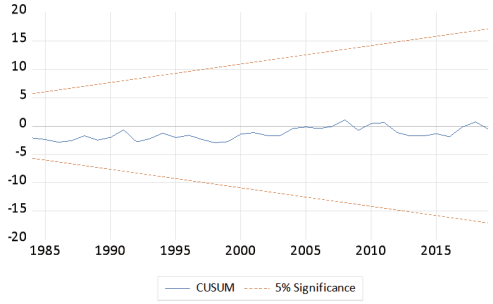

Figure 10. The result of squares tests

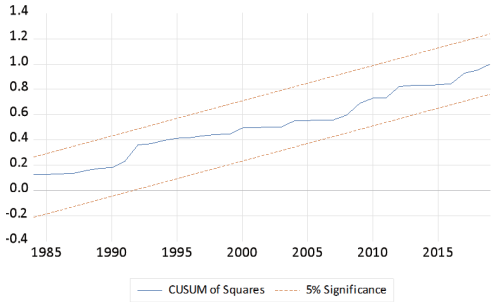

Figure 11. The result of CUSUM of squares tests

Source: The results reported are the author's own calculation and plots by using E-views software.

The CUSUM test gives the fluctuation detection over the time period. In this study case, time series fluctuation lies within the upper bound and lower bound of critical value at a 5 percent level of significance. Both figure shows the CUSUM and CUSUM of squares are within the critical value which indicates the model is stable over the observation period.

6. Conclusions

This study examines the relationship between domestic savings, investment, and economic growth in Nepal by using time series data covering from the period 1975 to 2019. The vector error correction model (VECM) has been used to investigate the long-run and short-run causal relationship between the variables.

The Johansen cointegration test results confirmed that there is a long-run relationship between savings, investment, and economic growth therefore, further analysis has to be set for the VEC model to analyze both long-run and short-run causality. The VECM equation result is -0.1363 which indicates that the adjustment speed of disequilibrium is 13.63 percent on average towards the equilibrium position in the long-run but the results are not significant at a 5 percent level of significance. The coefficients of savings and investments are positive with economic growth which also indicates that both variables have a positive impact on economic growth in the short-run. The results of the Jarque-Bera test show the residual distribution is normally distributed. For the model stability test, the study performed recursive estimation applying CUSUM and CUSUM of square, and both tests move within the 5 percent level of upper and lower bound significance indicating that the model is stable over the observation period.

This study suggests that in Nepal, there is a positive role of domestic savings and investment growth for the economic growth. The central bank, planning commission, and ministry of finance should focus on promoting domestic capital formation via domestic savings and properly investing those funds in the productive sector to stimulate sustainable economic growth in Nepal. Further, the study can be extended to provide better empirical evidence in the future with the coverage of a wide range of economic sectors and by applying an advance econometric models.

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