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Macroeconomic Factors and Stock Market Performance in Nepal

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Abstract: *This paper examines co-integrating relationship between macroeconomic factors and stock market performance in Nepal using time series data for the period 1987/88 to 2019/20. This study has used Autoregressive Distributed Lag (ARDL) bounds testing approach to identify the co-integrating relationship between macroeconomic variables and stock market performance. The stock market performance is measured by market capitalization which is considered as dependent variable and selected macroeconomic factors such as broad money supply measured by M2, economic growth measured by gross domestic product (GDP) and interest rate measured by 91-days Treasury bill rate are considered as explanatory variables. ARDL bounds test reveals that stock market performance is co-integrated with macroeconomic variables. Similarly, result of this paper shows the significant positive impact of economic growth. Further, finding reports a significant negative effect of broad money supply and interest rate on performance of Nepalese stock market in long-run. Finally, this paper concludes that disequilibrium of stock market performance in short-run is corrected by GDP, M2 and IR in the long-run. The policy implication of this paper is in formulation of capital market policy, monetary policy, financial policy and economic policy. Stock market policy makers should consider macroeconomic variables while formulating capital market policy for the better performance of stock market in Nepal.*

Keywords: Stock market performance, broad money supply, economic growth, interest rate and ARDL bounds test.

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I. INTRODUCTION

Stock market capitalization, stock turnover, stock market index measure the stock market performance. The stock market performance is affected by stock price, return, risk, and number of securities traded in the market etc. Stock returns, risks, prices, performance etc. are the immense concerned issues in the literature of economics and finance. In this concern Markowitz (1952) developed the Portfolio Theory to trade-off risk and return by constructing portfolios of individual investments. Sharpe (1964), Lintner (1965) and Mossin (1966) formulated a model to determine the expected rate of return of financial assets. This model is well-known as Capital Asset Pricing Model (CAPM) which predicts a positive association between stock return and systematic risk. Similarly, Ross (1976) formulated Arbitrage Pricing Theory (APT) to inspect the consequence of macroeconomic factors on stock market performance measured by expected return of assets which are affected by unidentified risk factors.

King (1966) analyzed the impact of market and industry variables on market price performance for the period of 1927-1960. Using multiple factor analysis, the study found that most of stock prices are influenced by macroeconomic factors and remaining by psychological as well as microeconomic factors. Further, the study found macroeconomic factors as the strongest component to explain share prices and stock market performance for long-term investment decisions. Similarly, numerous previous empirical studies such as Fama (1981), Bodie (1976) and Chen (1991) etc. analyzed macroeconomic variables and stock market development and documented evidence of effective causal relationship between macroeconomic variables and yields of stock in security markets Clare and Thomas (1994) revealed strong correlation of size of bank loans, inflation and oil price with stock market in Great Britain. Likewise, Hanousek and Filler (2000) documented a positive association between money supply and share prices in Central Europe.

In the examination of influencing of macroeconomic factors stock return, Flannery and Protopapadakis (2002) applied regression GARCH models covering data 1980-1996 and observed that money growth and inflation significantly correlated with stock market returns. The study concluded that macroeconomic factors such as consumer price index, producers' price index, monetary aggregate, balance of trade and unemployment are the major determinants of stock returns. Furthermore, Kandir (2008) used multiple regression models to analyze the role macroeconomic variables in explaining stock return and performance using data of non-financial firms for the period 1997-2005. Kandir concluded that macroeconomic variables for instance inflation, interest and exchange rates have explanatory power to explain stock return where money supply and oil prices have no any significant impact on stock returns of portfolios for the measurement of stock market performance.

Regarding the study of Asian market, Mukherjee and Naka (1995) examined effect of macroeconomic factors and stock market with the application of Vector Error Correction Model and confirmed positive association between industrial production and stock market development in Japan. Likewise, Mookerjee and Yu (1997) analyzed macroeconomic

determinants and stock prices in Singapore and established positive correlation of macroeconomic factors such as size of foreign exchange, money aggregates supply M1 and M2 with SSE index for financial market development. In the explaining power of macroeconomic factors in share market movements, Humpe and Macmillan (2009) substantiated positive relation between industrial production index and stock market index but inverse relationship between money supply and stock prices in Japan.

The cointegration and causality test between macroeconomic factors and stock return of Chinese stock market showed positive relationship of money supply, industrial production, trade balance, exchange rates with stock price (Chung & Shin, 1999). Wongbangpo (2002) revealed strong and positive relationship of inflation, foreign exchange rates, money supply, GDP with stock market development in ASEAN countries. Likewise, Ibrahim and Aziz (2003) conformed the positive correlation of industrial production, and consumer price index but inverse correlation of money supply and exchange rates to stock market performance in Malaysia. Likewise, in Indian perspective, Pethe and Karnik (2000) revealed positive and significant relationship between foreign exchange rate and stock market performance. In the examination of causal relationship of macro-economic factors and stock market, Kumar (2011) observed long-term positive relationship among foreign exchange rate, inflation and stock price.

Hsing (2013) examined the influence of macroeconomic factors on the performance of Japanese stock market. Hsing found positive impact of industrial production and negative effect of ratio of government deficit to gross domestic product, domestic real interest rate and expected inflation rate on performance of Japanese stock market. Likewise, the relationship between macroeconomic forces and stock market performance in Indian context was analyzed by Tripathi and Seth (2014). Tripathi and Seth used monthly time series data for the period of July 1997 to June 2011 and revealed a significant relationship between stock market performance and macroeconomic forces. Result of the study concluded that inflation, interest rate and exchange rate have significant impact on stock market performance.

The performance of Pakistani stock market is adversely affected by interest rate and positively affected by exchange rate and inflation during the period of 1991 to 2017 in long-run and deviation in stock market performance is corrected by 46.53 percent per year (Khalid & Khan, 2017). There is a positive influence of real gross domestic product and negative influence of inflation and prime lending rate, and no influence of exchange rate on performance of stock market of Nigeria for the period of 1986 to 2009 (Harcourt, 2017).

Megaravalli and Sampagnaro (2018) examined the impact of macroeconomic indicators on stock market performance of India, China and Japan using monthly time series data from 2008 to 2016 and reported that exchange rate has significant and positive impact whereas inflation has insignificant negative effect on stock market performance in long-run. However, Megaravalli and Sampagnaro have concluded that there is no significant impact of exchange rate and inflation on stock market performance in short-run. Influence of macroeconomic variables on Chinese stock market using Granger causality,

impulse response functions and variance decompositions was analyzed by Huang et al. (2019). Huang et al. found no significant impact of output growth and inflation on stock return. They also revealed that stock return of Chinese stock market do not respond on money supply and short-term interbank rates.

Etale and Eze (2019) applied Johansen co-integration test and investigated long-run equilibrium and short-run dynamic relationship between macroeconomic variables and stock market performance. Etale and Eze found significant positive impact of money supply and exchange rate and negative effect of interest rate and inflation ration on stock market performance. Stock market performance is significantly influenced by macroeconomic variables and money supply has significant positive impact and interest rate has significant negative impact whereas exchange rate and inflation have no effect on stock market performance (John, 2019).

In the context of Nepal, Shrestha and Subedi (2014) analyzed monthly data from August 2000 to July 2014 and reported a negative influence of interest rate and positive effect of inflation and money supply on stock market price. The positive effect of money supply and negative influence of interest rate on NEPSE index were verified by the findings of Shrestha and Pokhrel (2019) and Devkota and Dhungana (2019). Rakhal (2018) found the significant positive effect of remittance and money supply and negative effect of interest rate and exchange rate on the performance of Nepalese stock market.

Panta (2020) applied ARDL model and found a strong association of GDP, money supply, inflation, interest rate and exchange rate with performance of Nepalese stock market in long-run. Panta explored a significant negative relationship of GDP, inflation, interest rate, exchange rate and money supply and a significant positive relationship of money supply on stock market performance in long-run. Likewise, negative relationship of interest rate and inflation is also verified in short-run. Aryal (2020) observed negative relation of exchange rate and interest rate and positive relation of inflation with stock market performance measured by NEPSE index. The impact of GDP on performance of Nepalese stock market measured by market return is positive for the period of 1994 to 2017 (Bhatta & Mishra, 2021).

Large volume of previous literature showed that effect of macroeconomic variables on stock price, yields and stock market performance are concentrated on developed countries like on US market. Sprinkel (1964) investigated the causal relationship of money supply and stock price and revealed positive and significant correlation between money supply and stock price in US market. Similar studies were made by Jeng et al. (1990) and Malliaris and Urrutia (1991) and support to the findings of Sprinkel. Cheung and Ng (1998) observed positive correlation between economic variables (GDP, money supply, oil price) and yield rates of shares in stock market in US. Inflation rate, producers' price index, trade balance, money supply, unemployment have significant effect on stock price in USA whereas industrial production, and GDP have no significant impact on stock price.

The analysis of association between macroeconomic factors and stock prices which makes effect on stock market performance is debatable and pertinent area of the study

in finance and economics. Though numerous empirical studies were made both on developed countries (Jaffe & Mandelker, 1976; Fama & Schwert, 1977) and developing countries (Mookerjee & Yu, 1997; Chung & Shin, 1999; Ibrahim & Aziz, 2003), but, there is still lacking in-depth similar study in under developing country like Nepal. In consideration and taking account to the results of previous studies on macroeconomic factors and their impact on stock price performance, there is a need to examine the relationship of macroeconomic factors on stock market performance in the context of Nepal.

In these perspectives, central concentration of this study is to examine the co-integrating relationship between some macroeconomic factors and stock market performance in Nepalese context. In this paper, broad money supply measured by M2, economic growth measured by GDP, and interest rate measured by 91-days Treasury bill rate are considered as proxy macroeconomic factors to explain the relationship with stock market performance. This paper hypothesize that there exists co-integrating relationship between macroeconomic factors and performance of Nepalese stock market. The co-integrating relationship between macroeconomic factors and stock market performance is examined by applying Autoregressive Distributed Lag (ARDL) bounds testing approach.

This paper aims to:

- investigate the co-integrating relationship between macroeconomic variables and performance of Nepalese stock market,
- examine the long-run impact of macroeconomic variables on performance of Nepalese stock market, and
- analyze the short-run impact of macroeconomic variables on performance of Nepalese stock market.

The remaining part of the paper has been divided into four sections. Section two presents the data description and methodology. Section three presents the result and discussion of the study, and finally, conclusion and implications are presented in section four.

II. DATA DESCRIPTION AND METHODOLOGY

Data description

The aim of this study is to analyze the co-integrating relationship between macroeconomic variables and stock market performance of Nepalese stock market. For this purpose broad money supply (M2), gross domestic product (GDP) and interest rate (IR) are taken as proxy of macroeconomic variables and market capitalization is taken as proxy of stock market performance (SMP). Similarly, 91-days Treasury bill rate is taken as proxy of interest rate.

The required data for this study are collected using various sources. The data related to stock market performance, i.e., market capitalization is collected from the annual report of NEPSE and Nepal Rastra Bank. Similarly, the data related to broad money supply (M2) and interest rate (IR), i.e., 91-days Treasury bill rate are collected

from quarterly economic bulletin published by Nepal Rastra Bank. Finally, data related to gross domestic product (GDP) are collected from the Economic Survey published by Ministry of Finance, Government of Nepal. Market capitalization of Nepalese stock market is not available before 1987/88. Thus, empirical analysis of this paper is based on annual time series data of 33 years i.e. form 1987/88 to 2019/20.

III. METHODOLOGY

This study has adopted Autoregressive Distributed Lag (ARDL) bounds testing approach to identify the co-integrating relationship between macroeconomic factors and stock market performance. At the first stage of ARDL approach the stationarity of the variables are examined using Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. In the second stage using Eviews software the lags of the ARDL model is selected automatically based on AIC. Similarly, in the third stage, the co-intgrating relationship between the macroeconomic variables and stock market perofrmance is examined using ARDL bound test. When variables are found to be cointegrated in the next stage the long-run and short-run model has been estimated. Finally, normality, serial correlation and heteroskedasticity are examined for diagnostic tests and stability of the model is ensured through CUSUM statistics. In this study stock market performance is considered as dependent variable and macroeconomic variables such as broad money supply (M2), gross domestic product (GDP) and interest rate (IR) are considered as explanatory variables.

Specification of the model

The co-integrating relationship between macroeconomic variables and stock market performance has been observed through ARDL model. At first, the ARDL bounds test is determined by utilizing Unrestricted Error Correction Model (UECM) of *Equation 1*.

$$\Delta SMP_t = \alpha_0 + \sum_{i-1}^{n} \alpha_1 \Delta SMP_{t-1} + \sum_{i-0}^{n} \alpha_2 \Delta Ln(M2)_{t-1} + \sum_{i-0}^{n} \alpha_3 \Delta Ln(GDP)_{t-1} + \sum_{i-0}^{n} \alpha_4 \Delta IR_{t-1} + \theta_1 SMP_{t-1} + \theta_2 Ln(M2)_{t-1} + \theta_3 Ln(GDP)_{t-1} + \theta_4 IR_{t-1} + \varepsilon_t \quad (1)$$

SMP_t is the stock market performance measured by equity market capitalization for year t, M2 represents the broad money supply for year t, GDP_t indicates the gross domestic product for year t, IR_t specifies the interest rate measured by 91 days Treasury bill for year t, Δ is the first difference, n is the optimum lag length, Ln is the natural logarithm, $\alpha_{0,}$ indicates intercept term, α_1, α_2, α_3 and α_4 are the short-run and θ_1, θ_2, θ_3 and θ_4 are the long-run coefficients, and ε_t represents the residual error term.

After identifying the co-integrating relationship between macroeconomic variables and stock market performance through ARDL bounds test, the long-run relationship between macroeconomic variables and stock market performance has been estimated by using *Equation 2*.

$$SMP_t = \theta_1 Ln(M2)_t + \theta_2 Ln(GDP)_{t-1} + \theta_3 Ln(IR)_{t-1} + \varepsilon_t \quad (2)$$

Finally, the short-run relationship between firm macroeconomic variables and stock market performance and speed of adjustment have been estimated by using Error Correction Model of *Equation 3*.

$$\Delta SMP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta SMP_{t-1} + \sum_{i=0}^{n} \alpha_2 \Delta Ln(M2)_{t-1} + \sum_{i=0}^{n} \alpha_3 \Delta Ln(GDP)_{t-1} + \sum_{i=0}^{n} \alpha_4 \Delta IR_{t-1} + \varepsilon_t \quad (3)$$

VI. RESULTS AND DISCUSSION

Unit root tests

In time series analysis, before running any test, variables must be tested for their stationarity. ARDL model also requires that variables do not have a unit root problem and order of integration of the variables should not be more than one or the variables should be I(0) or I(1). Thus, this study has determined the order of integration of all variables using the unit root tests. For this purpose, this paper has adopted ADF and the PP tests. The results of the unit root tests are given in *Table 1*.

Table 1
Unit root test at level and 1st Difference

Panel (A) Augmented Dickey-Fuller Test				
Variables	Data at Level		Data at 1st Difference	
	ADF t-stat	p-value	ADF t-stat	p-value
Ln(SMP)	-1.1585	0.6798	-4.5580*	0.0000
Ln(M2)	0.0275	0.9542	-3.6753*	0.0097
Ln(GDP)	-1.2533	0.6387	-4.0574*	0.0037
IR	-2.1277	0.2367	-5.3972*	0.0001
Panel (B) Phillips-Perron Test				
Variables	Data at Level		Data at 1st Difference	
	ADF t-stat	p-value	ADF t-stat	p-value
Ln(SMP)	-1.6955	0.4239	-5.3546*	0.0001
Ln(M2)	0.3549	0.9053	-3.6918*	0.0093
Ln(GDP)	-1.0860	0.7091	-4.0310*	0.0040
IR	-2.0733	0.2561	-10.1783*	0.0000

*Note. All variables are presented in logs excepect interest rate (IR). * denotes that result is signifcant at 1 percent level.*

Panel (A) of *Table 1* shows the result of Augmented Dickey-Fuller test and Panel (B) of Table 1 shows the result of Phillips-Perron test. As depicted in Panel (A) all the variables are not stationary in their level data. But, they are stationery in first difference at 1 percent level of significance. Likewise, Panel (B) of Table 1 shows that all the variables are not stationary in their level data and they become stationary in their first difference. Further, it is also observed that all the variables are stationary at 1 percent level of significance. Hence, the result of Table 1 indicates that all the varibles have no problem of unit root and they are stationary at first level difference i. e. they are stationey at I(1). Thus, the restut of unit root test of this study permits to apply ARDL model for determinig the co-integrating relationship among the variables.

ARDL estimates

After ensuring all the variables are stationary in their first level difference, i.e., I(1); ARDL model for macroeconomic variables and stock market performance has been estimated. While estimating ARDL model optimal numbers of lags are selected using Akaike Information Criterion (AIC). While selecting lags in ARDL model serial correlation, heteroskedasticity and normality should be considered (Pesaran et. al., 2001). Thus, this paper has considered all these criteria and concluded that the optimum lag length for p variable (the dependent variable, i. e., stock market performance) is 1 and the optimum number of lag of q variables (the independent variables) are 2 for q1 [Ln(m2)], 2 for q2 [Ln(GDP)], and 2 for (IR). In these lags there is no problem of serial correlation, heteroskedasticity and normality. The result of serial correlation, heteroskedasticity and normality are presented in *Table 5* and *Figure 1* respectively.

ARDL bounds test

ARDL bounds test has been applied to test whether the co-integrating relationship exists among the variables or not. The result of ARDL bounds test is presented in *Table 2.*

Table 2
ARDL bound test result

Computed F-Statistic	7.7933
1% critical bound Value	
I(0)	5.333
I(1)	7.063
5% critical bound Value	
I(0)	3.710
I(1)	5.018
10% critical bound Value	
I(0)	3.008
I(1)	4.15

Note. I(0) indicated the lower bound and I(I) indicates the upper bound

Table 2 shows the computed F-statistics is 7.7933 which exceed the upper bounds critical value of 7.063 at 1 percent level of significance. Thus, this study concludes that macroeconomic variables and stock market performance of Nepalese stock market are co-integrated. After the verified that the variables are co-integrated with each other, this paper further estimated the long-run relationship between macroeconomic variables and stock market performance.

ARDL long-run relationship

After ensuring that the variables are co-integrated; long-run coefficients of the ARDL model should be estimated to identify the impact of independent variables on dependent variable in long-run. Thus, this study has estimated long-run coefficients of the variables

under ARDL model. The result of the long-run relationship between macroeconomic variables and stock market performance is presented in *Table 3*.

Table 3
Result of long-run relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Ln(GDP)	11.5864	3.8117	3.0397*	0.0067
Ln(M2)	-7.3111	2.8352	-2.5787**	0.0184
IR	-0.1743	0.0753	-2.3132**	0.0321

Note. The values preseted in this table are the coefficient of ARDL long-run realtionship along with standard error and t-statistics. '' Indicates the results are signifciant at 1 percent level and '**' indicates the results are significant at 5 percent level.*

The result of *Table 3* shows that Ln(GDP) has significant positive, Ln(M2) and IR have significant negative coefficients. The coefficient of Ln(GDP) 11.5864 with t-statistics of 3.0397 (significant at 1 percent level) is observed. The significant positive coefficient of gross domestic product indicates that stock market performance of Nepal increases as the gross domestic product of the country increases. Thus, this result implies that there is a significant positive impact of gross domestic product on stock market performance of Nepal in long-run. On the other hand, Table 3 revealed the coefficient of Ln(M2) -7.3111 with t-statistics of -2.5787 (significant at 5 percent level). The negative and significant coefficient of broad money supply indicates that as the money supply in the economy increases, performance of Nepalese stock market decreases in long-run. This result suggests that there is a significant negative impact of broad money supply (M2) on performance of Nepalese stock market in long-run.

Similarly, the coefficient of IR -0.1743 with t-statistics of -2.3132 (significant at 5 percent level) is observed. The significant negative coefficient of interest rate implies that increasing the interest rate in the economy decreases stock market performance of Nepal in the long-run. Hence, there exists a significant negative impact of interest rate on performance of Nepalese stock market.

Finally, the long-run ARDL (1, 2, 2, 2) model of macroeconomic variables on stock market performance (SMP) is estimated as follows:

SMP = 11.8564 Ln(GDP) - 7.3111 Ln(M2) - 0.1743 IR

Error correction model

After identifying the long-run relationship between macroeconomic variables and stock market performance, ARDL error correction model (ECM) has been estimated to determine the short-run relationship and to confirm the reliability of the long-run coefficient. The result of error correction model is presented in Table 4.

Table 4 depicts the value of error correction term i.e. ECT(-1) is -0.5402 with t-value of -6.0079 which is significant at 1 percent level of significance. The negative and significant value of ECT -0.5402 indicates that the disequilibrium in short-run is corrected at the

speed of adjustment of 54 percent per year in the long-run. This implies that a deviation from the long-run equilibrium of stock market performance in one year is corrected by 54 percent over the following year by macroeconomic variable under the study. Furthermore, the coefficient of ΔLn(M2), one lag ΔLn(M2), and one lag ΔIR are observed positive and ΔLn(GDP), one lag Δ(GDP) and ΔIR are observed negative in short-run. Similarly, the coefficient of ΔGDP is observed negative with insignificant t-value.

Table 4
Result of error correction model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	-26.9242	4.5101	-5.9697*	0.0000
ΔLn(GDP)	-1.5460	1.5470	-0.9993	0.3302
ΔLn(GDP(-1))	-5.9827	1.3025	-4.593*	0.0002
ΔLn(M2)	2.4687	1.0549	2.3403**	0.0303
ΔLn(M2(-1))	6.1366	1.2908	4.7542*	0.0001
Δ (IR)	-0.0201	0.0185	-1.0872	0.2906
Δ (IR(-1))	0.0877	0.0238	3.6869*	0.0016
ECT(-1)*	-0.5402	0.0899	-6.0079*	0.0000
R-squared	0.7318	Akaike info criterion		0.0322
Adjusted R-squared	0.6464	Schwarz criterion		0.4059
F-statistic	8.5738	Hannan-Quinn criterion		0.1518
Prob(F-statistic)	0.0000	Durbin-Watson stat.		1.8849

Note. The values preseted in this table are the coefficient of error correction model along with standard error and t-statistics. '' Indicates the results are signifciant at 1 percent level and '**' indicates the results are significant at 5 percent level.*

Coefficient of one lag ΔGDP is negative and significant at 1 percent level of significance which indicates negative impact of one lag ΔGDP in stock market performance in short-run. Likewise, the coefficient of ΔM2 and one lag ΔM2 are positive and significant which implies that broad money supply has significant positive impact on stock market performance in short-run. The significant negative effect of GDP and significant positive impact of broad money supply on stock market performance in short-run is not similar as the coefficient of long-run. Finally, ΔIR shows insignificant negative coefficient and one lag ΔIR shows significant positive coefficient at 1 percent level of significance. The significant positive coefficient of one lag ΔIR is not similar as the result obtained in the result of long-run relationship which indicates one lag ΔIR has significant positive impact on stock market performance of Nepal in short-run.

Table 4 shows the value of adjusted R^2 0.7318 and F-statistics of 8.5738 ($p=0.0000<0.01$). The value of adjusted R^2 indicates that performance of Nepalese stock market is explained by 73.18 percent by the explanatory variables in short-run and value of F-statistics 8.5738 is significant at 1 percent level which indicates overall model of this paper is the best fitted model. Durbin-Watson statistics 1.8849 implies that there is no problem of autocorrelation.

Diagnostic tests for ARDL model

This study has performed a number of diagnostic tests to examine the reliability of the estimated ARDL model including serial correlation, heteroscedasticity, normality and stability of the model. Breusch-Godfrey Serial Correlation LM test, Breusch-Pagan-Godfrey of Heteroscedasticity test, Jarque-Bera test statistics and Recursive CUSUM test have been applied to test serial correlation, heteroscedasticity, normality and stability of the estimated ARDL model respectively. The results of serial correlation and heteroscedasticity are given in Table 5 and results of normality and stability of the model are presented in *Figure 1* and *2* respectively.

Table 5
Result of serial correlation and heteroskedasticity

Panel (A) Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.3635	Prob. F(2,11)	0.2824
Obs*R-squared	4.1471	Prob. Chi-Square(2)	0.1257
Panel (B) Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.5792	Prob. F(10,13)	0.8111
Obs*R-squared	7.0089	Prob. Chi-Square(10)	0.7246
Scaled explained SS	2.7564	Prob. Chi-Square(10)	0.9866

As result shown in Panel (A) of Table 5 the probability value of F-statistics and the probability value of Chi-Square for Breusch-Godfrey Serial Correlation LM test are greater than 0.05 which suggests that there is no problem of serial correlation (null hypothesis of no serial correlation is accepted). Similarly, result of Panel (B) of Table 5 shows probability value of F-statistics and probability value of Chi-Square for Heteroskedasticity test greater than 0.05. Since, probability value of F-statistics and Chi-Square value is greater than 0.05 which confirms that there is no problem of heteroskedasticity in the estimated ARDL model.

Similarly, normality of the residual terms included in the model is observed through the Jarque-Bera statistics. The result of normality of residual terms is presented in *Figure 1*.

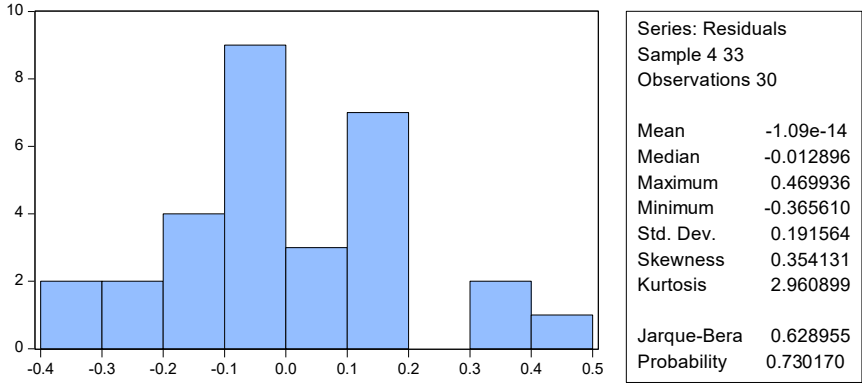

Figure *1.Plot of residual terms (normality test)*

Figure 1 shows that the Jarque-Bera test statistics of 0.6290 (p=0.7302>0.05). Thus, the value of Jarque-Bera test statistics fails to reject the null hypothesis that the residual series is normally distributed from the model. Therefore, it is conformed that the estimated ARDL model has no problem of normality.

Stability test of the model

Finally, stability of the model has been estimated by using cumulative sum (CUSUM) of the recursive residuals test at 5 percent level of significance. If the plots of CUSUM statistics lies within the critical bounds at 5percent level of significance than all co-efficient in the given model became stable. The result of the stability of the model is presented in *Figure 2*.

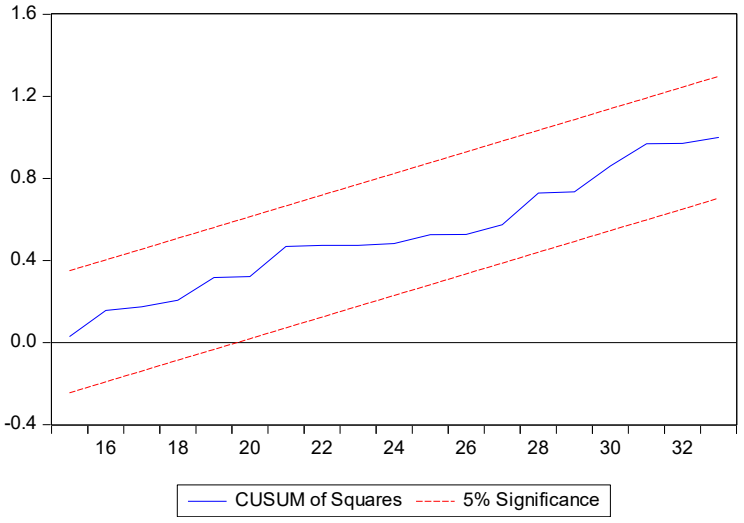

Figure 2. *Plot of recursive residual (CUSUM)*

Figure 2 shows the plot of CUSUM of square test along with the line of critical bounds at 5 percent level of significance. The straight lines represent the critical bounds at 5 percent significance level. As shown in Figure 2, the plots of CUSUM of square test lie within the critical bounds at 5 percent level of significance. Thus, it is confirmed that the estimated model is stable over the study period.

V. CONCLUSION AND IMPLICATION

Result of long-run relationship concludes the positve impact of GDP on stock market performance which implies that as GDP of the economy increases better stock market performance can be achieved in long-run. This result is similar as the findings of Bhatta and Mishra (2021) and Harcourt (2017) whereas it contradicts with result of Panta (2020). Further, this paper concludes the negative influence of broad money supply on stock market performance. It indicates that as money supply in the country increases, stock market may not perform well in long-run. This result is compatible with the findings of Humpe and Macmillan (2009), Ibrahim and Aziz (2003) and contradicts with the findings

of Panta (2020), John (2019), Etale and Eze (2019), Shrestha and Pokhrel (2019) and Devkota and Dhungana (2019), Wongbangpo (2002), Hanousek and Filler (2000), and Mookerjee and Yu (1997). Moreover, this paper also concludes the negative influence of interest rate on stock market performance. Negative impact of interest rate on stock market performance implies that stock market performance decreases with increase of interest rate of the economy. This finding confirms with the results of Panta (2020), Aryal (2020), John (2019), Shrestha and Pokhrel (2019), Etale and Eze (2019), Devkota and Dhungana (2019), Harcourt (2017), Khalid and Khan (2017), and Shrestha and Subedi (2014). Finally, this study also concludes that disequilibrium of stock market performance in short-run is corrected by macroeconomic variables (GDP, M2 & IR) in the long-run.

The findings of this paper can be implemented in formulation of monetary policy, financial policy and economic policy. Stock market policy makers should consider macroeconomic variables (gross domestic product, money supply, interest rate etc.) while formulating capital market policy for the better performance stock market and stock market development in Nepal.

REFERENCES

Aryal, P. (2020). Impact of macroeconomic variables on stock market price in Nepal. *Journal of Economics and Finance, 11*(5), 56-61.

Bhatta, G. P. & Mishra, A. (2021). Stock returns and gross domestic product in Nepal. *SEBON Journal, 8*(1), 1-19.

Bodie, Z. (1976). Common stocks as a hedge against inflation. *Journal of Finance, 31*(2), 459-470.

Chen, N. (1991). Financial investment opportunities and the macroeconomy. *Journal of Finance, 46(2),* 529-554.

Cheung, Y., & Ng, L. K. (1998). International evidence on stock market and aggregate economic activity. *Journal of Empirical Finance, 5*, 281-296.

Chung, S. K., & Shin, T. S. (1999). Cointegration and causality between macroeconomic variables and stock market returns. *Global Finance Journal, 10*(1), 71-81.

Clare, A. D., & Thomas, S. H. (1994).Macroeconomic factors, the APT and the UK stock market. *Journal Business Finance & Accounting, 21*(3), 309-330.

Devkota, T. P., & Dhungana, A. (2019). Impact of macro-economic variables on stock market in Nepal: An ARDL approach. *The Journal of Economic Concern*, *10*(1), 47-64.

Etale, L. M., & Eze, G. P. (2019). Analyzing stock market reaction to macroeconomic variables: Evidence from Nigerian Stock Exchange (NSE). *Global Journal of Arts, Humanities and Social Sciences*, *7*(3), 14-28.

Fama, E. F. (1981). Stock returns, real activity, inflation and money. *The American Economic review, 71*(4), 45-565.

Fama, E. F., & Schwert, G. W. (1977). Asset returns and inflation. *Journal of Financial Economics, 5*(2), 115-146.

Flannery, M. J., & Protopapadakis, A. A. (2002).Macroeconomic factors do influence aggregate stock return. *The Review of Financial Studies, 15*(3), 751-782.

Hanousek, J., & Filer, R. K. (2000). The relationship between economic factors and equity markets in Central Europe. *Economics of Transition, 8*(3), 623-638.

Harcourt, E. E. (2017). Macroeconomic variables and the performance of the Nigerian capital market. *International Journal of Managerial Studies and Research*, *5*(5), 13-23.

Hsing, Y. (2013). The stock market and macroeconomic factors in japan and policy implications. *International SAMANM Journal of Accounting and Finance*, *1*(1), 32-43.

Huang, P., Chen, S., Wei, W., & Elkassabgi, A. (2019). Influences of macroeconomic variables on stock market in China: An empirical analysis. *Journal of International Finance and Economics. 19*(4), 81-93.

Humpe, A., & Machmillan, P. (2009). Can macroeconomic variables explain long term stock market movements? A comparison of the US and Japan. *Applied Financial Economics*, *19*(2), 111-119.

Ibrahim, M. H., & Aziz, H. (2003). Macroeconomic variables and the Malaysian equity market a view trough rolling subsamples. *Journal of Economic Study, 30*(1), 6-27.
Jaffe, J. F., & Mandelker, G. (1976). The Fisher effect for risky assets: An empirical investigation. *Journal of Finance, 31*, 447-458.
Jeng, C. C., Butler, J. S., & Liu, J. T. (1990). The informational efficiency of the stock market: The international evidence of 1921-1930. *Economics letters, 34*(2), 157-162.
John, E. I. (2019). Effect of macroeconomic variables on stock market performance in Nigeria. *Journal of Economics, Management and Trade*, *22*(6), 1-14.
Kandir, S. Y. (2008). Macroeconomic variables, firm characteristics and stock returns: Evidence from Turkey. *International research journal of finance and economics*, *16*(1), 35-45.
Khalid, W., & Khan, S. (2017). Effects of macroeconomic variables on the stock market volatility: the Pakistan experience. International Journal of Econometrics and Financial Management, *5*(2), 42-59.
King, B. F. (1966). Market and industry factors in stock price behaviour. *Journal of Business, 39*(1), 139-190.
Kumar, A. (2011). An empirical analysis of causal relationship between stock market and macroeconomic variables in India. *International Journal of Computer Science & Management Studies, 11*(1), 2231-5268.
Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budget. *Review of Economics and Statistics, 47*(1*)*, 13-37.
Malliaris, A. G., & Urrutia, J. L. (1991). An empirical investigation among real monetary and financial variables. *Economics letters, 37*(2), 151-158.
Markowitz, H. (1952). Portfolio selection. *Journal of Finance*, *7*(1), 77-91.
Megaravalli, A. V., & Sampagnaro, G. (2018). Macroeconomic indicators and their impact on stock markets in ASIAN 3: A pooled mean group approach. *Cogent Economics & Finance*, *6*(1), 1-14.
Mookerjee, R., & Yu, Q. (1997). Macroeconomic variables and stock prices in a small open economy: The case of Singapore. *Pacific Basin Finance Journal, 5*(3), 377-388.
Mossin, J. (1966). Equilibrium in a capital asset pricing market. *Econometrica, 34*(4), 768-783.
Mukherjee, T. K., & Naka, A. (1995). Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error correction model. *The Journal of Financial Research, 18*(2), 223-237.
Panta, B. (2020). Macroeconomic Determinants of Stock Market Prices in Nepal*. Quest Journal of Management and Social Sciences*, *2*(1), 64-79.
Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.
Pethe, A., & Karnik, A. (2000). Do Indian stock markets matter? Stock market indices and macroeconomic variables. *Economic and Political Weekly*, 35(5), 349- 356.
Protopapadakis, A. A., & Flannery, M. J. (2002). Macroeconomic factors do influence aggregate stock return. *The Review of Financial Studies, 15*(3), 751-782.
Rakhal, R. (2018). Determinants of stock market performance. *NCC Journal*, *3*(1), 134-142.
Ross, S. (1976). The arbitrage pricing theory of capital asset pricing. *Journal of Economic Theory*, *13*(3), 341-360.
Sharpe, W. F. (1964). Capital asset pricing: A theory of market equilibrium under conditions of risk. *Journal of Finance, 19*(3), 425-441.
Shrestha, P. K. & Subedi, B. R. (2014). Empirical examination of determinants of stock index in Nepal. NRB working paper No. 24.
Shrestha, P. K., & Pokhrel, S. (2019). Factors affecting stock index in Nepal. *Sebon Journal*, 7, 33-52.
Sprinkel, B. (1964). *Money and stock prices*. Illinois: Richard D Irwin.
Tripathi, V., & Seth, R. (2014). Stock market performance and macroeconomic factors: the study of Indian equity market. *Global Business Review*, *15*(2), 291-316.
Wongbangpo, P. (2002). Stock market and macroeconomic fundamental dynamic interaction: ASEAN-5 countries. *Journal of Asian Economy*, *13*(1), 27-51.

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