Macroeconomic Variables and Effect on Stock Prices: Correlation Evidence from Nepal

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ABSTRACT: This paper attempts to study the macroeconomic factors that affect the stock prices in Nepal. It considers the annual data of four macroeconomic variables that affect the NEPSE Index; inflation rate, broad money supply, gross domestic product, and per capita income from 2011-2021 and tries to find out the influence of these variables on the NEPSE index (stock prices). It uses the Pearson correlation matrix to study the relationship between stock prices ad macroeconomic variables. The results obtained from correlation analysis revealed that market performance of stock prices is found to respond positively to broad money supply and gross domestic product and negatively to the inflation rate as expected. Also, the NEPSE index is not affected by the changes in the per capita income of the nation. These findings help to build up economic and financial policies in the nation and stabilize the capital stock market in Nepal.

KEYWORDS: NEPSE, Nepal, Macroeconomics, Stock Prices, Inflation, Correlation.

1. INTRODUCTION

The relationship between inflation with various macroeconomic variables such as broad money supply, gross domestic product, NEPSE index, per capita income is studied by different economists belonging to public, private, and academic sectors, in which most of the researchers concluded that inflation occurs mainly due to budget deficit (Ali et al., 2015). Monetization ultimately leads to an increase in the money supply, which directly causes inflation to rise in the long run. Stock prices are affected by economic variables (Valcarcel, 2012), for this reason, the significance of macroeconomic variables cannot be neglected (Goyal and Welch, 2008; Valcarcel, 2012, Rapach and Zhou, 2013). Long-run stock prices, in most of the studies, showed to be affected by inflation (Gupta and Inglesi-Lotz, 2012). The stock market is the unpredictably volatile premise with unanticipated moves that give investors either positive or negative signs about stock returns. Besides inflation rates, the stock returns also depend on the interest rates in particular. High inflation rates indicate low real money value and less purchasing power of the consumers, declined profitability, and reduction in real investment returns. In the long run, inflation parameters affect real stock returns due to monetary non-neutrality (Rapach, 2002; Bjørnland and Leitemo, 2009; Valcarcel, 2012; Bjørnland and Jacobsen, 2013). Numerous channels can affect the stock prices. According to the Gordon (1962) growth model, the stock price has a direct correlation with current growth rates of dividend returns. However, it has an inverse relationship with the required rate of returns on equity. Whether dividend returns increased or expected returns on investment decreased, both serve to increase stock prices.

Global history has suffered an increased preoccupation with inflation in many countries, including Nepal. This has prompted theoretical and empirical economic research on the relation between stock prices and inflation (Solnik, 1983). (Fama & Schwert, 1977) found out that stock returns were inversely related to inflationary expectations. The failure of the Fisherian model to clarify the observed correlation between stock prices and inflation has led to the evolution of alternative macro-economic hypotheses. Both economic policy and monetary policy were observed to affect the stock prices (Grande et al., n.d.). When the central bank is supposed to be actively dedicated to price stability, even a minor surge in inflation expectations engenders the market to fear a high monetary policy reaction, which would result in higher interest rates, poor economic activity, and fewer expected dividends. Consequently, stock prices decrease, and the negative relationship between stock returns and expected inflation is obtained, which is called the proxy hypothesis proposed by Fama (1981). In this manner, the negative relationship can reflect changes in the expected return. The inflation-stock return correlation has been undergone depth study at the end of the 1970s and the beginning of the 1980s (Boucher, 2006). The objective of this paper is to evaluate the influence of macroeconomic variables on the stock prices of the Nepali stock market during the period 2011-2021. It is based on the hypothesis that every macroeconomic variable that are under consideration have relationship with the stock prices. The findings of this study help the reader to understand

whether the fluctuation of stock prices in Nepal is attributed to some macroeconomic variables change. Investors will perceive this study as a helpful piece of literature for them to recognize some basic economic variables that they should take into consideration while investing in share market, and thus help in profitable decision.

1.1 Review of Literature in the context of Nepal

Several kinds of literature associated with the relationship between several macroeconomic variables with the stock prices and the NEPSE Index has been published for the developed countries like the USA. There is very little literature published in the context of Nepal. G.C. and Neupane (2006), to study the causality relationship, carried out the research entitled "Stock Market and Economic Development: a causality test". The study was performed by using the Granger causality test and was based on time series data for the years 1988-2005. The findings of this study were empirical estimation of long-run integration and causality of several economic variables and stock prices indicators in Nepal. It was calculated in real terms. It succeeds to explain the importance of the stock market's role in the economic growth and development of the nation, and answers the question of how economic development could be achieved with a positive NEPSE index. Baskota (2007), by considering the NEPSE data of 1994-2006, performed the research about the effect of money supply, interest rate, inflation rate, and trading volumes. He performed regression analysis and study the relationship among different variables. The result showed that Nepalese market stock is unpredictable and largely volatile, and the stock price movements are difficult to explain by macroeconomic variables. Bhattarai and Joshi (2009) studied the fluctuating relationship among stock prices and macroeconomic variables, for both short-run and long-run interdependence. The findings of this study support the globally popular view that stock prices are the hedges against inflation. It also supported the relationship between broad money supply and stock prices in the short run. It concluded that monetary authority in the country would likely influence the stock prices only in the short-run, however in the long run it hardly influences the NEPSE Index.

Shrestha and Subedi (2014) performed empirical research on determinants of stock prices in Nepal, by considering the month-base data for the period of 2000 to 2014. The results obtained from regression analysis revealed that stock prices are positively related to inflation and broad money supply, and negatively related to the interest rate. This suggests that Nepalese investors seem to take stock just as an alternative financial instrument. The study on the relationship of several macroeconomic variables on the stock prices seems to vary across the data available. When a large number of literatures are available in developed countries, there are only a few pieces of literature of this type in the context of Nepal. Thus, our study serves as an attempt to study the relationship between macroeconomic variables and stock prices value in Nepal for the period of a decade, 2011-2021.

2. CONCEPTUAL CLARIFICATION

2.1 Inflation

A well-known concept of an increase in the general level of prices, that is inflation, is typically measured through Consumer Price Index (CPI) (Oxman, 2012). However, it is not only the measure of inflation, as there may be different variables affecting inflation. The term "Inflation" is quite important for investors. The long-term research has yet not clearly defined the relationship of inflation with other economic variables due to the volatility of the stock market. Since inflation is used as an input into the valuation multiple, its uses vary in different economic perspectives. The inverse relationship had been evident among low inflation and valuations (What Drives the Stock Market? n.d.). The average inflation rate in Nepal was estimated at approximately 4.64 % in 2019, a little drop to the year 2018. The inflation rate is evaluated from the price increase of a specific product and service, on which the average consumer expends money annually. They incorporate expenses for daily items, clothes, shelter, power, telecommunications, recreational activities, and raw materials (e.g. gas, oil), and federal taxes (*Nepal Inflation Rate 2014-2024*, n.d.).
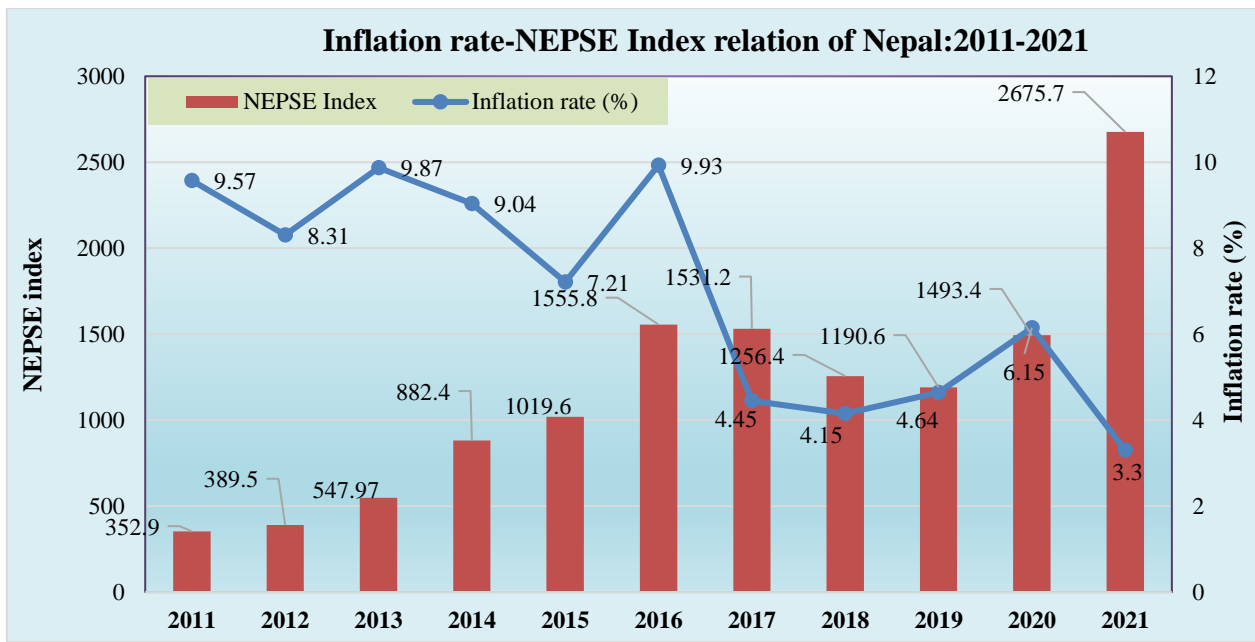
Figure 1 Inflation rate-NEPSE Index relation of Nepal:2011-2021

The inflation in most of the developing countries, including Nepal is valued as the annual percentage change in Consumer Price Index (CPI), which refers to the price paid by the average customer in their country. Similarly, it can be estimated with other price indices called Producer Price Index (PPI). The intended values of Inflation of many countries lie between 2-3 % per year, which is very less to cause business problems. However, it is very difficult to achieve this value.
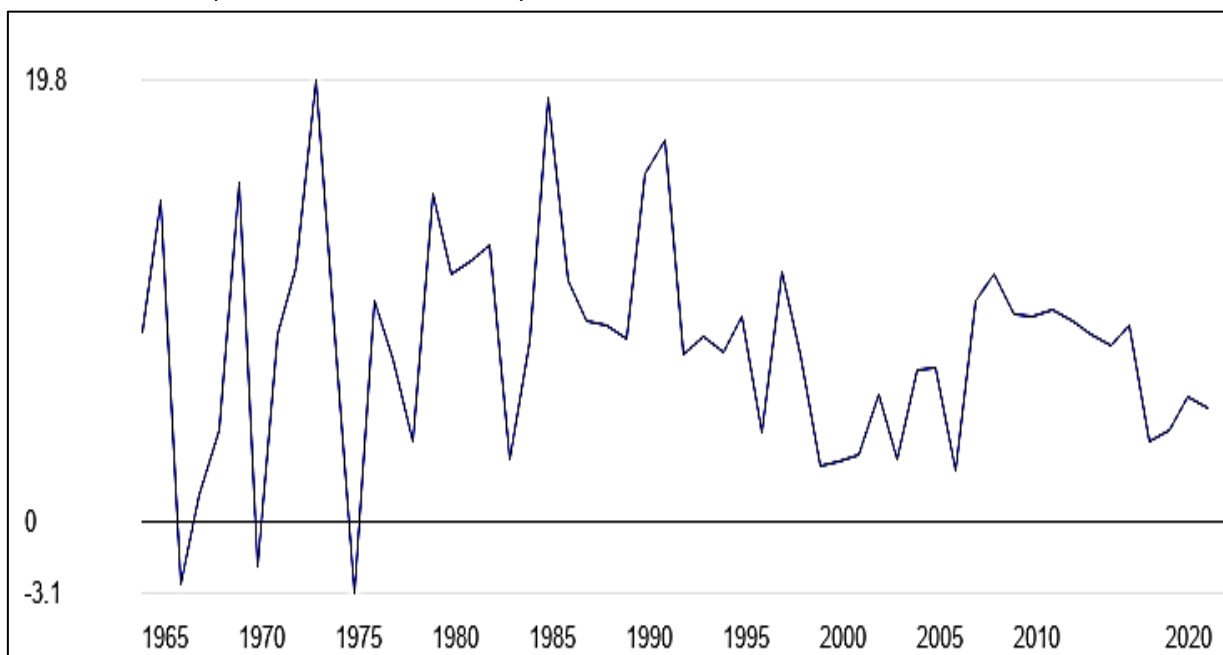

Figure 2 Long series of Inflation dating from 1965-2020

The above figure shows the long series of inflation data dating from 1965 to 2020, where the average value during that period was 7.9 %, the minimum value of -3.1 % (1976), and a maximum of 19.8% (in 1974). However, in 2020, the country has achieved a 5.1 % of inflation rate (Figure 2). In the same year in 2020, the average inflation on a global basis was 4.5 % (Global Economy, 2020).

2.2 The effect of inflation rate on stock returns

Economists are being much concerned on the subject regarding the effect of inflation on stock returns for a long time of economic development. Fisher (1930) suggested that nominal stock returns are hedges as opposed to inflation. On that account, the rise in current and expected inflation should raise the nominal dividend payments. Accordingly, Oxman (2012) justified that the discount rate should be calculated by the returns rate which the investors had expected to gain as dividend yield on the stock. For that reason, the rise in inflation expectations should have a positive relationship with the flow of nominal dividend payments for stock.

This would result in an upward revision of stock prices. To contrary to the classical theories of economics, modern empirical findings have not supported the theories that stock returns may work on as a hedge against inflation (Joseph, 2012). This may eventually lead to the "Inflation-stock returns puzzle". The post-1953 era reported the negative correlation between the inflation rate and the stock prices in most of the empirical literature reports. Similarly, Olkin and Sampson (2001) observed the inverse relationship between these two variables. Any company tries to increase external financing when the inflation rate rises. No matter whether debt or equity financing is being carried out, any company's real cost of capital increases. Although if the profit margin is at a supporting level, the increase in the real cost of capital will decrease the optimal rate of real growth. (Ali et al., 2015) claimed that the inflation effect is much affected by the money illusion. The majority of the investors bump into money illusion because the investors discount real cash flows, which leads to behavioral problems. Ultimately, it results in inflation-induced valuation errors. The Modigliani–Cohn hypothesis anticipated that the stock market will suffer undervalued when there is high inflation because this undervaluation should be removed once actual nominal cash flows are disclosed. Inflation-stock returns negative correlation is derived from the negative correlation between inflation rates and various macroeconomic activities (Solnik, 1983). It is popularly known as the "Stagflation phenomenon", where there is a positive relationship between stock returns and inflation. Coherent with rational expectations theory, the relation between these two discussed variables relies on the prediction of future real performance. A similar type of negative relationship was reported by (Fama & Schwert, 1977) Moreover, Alexakis et al. (1996) assert that stock prices are largely affected by high inflation rates, due to their volatile nature. The emerging capital markets are mostly succumbed to the volatility effect of inflation, while those countries with developed capital markets experience low inflation rates and have stability in stock prices. Numerous researches agree with the disagreement that the inflation rate usually affects emerging capital markets (Boucher, 2006).

3. RESEARCH METHODOLOGY

3.1 Theoretical framework base

The past literature has empirically shown several macroeconomic variables to affect stock prices. The majority of the theorists mainly focused on the primary macroeconomic variables such as GDP growth, market index (measured as NEPSE index), Broad money Supply (BMS). We have further used Per capita Income (PCI) in our study of correlation analysis to check the relationship among variables. Broad money supply comprises currency, deposits with a fixed maturity of up to 2 years, deposits corrigible at the notice of up to 3 months, and repurchase reconciliation, money market fund shares/units, and debt securities up to 2 years (OCED, 2021). Based on the objective, the conceptual framework of the study is presented in Figure 3.
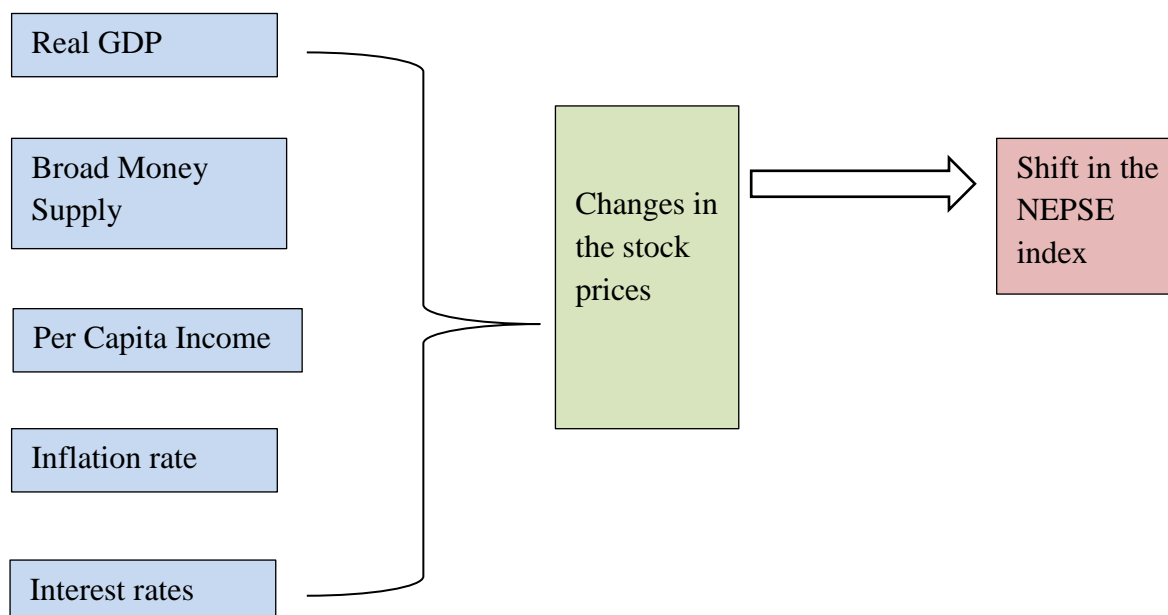
Figure 3 Conceptual framework for macroeconomic factors that affect stock prices

Adjasi et al. (2008) stated that interest rate and inflationary expectations had a strong influence on the stock market capitalization of Ghana, which was in contradiction to a stock market capitalization of Chile where there was a weak influence (Bénétrix et al., 2015). Later, Chen et al (2001) observed a positive correlation between inflationary expectations and stock market capitalization in Chile. However, Joseph (2012) found out that there is a negative correlation between interest rate and stock prices performance.

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3.2 Research Design

Our study used both descriptive and statistical analysis to best deal with the macroeconomic variables influencing stock prices in the context of Nepal. The descriptive-analytical design was used to describe or summarize the characteristics of economic factors, such as mean, median, skewness, kurtosis, variance, and standard deviation. The statistical analysis has been designed to study the relationship among different variables that were under our consideration. Several economic variables like Broad Money Supply, GDP, Per capita income, etc. were studied to check whether they were positively or negatively related to the stock prices in Nepal. The main reason behind our study was to determine whether it is possible to predict the stock returns based on information about other variables affecting the economy

3.3 Data Variables

The present study is based on secondary data, past literature, and historical reviews of the macroeconomic variables that were supposed to affect the stock prices and the NEPSE index. The assumption behind the study performance is that the stock prices are more or less influenced by several macroeconomic variables. Among them, Inflation rate, Interest rates, Broad Money supply, GDP, Per capita income are found to be more important. The required annual data and information of economic factors were collected from World Bank, Nepal Rastra Bank (NRB), Trading economics, etc. Several pieces of articles and reports published in different journals and websites were considered during the preparation of the manuscript, which provided base for past evidence inclusion in our study.

The following data are taken into consideration to study the relationship of various macroeconomic variables with stock prices (Table 1). Different variables code was assigned to different factors: NEPIN to NEPSE index, INR to the Inflation rate, BMS to broad money supply, GDP to gross domestic product, and PCI to per capita income. BMS was expressed as Nepali billion and GDP as USD billion.

Table 1. Economic variables and their description

Variable Code	Variable name	Unit
NEPEAN	NEPSE (Nepal stock exchange) Index	-
InR	Inflation rate	Percentage (%)
BMS	Broad Money Supply	Billion (NRs.)
GDP	Gross Domestic Product	Billion (USD)
PCI	Per Capita Income	USD ($)

4. RESULTS AND DISCUSSIONS

4.1 Descriptive statistics for macroeconomic variables

The descriptive statistics for the Inflation, NEPSE Index, and other macroeconomic variables over the period 2011-2021 are reported in Table 2. It shows that the inflation rate was 7.12 % during the period with a standard deviation of 2.475 %. The mean NEPSE Index was observed to be 1098.37 with a standard deviation of 679.01. As the standard deviation from the mean is high, we can conclude that there was high volatility and fluctuations in the annual NEPSE Index. The mean broad money supply (BMS) and gross domestic product (GDP) were 2505.2 billion NRs. and 26.04 billion USD respectively. The average per capita income during the decade was 926.08 USD, with a standard deviation of 182.79 USD.

Table 2. Descriptive statistics of the macroeconomic variables

Descriptive Statistics							
Variables	Mean	S. D	Variance	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
NEPSE Index	1098.37	679.01	461057.57	0.899	0.637	1.214	1.232
Inflation rate	7.12	2.475	6.128	-0.334	0.637	-1.671	1.232
Broad Money Supply	2505.2	1447.05	2093954.	0.581	0.637	-0.674	1.232
Gross Domestic Product	26.04	5.7458	33.015	0.061	0.637	-0.894	1.232
Per Capita Income	926.08	182.79	33415.35	0.116	0.637	-0.451	1.232

4.2 Correlation Analysis

The empirical relationship between inflation and stock prices and other macroeconomic variables has been presented in table 3 which uses a Pearson correlation coefficient that explains the magnitude of correlation among different pairs of macroeconomic variables during the period 2011-2021.

Correlation analysis is the statistical interpretation of data where multiple measurements are carried out on each variable and the relationship is studied (Olkin and Sampson, 2001). The correlation between a variable and itself is always 1. The spearman correlation coefficient indicates the negative relationship between NEPSE Index and the Inflation rate (-0.7). It means that with an increase in the inflation rate, the NEPSE index goes down as expected. This relationship is statistically significant at a 5 % level as it is hypothesized. However, the relationship of the NEPSE Index with other macroeconomic variables like Broad Money supply (0.89) and Gross Domestic Product (0.65) is statistically significant at 1 % and 5 % level of significance respectively. An increase in both Money supply and GDP increases the index value of the Nepal Stock Exchange (NEPSE). However, no significant relationship was found for NEPIN and PCI, indicating that as Per capita income shifts from its present value, no changes in NEPSE Index will occur.

Table 3. Correlation analysis for different variables

Pearson Correlation Matrix					
Variables	**NEPIN**	**InR**	**BMS**	**GDP**	**PCI**
NEPIN	1				
InR	-.700*	1			
BMS	.890**	-.799**	1		
GDP	.650*	.794**	.870**	1	
PCI	0.463	-.667*	.706*	.959**	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

The inflation rate (InR) is found to be negatively correlated with the Broad Money supply, with a correlation coefficient of 0.799. When the government increases the money supply through Nepal Rastra Bank, the inflation rate decreases accordingly. This result approximately hints that the country's money supply plays an important role to predict the inflation rate of that country. Similarly, the calculated significant positive relationship between NEPSE and GDP is consistent with Adel (2004), and Pilinkus (2009), and inconsistent with Flannery and Protopapadakis (2002). A statistically significant positive correlation has been obtained between the Inflation rate (INR) and GDP in Pearson (0.794, being statistically significant at 1 % level of significance). If inflation increases, people will expend more money because they will predict that it will be less valuable in the coming days. Consequently, GDP will increase in the short term, causing the prices to increase further (Barnes, 2021). Even though the fluctuations in the inflation rate can not necessarily change the per capita income (Khalid et al., 2015), our study found a negative significant relationship between these two variables. The Pearson correlation coefficient was 0.667, being statistically significant at a 5 % level of significance. However, no statistically significant relationship was observed between inflation and Per capita income in India, Brazil, and South Africa (Ehiraika, 2008).
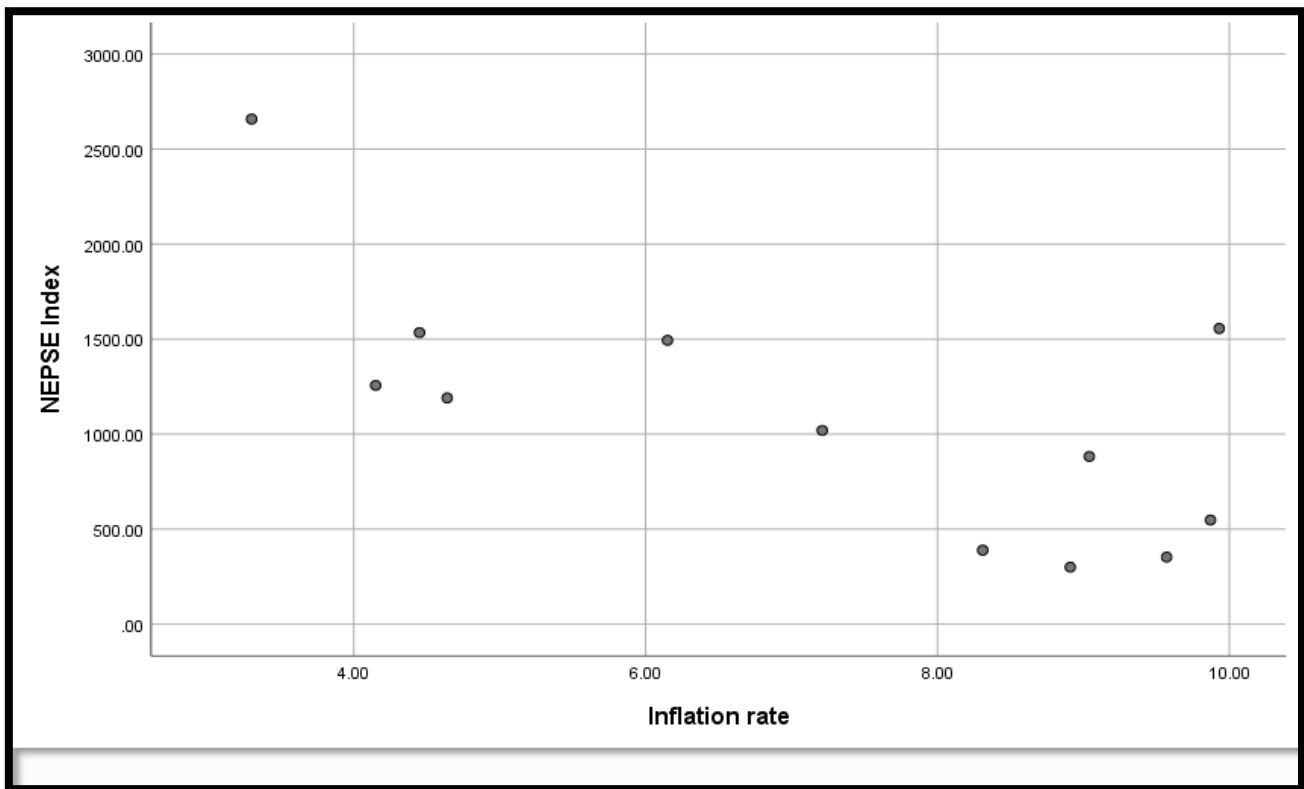
Figure 4. Scattered plot for correlation of InR and NEPIN

The statistical calculation of correlation shows that Per capita Income and Gross domestic product are highly correlated. The Pearson correlation coefficient was 0.959 and was significant at a 1 % level of significance. The increase in GDP has an increment effect on Per capita income (PCI) and vice-versa. Figure 4 shows the scattered plot for the InR-NEPIN relationship, which was negatively related to our findings of correlation analysis.

5. CONCLUSION

Several studies indicated that there must be a positive relationship between the inflation rate and the stock prices, while some opposed this statement. The economy is a wide realm, and stock prices are largely affected by several macroeconomic variables. Besides inflation, stock prices could be affected by broad money supply, per capita income, Gross domestic product, and so on. Out of these, Broad Money supply and GDP have a positive relationship with the NEPSE index (Stock prices), while the inflation rate is negatively related to the stock prices. The results of our correlation analysis further found out that Per capita income does not have any role to increase the NEPSE index in Nepal. The Inflation rate was negatively correlated with both Per capita income and Broad Money supply. The rest of the variables were positively correlated with each other.

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