The Effect of Consumer price index, Foreign Exchange Reserve and Labour Force on economic growth of Nepal

Ganesh Subedi[1]

Abstract

One of the main objectives for any country is to attain higher economic growth. Even though there are many factors that affect the economic growth of the country, this paper tries to examine the casual associations between the major economic indicator (GDP) with other factors such as consumer price index (CPI), foreign exechange reserve (FOREX), Labour force, so as to confirm the short run and long run relationship between GDP and these factors. This study uses the data from 1990 to 2021. Johansen approach to cointegration and vector error correction model has been implemented and the result have confirmed that a percentage increase in consumer price index will decrease GDP by 0.98 percentage, a percentage increase in foreign exechange reserve increase GDP by 0.017 percentage, where as a percentage increase in labour force will decrease GDP by 0.25 percentage.

Key words: Johansen Cointegration test, Vector Error Correction Model, GDP.

I. Introduction

Economic growth refers to an increase in the size of the country´s economy over a period of time (RBA,2018). Stone (2017) states that there are two main sources of economic growth, growth in the size of the workforce and growth in the size of the productivity of that workforce.

Consumer Price Index (CPI) are the index numbers that measures changes in the price of goods and services purchased or otherwise required by the household (IMF,2019). The CPI of Nepal had increased from 137.6 in 2020 to 146.3 in 2021 (NRB,2021). CPI positively and significantly affect the economic growth of Nepal (Dhungel,2021). Mamo (2012) argued that the relation between economic growth and inflation is negative. Foreign exechange reserve refers to the foreign assets hold by the central bank of a country (CFI,2022). IMF (2021) argued that the weak or risky forex reserve management practices restricts the ability of the country to respond to the crisis. The foreign exechange reserve of Nepal had reduced drastically and is only sufficient for merchandise and service imports of 8.3 months (NRB, 2022). Forex exechange reserve had positive contribution to the economic growth of Nepal (Kaphle, 2021). Labour force comprises of all persons who fulfill the requirement for inclusion among the employed or unemployed (ILO, 2013). The skilled labour force enhances the economic growth of the country (Duval et al., 2010). Stone (2017) state that the growth in the size of the workforce and productivity is the major sources of economic growth Labour force participation in Nepal had decreased to 79.6% in December 2021, compared with 77.4% in the previous year (NPC, 2021).

1. *Mr. Ganesh Subedi BBA-FA Scholar at Lumbini Banijya Campus, Tribhuvan University, Butwal.*

The GDP of Nepal had contracted by 2.1% in F.Y. 2020 due to lockdown caused by coronavirus pandemic (ADB,2022). Nepal's labour productivity had decreased by -1.232% (NPC, 2021).

The price of the food stuff and fuel is increasing in Nepal (NRB,2021), foreign exechange reserve had decrease drastically, labour productivity is decreasing (NPC,2021). Downfall in these parameters motivated to conduct research in order to study the effect of increasing consumer price index, decreasing foreign exechange reserve, decreasing labour productivity on the economic growth of Nepal.

There donot seems to have enough research conducted in this subject, even if the research is done, the result obtained by the existing researcher's seems to be contradictory. To fulfill the research gap of inadequate research on the subject matter this research is undertaken. The rationale of the study is to analyze the effect of Consumer price index, Foreign exechange reserve and Labour force in the economic growth of Nepal during the period from 1990 to 2021.

II. Theoretical Framework

There are different school of thought regarding the economic growth. According to classical growth theory country's economic growth will decrease with increase in population and limited resources. It ignores the role of technology which maximizes production. Neo classical growth theory outlines how a steady economic growth rate results when three economic forces came into play: labour, capital and technology. Solow swan model explains long run economic growth by looking at capital accumulation, labour or population and increase in technology mainly driven by technological progress.

One of the major indicators of the economic growth is GDP (Gross Domestic Product). Stone (2017) states that there are two main sources of economic growth i.e., growth in size of workforce and growth in the size of the productivity of that workforce. In this study, we are takinggross domestic product as proxy of economic growth, consumer price index as proxy of inflation, foreign exechange reserve as the proxy of capital stock and population ranging from age 15 to 64 as the proxy of labour force.

Benli et al. (2022) investigate the effect of international reserve on economic growth in the long run in 41 developing countries over the period of 1970 to 2019 confirms the deteriorating effect of international reserve on the long run economic growth in the selected sample of the countries. Fisher (1993) investigates the relationship between inflation and economic growth by analyzing the dataset of 93 countries and founds that the inflation negatively affects economic growth rate by reducing investment and productivity growth.

Kearny and Chaudhary (1997) by examining both the direction and pattern of casualty between inflation and economic growth in 70 countries using annual data over the period from 1960 to 1989 founds no casualty relationship between inflation and economic growth in 40% of the countries, bidirectional casualty in about 20 % of the counties and unidirectional relationship in the rest of the countries. Mamo (2012) by analyzing panel data from 1969 to 2009 of 13 SSA countries confirms that there is negative relationship between inflation and economic growth. Sidrauski (1967) based on explicit analysis of individual saving behavior suggested that there is no relationship between inflation and economic growth. Ahmed and Mortaza (2005) demonstrate that there exists a statistically significant long run relationship between CPI and real GDP of Bangladesh. Dhungel (2021) by analyzing the casual associations between Nepalese monetary factors and gross domestic product growth from 1980 to 2019 using Johansen approach to cointegration and vector error correction model confirms that consumer price index positively and significantly affects the gross domestic product growth of Nepal. Fukuda and Kon (2010) analyzes the long run impact of foreign exechange accumulation in developing countries using the panel

data from penn world table shows that an increase in foreign exechange reserve raises external debt outstanding and shortens debt maturity also lead to decline in consumptions, which can also enhance investment and economic growth. These positive impact on economic growth disappeared when we control the impact through investment. Kashif et al. (2017) investigated the impact of economic growth on Brazilian international reserve holding using data over the period of 1980 to 2014 founds that economic growth and international reserves have positive long run relationship, which had been validated by error correction term, which is negative and statistically significant. Kaphle (2021) through analysis of the time series data obtained from the year 1975 to 2018 confirms that the past values of the foreign exechange reserve have positive contribution to the economic growth of Nepal, GDP was also found to be influencing gross fixed capital formation in the economy, which showed that the investment policy in the country created some expected result, however GDP is unable to promote foreign exechange earning in the country. Maestas et al. (2022) using variation in the predetermined component of population aging across state of U.S to estimate the impact of population aging on growth in GDP per capita for 1980 to 2010 founds that each 10% increase in the fraction of the population ages 60 plus decreased per capita GDP by 5.5%. one third of the reduction arose from slower employment growth, two third was due to slower productivity growth, labour compensation and wages also declined in response their estimates implies that population aging reduced the growth rate in GDP per capita by 0.3 percentage points per year during 1980 to 2010.

Shahid (2014) analyzes the impact of labour force participation on economic growth in Pakistan from period 1980 to 2012 using Johansen cointegration test and vector error correction model, founds that labour force participation has negative significant relationship in short run. Lamah et al. (2021) analyzes the annual data from 2005 to 2019 using error correction model with EViews program, founds that labour force has no impact on the economic growth in Indonesia in short term and long term. Zulu and Banda (2015) explore the impact of labour force productivity on economic growth in Mauritius and South Africa founds that the growth of the labour force has been positive for general economic growth in both the countries, however, they argued that high quality skilled labour is needed to maintain productivity and economic growth.

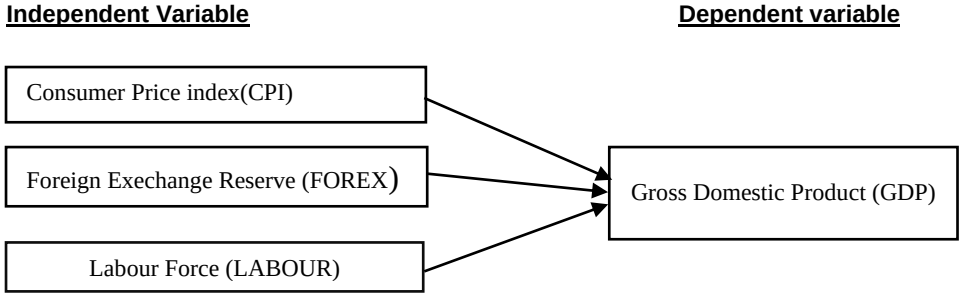
There are several different international studies in case of the effect of these economic factors on the economic growth of a country, however limited studies had been done in case of Nepal.

III. Research Methodology

This study comprises analytical and descriptive research. So as to explore the effect of consumer price index (CPI), foreign exechange reserve (forex) and labour force on the economic growth of Nepal. The study is based on the analysis of the time series data from 1990 to 2021 A.D extracted from different source such as quarterly economic bulletin of Nepal Rastriya Bank and data bank of world bank.

Research design

Quantitative data from secondary sources had been used, so as to analyze the effect of consumer price index, foreign exechange reserve and labour force on the GDP. These variables had been previously taken for study by (Dhungel, 2021), (Kaphle,2021) and (Shahid,2014). The analysis is made with the help of statistical econometric test.



Source: Adapted from by (Dhungel, 2021), (Kaphle,2021) and (Shahid,2014)

Sample and Variable

This quantative study has used secondary data ranging from 1990 to 2021. So as to find the effect of consumer price index (CPI), foreign exechange reserve (FOREX) and labour force (LABOUR) on the GDP of Nepal. The dependent variable is GDP (Gross domestic product) and independent variable are CPI (consumer price index), FOREX (foreign exechange reserve) and Labour.

Using the dependent and independent variable we specified the following functions

GDP=f (CPI, FOREX, LABOUR) …… (1)

To make our equation linear and so that the coefficient on the variable are directly interpretable as approximate proportional difference, we take natural log of equation (1) as shown below

$\ln GDP = \beta_0 + \beta_1 \ln CPI + \beta_2 \ln FOREX + \beta_3 \ln LABOUR + \mu$……..... (2)

ln= Natural logarithm

μ=Error term

where, β_0 are the intercept and β_1, β_2, β_3 are the parameters.

Testing for stationarity

The unit root test is crucial so as to avoid the problem of spurious result in case of time series data. Time series data usually have a problem of non-stationarity which usually create long lasting problem in the data analysis process. So, we intend to conduct a test for stationarity by employing Augmented Dickey Fuller (ADF) test to look for stationary through regression of the series first difference against the first lagged value.

The Dickey-Fuller equation for unit root test are as follows,

$\Delta Y_t = \gamma Y_{t-1} + \mu$…… (3) [with no intercept and trend]

$\Delta Y_t = \alpha + \gamma Y_{t-1} + \mu$…… (4) [with intercept]

$\Delta Y_t = \alpha + \varphi t + \gamma Y_{t-1} + \mu$…… (5) [with intercept and trend]

Where,
μ= error term
α=intercept
φt= time trend

Now the lag value of dependent variable is added on independent variable, which increases the fitness of the model. Then the equation is,

$\Delta Y_t = \alpha+\varphi t+\gamma Y_{t-1}+ \sum_{i=1}^{k} \varphi_i \Delta Y_{t-1+} \mu$…… (6)
which is the estimated equation for ADF test.

The hypothesis for the unit test is,
H_0: $\beta=1$, $\gamma=0$, there is a unit root in variable

H_1: $\beta<1$, $\gamma<0$, there is no unit root in variable

Johansen Approach to Cointegration and Vector Error Correction Model

As the series are integrated of first order, cointegration test becomes necessary to establish a long run relationship. So here in this study we will perform Johansen cointegration test, which check the relationship between each variable endogenous of other variable.

The equation for performing Johansen cointegration test can be as:

Ln GDP = $\alpha+ \beta_1 lnCPI+ \beta_2 lnFOREX+ \beta_3 lnLABOUR+\mu$…… (7)

Where relationship between each variable is checked by making each variable endogenous turn wise.

The hypothesis is as:
H_0= No cointegrating equation

H_1= H_0 is not true

Decision criteria:

1. Rejection at the 5% level.

2. Reject the null hypothesis if the value of trace and max eigen statistics is greater than 5% critical value, otherwise fail to reject the null hypothesis.

The Vector Error Correction Model (VECM) is performed from the following equation

$\Delta GDP_{t-1} = \beta_0+ \beta_1 \sum_{i=1}^{k-1} \Delta GDPt-1 + \beta_2 \sum_{i=1}^{k-1} \Delta GDPt-1 + \beta_3 \sum_{i=1}^{k-1} \Delta GDPt-1 + \beta_4 \sum_{i=1}^{k-1} \Delta GDPt-1 + \lambda ECT_{t-1}+ \mu$…… (8)

where, ECT_{t-1}= Lags OLS residual λ= Speed of adjustment parameter with a negative sign

IV. Results and Conclusion

Table 1

Stationary test result

Variables	ADF Test			
	Level		1st difference	
	C	c and t	c	c and t
lnGDP	0.9845	0.4134	0.0007	0.0033
lnCPI	0.9337	0.7544	0.0001	0.0017

lnFOREX	0.8336	0.6140	0.0013	0.0075
lnLABOUR	0.0643	0.3026	0.0000	0.0105

Performing ADF test at level shows all the values at level is greater than critical value at 5%. Hence, we need to accept H_0 i.e., the series is not stationary. Whereas conducting ADF test at first difference shows that all the probability value at 1st difference is smaller than critical value at 5% i.e., 0.05. Hence the time series data is stationary at 1st difference. Since all the variable are integrated of the same order i.e., are stationary at first difference therefore, it is appropriate to use Johansen cointegration approach to test whether the series is long run associated or not.

The outcome of Johansen Cointegration test is as shown below:

Included number of observations: 30 after adjustment, lag length:1to2

Table 2

Unrestricted Cointegration rank test

Hypothesized NO of CE(s)	Trace Statistics	0.05 Critical Value	Probability
None*	76.32611	63.87610	0.0032
At most 1	40.16240	42.91525	0.0918
At most 2	16.15299	25.87211	0.4490
At most 3	2.800875	12.51798	0.8993

Trace statistics indicates 1 cointegrating equation at 0.05 level.

(*) denotes rejection of null hypothesis at the 0.05 level.

Table 3

Unrestricted Cointegration Rank Test (Max Eigen value)

Hypothesized No of CE(s)	Max Eigen Statistics	0.05 Critical value	Probability
None	36.16372	32.11832	0.0151
At most 1	23.609040	25.82321	0.0954
At most 2	13.75212	19.38704	0.2172
At most 3	2.800875	12.51798	0.8993

Max-eigen value test indicates 1 Cointegrating equation at the 0.05 level .

(*) denotes rejection of null hypothesis at 0.05 level.

From the above table it is clear that there exists at least one cointegrating equation i.e., rejection of null hypothesis which means there exists long run relationship and can be combined in linear fashion. It also implies that even if there are shocks in the short run, which may affect the movement in individual series, they will converge with time in long run.

Now for vector error correction model (VECM) further analysis was carried out using the equation.

D(lnGDP)=C(1)*(lnGDP(-1)-0.667947205028*lnCPI(-1)-0.84319936982*lnFOREX(-1)+4.02853423057*lnLABOUR(-1)-68.282949038)+C(2)*D(lnGDP(-1))+C(3)*D(lnCPI(-1)+C(4)*D(lnFOREX(-1)+C(5)*lnLABOUR(-1)+C6.

Table 4

Result of Vector Error Correction Model

	Coefficient	Standard error	T-Statistics	Probability
C (1)	-0.034886	0.095690	-0.364572	0.7186
C (2)	0.187865	0.223456	0.840724	0.4088
C (3)	-0.975265	0.475166	-2.052473	0.0512
C (4)	0.017142	0.164342	0.104308	0.9178
C (5)	-0.245342	1.291092	-0.190027	0.8509
C (6)	0.132422	0.046271	2.861907	0.0086

R-Squared=0.175782 Durbin-Watson statistics=1.625641

Here,

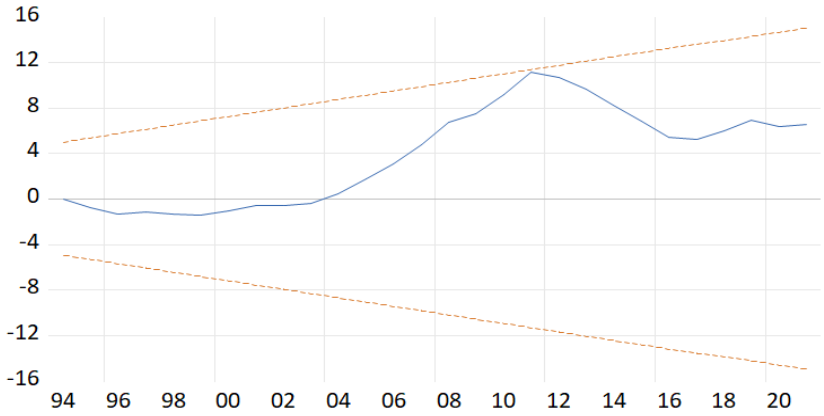
C(1)= Long run coefficient
C(2)=ln(GDP)
C(3)=ln(CPI)
C(4)=ln(FOREX)
C(5)=ln(LABOUR)
C(6)=Constant or intercept

The long run coefficient C (1) is negative which shows the long run casualty between ln(CPI), ln(FOREX),ln(LABOUR) to ln(GDP). Coefficient should have negative sign showing the ability to bounce back. In case of short run coefficient C (2) a percentage increase in itself ln(GDP) will lead to increase in GDP by 0.19 percent. In case of C (3) a percentage increase in consumer price index will decrease GDP by 0.98 percentage. In case of C (4) a percentage increase in foreign exechange reserve will increase GDP by 0.017 percentage. In case of C (5) a percentage increase in labour force will decrease the GDP by 0.25 percentage. C (7) is constant.

Since the value of Durbin Watson statistics is 1.625641 which is within acceptable range of 1.5 to 2.5 hence the data is free of autocorrelation.

Diagnostic Test

Cusum test



It is clearly shown that, blue line lies within 5% critical line which proves that residual variance is stable.

LM-Test

Obs* R-Squared= 4.693622
P-Value= 0.0957 (Not significant)

Hence there is no serial correlation.

Heteroskedasticity test
R-Squared=5.762559
Prob chi square = 0.6738 (Not significant)

Hence, it is not affected by heteroskedasticity. So, the model is fit in all form.

Discussion

Table 4 represents the overall output of Vector Error Correction Model. The result of Johansen Cointegration test (Table 4) confirms that there exists long run association between GDP and CPI, FOREX and LABOUR. The negative error coefficient terms show the ability to convergence towards the equilibrium. Value of R^2 is 0.175782 which shows that 17.5782% variation in dependent variable (GDP) is explained by independent variable (FOREX, CPI, LABOUR). It shows that foreign exechange reserve have positive effect on GDP. Whereas Consumer Price Index have strong negative effect on GDP, labour force also had negative effect on GDP.

Coming towards the explanations of the individual variable, Consumer Price Index have significant negative effect on the GDP, suggesting that if the price of goods and services increases than economic growth of the country slows down. These finding are confirmed by (Mamo,2012) and (Benli et al., 2022). As increase in price reduces investment and productivity growth, economic growth of the country slows down.

According to our finding foreign exechange reserve has positive effect on GDP which is accordance with the findings of (Kaphle,2021), (Kashif et al., 2017), (Fukuda and Kon, 2010).This finding is in support of Solow and Swan model. Foreign exechange reserve is the major source of capital mainly for developing countries like Nepal which is used to transfer technology, which increases productivity, which is the major source of economic growth (Stone,2017). Higher the foreign exechange reserve higher will be the rate of

technology transfer, higher will be the productivity and higher economic growth will be achieved. In Nepal major source of foreign exechange is remittance, money coming from remittance is mainly used for the consumption and only small portion is used for production, so even though foreign exechange had positive relation, it had not been able to have significant impact on the GDP of Nepal.

Our findings shows that labour force participation also had negative relationship with GDP. Which is in accordance with the findings of (Shahid,2014). Almost 10% of the total population of Nepal (2.16 million) are working in abroad (CBS,2021) these people are the skilled and productive population of Nepal. As Nepal is not being able to utilize the skill of its productive population. So even if the productive population is increasing their impact in economic growth of Nepal is negative as they are not contributing for the economic growth of Nepal by choosing abroad as their working destination. Majority of the population ranging from 15 to 60 are working in abroad and are using their skill in that particular country for their growth rather than of Nepal, So the negative relation of labour force with economic growth is expected.

Conclusion and Implication

After the restoration of democracy in Nepal in 1990. Nepal had experienced a change in political structure, this changed political system had introduced different policies such as foreign employment policy, tourism policy, special economic zone, foreign investment and technology transfer act so, as to change the economic system of Nepal.

The negative effect of consumer price index on Nepalese economy implies that the policy maker needs to formulate policies to control the price of goods and services as it directly affects the living standard of the Nepalese people by decreasing their real income as well as decrease productivity and investment of the country which are the main sources of economic growth.

The positive effect of foreign exechange reserve on the GDP of Nepal implies that most of the forex reserve is used to purchase fuel and foodstuff, less is being used for to transfer technology, which increases productivity of workforce, ultimately leads to increase in economic growth, So the policy maker of Nepal needs to formulate policies so as to increase foreign exechange reserve as well as they need to focus in transferring technology.

The negative effect of Labour force on the GDP of Nepalimplies that though, Nepal had higher productive population most of its productive population choose abroad as their workplace leading to situation of brain drain in Nepal, which cause labour force to have negative effect on the GDP of Nepal even though the productive population is increasing. This suggests Nepalese policy maker to make policies so as to create employment opportunities within Nepal. So that its productive population skills are best utilized for the economic development of the country.

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