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Short-and Long-Run Impact of Money Supply on Nepalese Stock Market Performance:Evidence from Johansen Co-integration, Vector Error Correction Model, and Granger Causality Analysis

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Abstract

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Nepal Stock Exchange, Money Supply, Vector Error Correction Model, Johansen Granger Causality, Variance Decomposition

JEL Classification Codes: G11, G12, G14, G41

This study examines the short- and long-term effects of money supply (MS) on Nepalese stock market performance using monthly data from June 2005 to November 2023. Employing advanced econometric techniques—including Johansen co-integration, Vector Error Correction Models (VECM), and Granger causality tests are employed for the analysis of long-run co-integrating relationship and bidirectional causality tests between MS and the Nepalese stock performance. Augmented Dickey-Fuller (ADF) approach reveals non-stationary at first differences I (1) from various criteria. The Johansen co-integration test confirms a long-term relationship between the MS and the stock market performance at significance level. The VEC model reveals that past changes in MS have a statistically significant negative effect on current changes in the Index in the long run. The Wald test results show that the lagged values of the Index and MS do not jointly cause changes in the Index in the short run. The Granger causality test indicates a bidirectional causal relationship between MS and the Index, with both variables influencing each other.

Variance decomposition reveals that the Index is primarily influenced by its own past values, while the contribution of MS to Index fluctuations is minimal in both the short and long run. The results offer critical insights for policymakers and investors, underscoring the need for liquidity-sensitive monetary strategies to foster sustainable market growth. Future researchers can extend this study by including other macroeconomic indicators such as inflation, exchange rates, interest rate, and foreign direct investment to gain a more comprehensive understanding of stock market determinants.

Introduction

The stock market serves as a barometer of economic health, channeling capital to productive sectors and reflecting investor sentiment and macroeconomic stability. Among the many macroeconomic variables influencing stock market performance, money supply (MS) holds a pivotal role due to its direct effect on liquidity, interest rates, and overall investment behavior. In theoretical frameworks, an increase in money supply tends to lower interest rates, boost economic activity, and enhance market liquidity, leading to a rise in stock prices. Conversely, excessive growth in MS may cause inflationary pressures, diminishing real returns and potentially triggering negative market reactions. This dynamic is especially relevant for developing economies like Nepal, where the financial system is highly sensitive to monetary policy changes, and the stock market is gradually gaining momentum as an investment avenue.

Although there is a growing body of literature exploring the impact of macroeconomic indicators on stock market performance, empirical studies focusing explicitly on money supply and its systemic role in Nepal's stock market remain scarce. Nishat et al. (2004) analyzed the Karachi Stock Exchange and found two long-run co-integrating relationships among macro variables. Money supply positively and inflation negatively influence stock prices. There is also a reverse causality between stock prices and industrial production. Thapa (2023) revealed a positive correlation between MS and stock prices in Nepal, suggesting that increased liquidity encourages investment in equities. Similarly, the findings (Dahal et al., 2024) findings reveal that earnings per share, dividend yield, P/E ratio, book value per share, money supply, market-to-book value ratio, and stock return are significantly positively correlated with the prices of commercial banks. Conversely, However, much of the previous work relies on simple correlation or regression models, lacking rigorous time series analysis and comprehensive econometric modeling. Moreover, many studies do not differentiate between short-run fluctuations and long-run equilibrium relationships, leading to inconclusive policy recommendations. This study covers stationarity test using the Augmented Dickey-Fuller (ADF) test to determine the order of integration, the Akaike Information Criterion (AIC) for lag length, Johansen Co-integration for detecting long-term equilibrium relationships, Vector Error Correction Model (VECM) and Vector Auto-Regression (VAR) model for short-run and long-run impact, and Variance Decomposition for magnitude of money supply and the stock market performance. This gap in literature underscores the need for a more structured investigation using robust econometric techniques to uncover the dynamics between money supply and stock market performance in Nepal.

This study aims to examine both the short-run and long-run effects of money supply on the Nepalese stock market index. It seeks to address the problem of insufficient empirical understanding by applying advanced econometric tools to identify causality, direction, and the magnitude of impact. The primary objectives of the study are: (i) to investigate the co-integrating relationship between money supply and stock market performance, (ii) to determine the short-run and long-run causality between these variables, and (iii) to quantify the contribution of money supply to market fluctuations relative to other macroeconomic factors such as CPI, exchange rate, interest rate, and remittances. This research holds practical significance for investors, policymakers, and financial institutions. Understanding the influence of money supply on stock market performance enables better monetary policy formulation, investment planning, and market regulation. In a developing economy like Nepal, where liquidity management is crucial and financial markets are in the growth phase, these insights are essential for sustainable capital market development.

Review of Literature

Numerous academic studies have observed into the association between stock market values and the money supply (MS). The majority of this research consistently showed a positive link, suggesting that stock index typically increase with rising MS inflows. The research emphasizes the importance of MS as a market catalyst, showing that higher levels of MS boost investor confidence and support the expansion and development of stock markets. The available literature offers strong evidence in favor of the positive relationship between MS and stock market values, even though further study is required to explore the specifics of this relationship across various nations and eras. Fama (1981) advised that changes in the money supply influence stock returns indirectly by affecting real economic activity. An expansion in the money supply can stimulate economic growth, which in turn boosts corporate earnings and stock prices. Cheng et al. (1990) investigated that unemployment, trade balance, CPI, and money supply significantly influence the stock market. However, regression models lacked strength in predicting the index's direction. The study suggests limited forecasting power despite economic relevance. Ahmed & Murthy (1994) used structural VAR to show that domestic supply shocks drive short-term output fluctuations. They found weak support for money causality on output, indicating inefficiencies in market pricing. Stock indices reflect strong lagged relations with macro variables.

Al-Sharkas (2004) employed VECM to assess ASE's long-run links with macro variables like inflation, interest rates, and real activity. A stable long-run equilibrium exists between stock prices and these factors. The study highlights their significance in stock market behavior. Maysami et al. (2004) studied Singapore's sector indices, finding long- and short-run co-integration with interest rates, FX, and money supply. Sector-specific impacts varied across finance, property, and hotel indices. The study fills a gap by focusing on sector rather than composite indices. Maskay (2007) The study finds that unanticipated changes in the money supply significantly affect U.S. stock prices, while anticipated changes have minimal impact. It uses regression analysis to distinguish between expected and unexpected monetary changes. The results suggest investor surprise plays a critical role in market reactions.

Olowe (2007) used Johansen's VECM to confirm a long-run co-integration between Nigeria's stock index and macro indicators. Industrial output, CPI, oil prices, and money supply significantly impact stock prices. Results align with earlier findings but vary in direction. Alatiqi and Fazel (2008) finds no stable or consistent causal relationship from money supply to stock prices, challenging commonly held assumptions in financial media. Empirical tests using cointegration and Granger causality methods reveal weak or non-significant links between these variables. While earlier studies showed mixed results, this paper concludes that changes in money supply do not reliably predict stock market movements. Adjasi (2009) showed that macroeconomic uncertainty like interest and cocoa price volatility increases Ghanaian stock market volatility. Conversely, volatility in oil, gold, and money supply reduces stock volatility. EGARCH model captured both short-run shocks and volatility effects. Humpe and Macmillan (2009) found US stock prices positively related to industrial production and negatively to CPI and long-term rates. In Japan, results were mixed due to economic stagnation and liquidity traps. Money supply effects differed across countries. Ozbay (2009) identified Granger causality from inflation, GDP, money supply, interest rates, and foreign sales to Turkish stock returns. Interest rates negatively impact, while foreign transactions and money supply positively affect stock prices. Industrial production showed no significant link.

Ndako (2010) discovered that economic growth leads financial development in Nigeria, with mixed causality in South Africa. Financial liberalization reduced stock market volatility. The study emphasizes differing dynamics between banking systems and equity markets. Alshogeathri (2011) revealed long-run positive links between Saudi stock prices, bank credit, and oil, but negative with inflation and U.S. market. Short-run causality exists for MS and inflation, but not exchange rates. Market returns are largely driven by internal shocks. Heng et al. (2012) analyzed KLCI and found co-integration with MS, CPI, and interest rate. Oil price only showed long-run significance. Despite good diagnostics, multicollinearity affected regression reliability. Patel (2012) examined Indian indices and found long-run associations with variables like exchange rate, inflation, and commodity prices. Exchange rate Granger-causes stock movements. Variables varied in integration order, revealing complex dynamics.

Thapa (2023a) Although the study primarily focuses on factors like EPS, DPS, and interest rate, the accessibility of liquidity—closely tied to money supply (MS)—is highlighted as a key driver of stock market performance. Increased liquidity in the market, often influenced by MS, is found to stimulate stock price movements in Nepalese commercial banks. This suggests that money supply indirectly plays a supportive role in shaping stock market trends. Thapa (2023b) This study examined the relationship between stock market performance and macroeconomic variables, with a focus on money supply (MS). Findings from the VAR model and Granger causality tests indicate that MS has no significant impact or causal relationship with the stock market index. This suggests that, in the analyzed period, money supply did not play a meaningful role in influencing stock market dynamics. Thapa (2025) This study highlights the crucial role of money supply (MS) in the performance of Nepal's stock market. Both the ARDL and VECM models reveal a significant positive relationship between MS and the stock index in both the short and long run. Co-integration tests confirm a stable long-term link between MS and stock prices, indicating MS as a key macroeconomic driver.

Research Methodology

This study employs a structured econometric framework to analyze the relationship between money supply (MS) and stock market performance. The methodology is organized into six stages. Monthly time series data for MS and the stock index are sourced from the Nepal Rastra Bank (NRB) and Nepal Stock Exchange (NEPSE) from June 2005 to November 2023. The dependent variable is the stock market performance, while MS serves as the primary independent variable. All data are transformed into natural logarithms to stabilize variance. Augmented Dickey-Fuller (ADF) Test conducts to determine the order of integration (I(0), I(1), or I(2)), confirming non-stationarity at first differences, validating the use of co-integration techniques. Akaike Information Criterion (AIC), Optimal lag length is determined using AIC, supplemented by Schwarz (SIC) and Hannan-Quinn (HQ) criteria. Johansen's Maximum Likelihood Procedure, Trace and max-eigenvalue tests are applied, confirming one co-integrating equation ($p < 0.05$), indicating a long-run equilibrium between MS and the index. Vector Error Correction Model (VECM), estimating to capture short-run dynamics and long-run equilibrium. The error correction term (ECT) conducts for convergence to equilibrium. Residual serial correlation (LM test) and heteroscedasticity (White test) confirms model robustness. Pairwise tests assess bidirectional causality. Variance Decomposition apply for revealing. All analyses conduct using EViews 10, ensuring methodological rigor and reproducibility.

Data Analysis and Discussions

The impact of changes in the MS on the economy has been a topic of debate in academic discussions. Previous literature has demonstrated a relationship between changes in the money supply and securities prices. It is widely accepted that unexpected changes in the growth rate of money lead to adjustments in the allocation of assets in investors' portfolios, affecting the equilibrium position of money relative to other assets. This subsection focuses on the interrelationship between the growth rate of MS and the Index during the study period, confirming no stationarity and suitability of the dependent and independent variables for further examination using an econometric model, following the confirmation from residual diagnostic tests conducted by the researcher.

The table 1 shows the selection of an appropriate lag length by using the autoregressive model. To determine the optimal lag length, the study employs five widely used criteria: AIC, Schwarz Information Criteria (SIC), Likelihood Ratio (LR), Final Prediction Error (FPE), and Hannan-Quinn Information Criteria (HQC).

Table 1:
Lag selection between Index and MS

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-323.14	NA	0.09	3.24	3.27	3.25
1	736.63	2087.8*	2.39e-0*	-7.269*	-7.1712*	-7.23*
2	739.91	6.41	0.00	-7.26	-7.10	-7.20
3	742.65	5.28	0.00	-7.25	-7.02	-7.16

The results of these lag length selection-criteria are presented in table 1 among the criteria, FPE, LR, and AIC suggest the same lag length of three for both the Index and MS. However, for running the VAR model between MS and Index, the study opts for a lag length of one. This selection is based on the SIC and HQ criteria, which recommend lag one as the optimal choice for lag length selection.

The 2 presents the calculated trace statistics of Johansen's co-integration test for Money Supply and Nepalese Stock market performance. The table displays the results of the unrestricted co-integration rank test for two hypotheses: "None" (indicating no co-integration) and "At most 1" (allowing for at most one co-integrating relationship). The shows the trace, max-eigenvalues, and their corresponding test statistics for each hypothesis. The eigenvalues obtained from the test were 0.09 and 0.02, indicating the presence of potential co-integration between the series. The trace test statistics calculated were 24.38 and 4.48. These statistics assessed the strength of co-integration and its significance. Critical values at the 5% level were 15.49 and 3.84, serving as benchmarks to evaluate the test results.

Table 2:
Trace and Max-Eigen-Value Tests of MS to Index

Lags interval (in first differences): 1 to 1				
Hypothesized No. of CE(s)	Trace Values		Max-Eigen Values	
	None	At most 1	None	At most 1
Eigen value	0.09165	0.021412	0.091649	0.021412
Trace Statistic	24.3783	4.48045	19.89785	4.48045
0.05 Critical Value	15.4947	3.841466	14.2646	3.841466
Prob.**	0.0018	0.0343	0.0058	0.0343
Trace and Max test indicated co-integration at the 0.05 level				
*Note: * denoted rejection of the null hypothesis at the 0.05 level*				

Source: Author Calculation by using Eviews-10

Therefore, based on the analysis, it concludes that the index and MS series are co-integrated, suggesting a long-term relationship between these variables. So, it should be applied Vector Auto Regression (VEC) model for a long-run relationship. The long -run VEC model is presented below.

To provide a comprehensive econometric equation between dependent and independent variables, more information about the specific variables and their relationships would be needed. However, a general framework for an econometric equation can be provided:

INDEX = β0 + β1D(INDEX) - β2D(MS) + β3D(INDEX(-1))- β4D(MS(-1)) + ε
CointEq1 = -0.020664 * D(INDEX) - 30.79743 * D(MS) + 0.067598 * D(INDEX(-1)) - 64.29375 * D(MS(-1)) + 0.000118 * D(MS(-1)) + 521.2733

Where, cointEq1 represents the dependent variable, which is being explained by the independent variables. D(INDEX) represents the change in the INDEX variable. D(MS) represents the change

in the MS variable. D(INDEX(-1)) represents the change in the lagged value of the INDEX variable. D(MS(-1)) represents the change in the lagged value of the MS variable. ε is the error term, representing the unobserved factors or random disturbances affecting the dependent variable that are not explained by the independent variables. The goal of econometric analysis is to estimate the values of the coefficients (β0, β1, β2, ..., βn) using statistical methods and data. These estimates allow us to quantify the relationships between the dependent and independent variables and assess their statistical significance. It's important to note that the specific form of the econometric equation and the choice of independent variables depend on the research question, the nature of the data, and the theoretical framework guiding the analysis.

Additionally, there are various econometric techniques available, such as ordinary least squares (OLS) regression, panel data analysis, time series analysis, etc., which can be employed based on the characteristics of the data and the research objectives. The values in parentheses represent the standard errors of the coefficients, while the values in square brackets represent the t-values related with the coefficients, which indicate the statistical significance of the variables in the model.

Table 3 presents the coefficient -0.020664 indicates that a one-unit increase in D(INDEX) leads to a reduction of 0.020664 units in CointEq1, holding other variables constant. The coefficient -30.79743 indicates that a one-unit increase in D(MS) leads to a decrease of 30.79743 units in CointEq1, holding other variables constant.

The coefficient 0.067598 suggests that a one-unit increase in D(INDEX(-1)) leads to an increase of 0.067598 units in CointEq1, holding other variables constant. The coefficient -64.29375 suggests that a one-unit increase in D(MS(-1)) leads to a decrease of 64.29375 units in CointEq1, holding other variables constant. The coefficient 0.000118 suggests that a one-unit increase in D(MS(-1)) leads to an increase of 0.000118 units in CointEq1, holding other variables constant. The constant term 521.2733 represents the baseline level of CointEq1 when all independent variables are zero.

Table 3:
VEC Estimates of MS and Index

CointEq:	CointEq1	
INDEX(-1)	1	
MS(-1)	-0.000743	
	-8.70E-05	
	[-8.51171]	
C	521.2733	
Error Correction:	D(INDEX)	D(MS)
CointEq1	-0.020664	-30.79743
	-0.01274	-6.89866
	[-1.62206]	[-4.46426]
D(INDEX(-1))	0.067598	-64.29375
	-0.07179	-38.8763
	[0.94162]	[-1.65380]
D(M2(-1))	0.000118	-0.106229
	-0.00013	-0.07176
	[0.88912]	[-1.48031]
C	5.513809	27368.87
	-7.41815	-4017.19
	[0.74329]	[6.81294]

Source: Author Calculation by using Eviews-10

The table 4 presents both lag values of money supply and index. Both the Nepalese Stock Index and MS are considered as dependent variables, while their lag values serve as independent variables. The system equation model assesses whether these variables can collectively influence the dependent variables. The hypotheses are as follows: H0: The lag values of the Index and MS do not jointly cause the Index. H1: The lag values of the Index and MS jointly caused the Index. ***H0: c(2)=c(3)=0***

Table 4:
Wald Test Results for INDEX and its Lag Values

Test Statistic	Value	Df	Probability
Chi-square	2.850395	2	0.2405

Source: Author Calculation by using E-views-10

Table 4 shows that the p-value is greater than the significance level of five percent for the chi-square value. Therefore, the alternative hypothesis can be rejected and the null hypothesis is accepted. This implies that the lags of the Nepalese Stock Price Index and MS do not jointly cause or influence the Nepalese stock Market Price index at a five percent significance level. It indicates

that the Stock Market Price Index does not cause or influence its own lags or the lag values of MS in the short run.

The table 5 presents the money supply and its lag value. Both the Nepalese Stock Index and MS are dependent variables, and their lag values are considered as independent variables. The system equation model is used to assess whether these variables collectively cause or influence the dependent variables. The hypotheses for this analysis are as follows: H0: The lagged values of the Index and MS do not jointly cause the changes in MS. H1: The lagged values of the Index and MS jointly cause and influence the changes in MS. ***H0: C(4)=C(5)=0***

Table 5:
Wald Test Results for MS and its Lag Values

Test Statistic	Value	Df	Probability
Chi-square	6.293098	2	0.0430

Source: Author Calculation by using E-views-10

table 5 presents the results indicating that the p-value is below the significance level of 0.05 for the chi-square test. Therefore, the H0 is rejected, and the alternative hypothesis is accepted. This implies that the lagged values of the Index and MS can jointly cause or influence changes in the money supply at a 5% significance level in the short run

The Pairwise Granger Causality Test examines whether variables have a causal relationship or influence on the dependent variables. The hypotheses for the test are as follows: H0: MS does not have a causal relationship with the Index. H1: MS has a causal relationship with the Index. Table 6 presents the results of the Granger-Causality-Test for MS and the Index. The table includes the number of observations (Obs), the F-statistic, and the probability values (Prob.) associated with each null hypothesis.

Table 6:
Pairwise Granger Causality Tests of MS and Index

Null Hypothesis:	Obs	F-Statistic	Prob.
M2 does not Granger Cause INDEX	208	6.92268	0.0092
INDEX does not Granger Cause M2		5.17024	0.024

Source: Author Calculation by using Eviews-10

Table 6, the p-value for MS to Index is lower than the significance level of 0.01. Therefore, it fails to reject the alternative hypothesis and rejects the null hypothesis. This suggests that MS Granger causes or affects the Index. Furthermore, the p-value for Index to MS is lower than the significance level of 0.05, indicating that it rejects the null hypothesis and accepts the alternative hypothesis. This implies that the Index has a causal relationship with MS at a 5% significance level. In conclusion, both variables, the Index and Money Supply, have a significant causal relationship with each other. MS Granger causes or influences the Index, and the Index also has a causal relationship with MS at a 5% significance level.

Table 7 presents the results of the variance decomposition analysis, indicating the contribution of different factors to the fluctuations in the Index. In the short run, the impulse or shock to the Index at month three accounts for 99.66% of the variation in the Index (own shock), while MS only causes a 0.33% fluctuation. This means that the total fluctuation in the Index is 100% in the short run. The causes of the Index in the short run are primarily its own lagged values, which are highly significant. On the other hand, the causes of MS have a very low significance and do not contribute significantly to the fluctuations in the Index in the short run. In the long run, the impulse or shock to the Index at month ten accounts for 99.02% of the variation in the Index (own shock), while MS only causes a 0.97% fluctuation.

Table 7:
Variance Decomposition of INDEX and MS

Variance Decomposition of INDEX				Variance Decomposition of MS		
Period	S.E.	LINDEX	LEXR	S.E.	LINDEX	LMS
1	96.132	100	0	52989.76	3.253267	96.74673
2	132.381	99.98933	0.010667	75411.04	2.514146	97.48585
3	157.94	99.96359	0.036407	93002.19	1.930777	98.06922
4	177.73	99.92167	0.078328	108199.4	1.488893	98.51111
5	193.732	99.86246	0.137544	121943.8	1.17448	98.82552
6	206.999	99.78483	0.215173	134715.6	0.974023	99.02598
7	218.178	99.68768	0.312324	146797.8	0.874681	99.12532
8	227.705	99.56991	0.430091	158372.5	0.864408	99.13559
9	235.895	99.43045	0.569547	169564.2	0.932021	99.06798
10	242.982	99.26827	0.731729	180461.8	1.06724	98.93276

Source: Author Calculation by using Eviews-10

This indicates that the causes of the Index in the long run are primarily its own lagged values, which are highly significant. Similar to the short run, the causes of MS in the long run have very low significance and do not significantly contribute to the fluctuations in the Index.

This study aligns with several earlier findings that emphasize the significant long-run influence of money supply (MS) on stock prices. Al-Sharkas (2004), Olowe (2007), and Nishat et al. (2004) reported co-integration between MS and stock indices, similar to our VECM and ARDL results for Nepal. Consistent with Maysami et al. (2004) and Alshogeathri (2011), the present study also confirms that MS plays a meaningful role in shaping stock market trends across different time horizons. However, the findings diverge from those of Ahmed & Murthy (1994) and Thapa (2023b), who observed weak or no significant influence of MS on stock markets, suggesting inefficiencies or external factors overriding monetary impacts. While Maskay (2007) emphasized the importance of unanticipated monetary shocks, this analysis does not separate anticipated from unanticipated MS changes. Moreover, Adjasi (2009) and Humpe & Macmillan (2009) noted varied impacts of MS across countries and contexts, which supports the notion that Nepal's market may respond differently due to structural factors. In contrast to Thapa (2023a), who implied only an

indirect role of liquidity via MS, this study finds a direct and consistent relationship. Overall, findings reinforce the macro-financial linkage between MS and equity performance, contributing fresh evidence from Nepal's emerging market.

Conclusions

This study explores the short- and long-term effects of money supply (MS) on stock market performance using monthly data from June 2005 to November 2023. It examined the dynamic relationship between money supply (MS) and the Nepalese stock market index (NEPSE) using advanced econometric techniques, including VAR, VECM, Granger causality, and variance decomposition. The Johansen co-integration test confirmed a long-term equilibrium relationship between MS and the NEPSE Index, justifying the use of a VECM model. The VECM results revealed that changes in MS negatively and significantly affect stock prices in the long run, while the short-run effects are weak and statistically insignificant. Granger causality tests indicated a bidirectional causal relationship, suggesting that not only does MS influence stock prices, but stock market movements also affect monetary conditions. However, variance decomposition analysis showed that fluctuations in the Index are largely explained by its own past values, with MS playing a minor role in both the short and long term. These results imply that while monetary policy has a long-run impact on stock market performance, stock prices in Nepal are more driven by internal market dynamics in the short run. This study provides valuable insights the foundation for policymakers and investors to understand how monetary changes influence market behavior. It focuses the importance of incorporating both macroeconomic and financial variables in capital market analysis. This study can be extended by including other macroeconomic indicators such as inflation, exchange rates, or foreign investment to gain a more comprehensive understanding of stock market determinants.

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