Original Research Article

Macroeconomic Determinants of the Stock Market in Nepal: An Empirical Analysis

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Abstract

The stock market plays a critical role in the field of the economic sector of a country, facilitating capital flow to businesses and reflecting the national economic health. The purpose of this study was to conduct an empirical analysis of co-integration and causality tests between the stock market and macroeconomic factors. The study used indicators such as the consumer price index (CPI), exchange rates (EXR), money supply (MS), and remittances (REMIT) to determine their potential impact on stock market dynamics. To analyze the data collected from June 2005 to November 2023, advanced econometric models like co-integration were employed to explore long-term equilibrium. Vector auto-regression (VAR) was used to analyze the impact and Grangers' causality tests were used to identify cause and effect. The results of the VAR model emphasized the market index's (INDEX) dependency on its own lagged values, with insignificant influence from consumer prices (CPI) and money supply (MS), but significant effects from exchange rates (EXR), and remittances (REMIT). Granger causality tests revealed no causality between CPI, MS, and REMIT in the INDEX. But this test exhibited a significant causality from EXR to INDEX. This highlights the predictive power of exchange rates on the stock market.

Introduction

The stock market serves as a critical component of the financial system, acting as a pipe for channeling capital to listed companies and playing a pivotal role in national economies. Its significance lies not only in providing diverse investment opportunities but also in reflecting and influencing the overall economic growth of a nation (Lal et al., 2013). Investors, policymakers, economists, managers, and researchers rely on stock market and economy indicators to make informed decisions and understand the intricate dynamics of financial markets. The behavior of the stock market is intricately linked to the number of buyers and sellers. Market performance is heavily influenced by the balance between demand and supply, when demand exceeds supply, stock prices rise, and vice versa (Fama, 1981). The movements in the stock market are reflected in varying stock returns over time, with bullish and bearish markets marking periods of optimism and pessimism, respectively. The total transactions in the stock market reflect its liquidity and indicate its fluctuations.

Microeconomics, by way of a branch of economics, involved a detailed exploration of specific company details such as earnings, dividends, and financial ratios (P/E, debt/equity) to gain valuable financial insights. Research studies, such as Benishay (1961) and Sharma (2011), have delved into the impact of dividends, earnings, and various factors affecting stock prices. On technical analysis employs tools like moving averages, relative strength index, and Elliott wave analysis to forecast market trends based on statistical indicators and behavioral finance (Alves, 2015; Vaiz et al., 2016). This multidimensional approach demonstrates the intricate nature of understanding stock market complexities. The complexity of these interactions requires a comprehensive analysis that considers both micro and macroeconomic perspectives. Macroeconomics, on the other hand, considers broader economic indicators such as GDP, interest rates, money supply, T-bills, remittance, foreign exchange rate, and inflation. Numerous studies, including (Eldomiaty et al., 2020; Heng et al., 2012; Hussainey & Khanh Ngoc, 2009; Iqbal et al., 2014; Kaur & Chaudhary, 2022; Naka et al., 1998; Rjoub et al., 2009; Rahman et al., 2009) have explored the influence of these macroeconomic factors on stock markets across different regions. Economic news, particularly related to interest rates and inflation, has been identified as a significant influencer of stock prices. In the context of Nepal, this study aims to bridge the existing gap in research by focusing on the association between macroeconomic factors and the stock market. The chosen macroeconomic variables for this study include INDEX, CPI, EXR, MS, and REMIT, which could be economic indicators (like indexes, consumer price index, exchange rates, money supply, remittances etc.). These variables are selected based on their potential implications for driving stock market dynamics in the Nepalese context.

This research paper investigated the influence of macroeconomic determinants on the stock market in Nepal through empirical analysis, focusing on key variables such as GDP, inflation rates, interest rates, and foreign exchange rates, to understand their impact on market performance. Firstly, researcher examined the connection between the stock market's current performance and its past (lagged) values. Additionally, it extended this inquiry to explore whether the Nepalese stock market maintains a long-run affiliation with macroeconomic variables. The inquiry of researcher delved into the fundamental relationship between the stock market and macroeconomic factors. This aspect of the research is crucial for understanding the direction of influence—whether economic indicators can forecast stock market movements or if the stock market's performance is a precursor to changes in economic conditions. Unraveling this causality could significantly impact economic forecasting and strategic investment planning in Nepal.

This research delved into the intricacies of the Nepalese stock market, aiming to uncover the key determinants that drive its performance. The substantial investigation is the analysis of the impact of lagged market values on current performance, offering insights into predictive trends. Additionally, it seeks to understand the long-run equilibrium between the stock market and macroeconomic factors, such as GDP growth, inflation, and interest rates, to ascertain their influence on market dynamics. A pivotal aspect of the study also included examining the causal relationships between these macroeconomic factors and the stock market, shedding light on the direction and magnitude of their interactions.

The inspiration behind this study stems from a keen interest in unraveling the complex dynamics of the Nepalese stock market, an area that remains relatively underexplored in financial literature. By identifying the impact of lagged values, assessing the long-term equilibrium with macroeconomic factors, and elucidating the causality between these elements, this research aims to bridge critical knowledge gaps. For the researcher, this presents a unique opportunity to contribute significantly to the field of financial economics, particularly within the context of emerging markets. The findings hold the potential to inform policy-making, enhance investment strategies, and foster a deeper understanding of the interplay between economic indicators and stock market performance, thereby underscoring the study's significance. The study incorporated the abstract, introduction, literature review, research methodology, discussions, conclusions, and findings to attain the objectives of the research.

The limitations of the study include its exclusive focus on Nepalese stock market, limiting broader applicability, and a selective set of macroeconomic variables that may not provide a comprehensive analysis. The data timeframe (June 2005 - November 2023) might not capture developing economic conditions or future market dynamics. Methodological based on specific econometric models could limit the insights gained, and the

distinction between causality and correlation may not fully represent direct economic relationships. Moreover, the analysis might not account for unexpected market dynamics or external shocks affecting stock market performance.

Literature Review

The connection between stock markets and macroeconomic variables has been a subject of ongoing discourse lacking a unified theoretical framework. Acknowledged, however, is the significant influence of economic conditions on predicted stock returns and discount rates? Numerous methodologies explore the impact of factors such as CPI, EXR, MS, and REMIT on stock market growth. The theoretical foundation dates back to the 1950s, with subsequent studies adding depth to our understanding.

Akaike (1974) proposed the Akaike Information Criterion (AIC) as a model selection metric, emphasizing its effectiveness in balancing goodness of fit with model complexity. Fama (1981) explored the efficient market hypothesis (EMH), categorizing information reflection in stock prices into weak, semi-strong, and strong forms, based on past prices, public announcements, and all available information. His next work investigated the influence of macroeconomic factors like GDP, industrial production, money supply, and interest rates on stock markets, emphasizing their effect on investor sentiment and highlighting global trends in international markets. The findings suggested that most of these macroeconomic variables have substantial impacts on the stock market indexes to varying degrees. Engle and Granger (1987) elucidated co-integration and error correction models, detailing their estimation and testing. Co-integration, indicating a long-run equilibrium among non-stationary time series, is explored through a representation theorem and an efficient two-step estimator. Seven co-integration tests are evaluated, with recommendations based on Monte Carlo simulations. Empirical findings validate co-integration in specific economic relationships. Garcia and Liu (1999) focused on stock market growth, finding significant influences from real income, saving rates, financial intermediaries, and stock market liquidity. Hamilton and Susmel (1994) informed that many economic and social processes have effects that unfold over time. Lagged factors allow researchers to capture these dynamic responses and understand how the impact of a variable evolves. Johansen (1995) explored co-integration vectors, providing a likelihood-based estimation method. Naka et al. (1998) examined the Vector Error Correction model, revealing associations between macroeconomic variables and the Indian stock market.

Al-Sharkas (2004) observed the long-term equilibrium link between stock prices and particular macroeconomic variables. The study examined several macroeconomic variables using the vector error correction model (VECM). The variables are real economic activity, inflation, the money supply, and interest rates. The empirical findings revealed a long-term equilibrium association between stock prices and macroeconomic factors. Rahman et al. (2009) analyzed the macroeconomic variables with Malaysian stock prices using a VAR framework, revealing co-integration. Hosseini et al. (2011) discussed four macroeconomic variables in China and India, finding short- and long-run equilibrium with the stock market. Muthike and Sakwa (2012) analyzed the Nairobi Stock Exchange, identifying leading indicators and correlations with macroeconomic indicators.

Shrestha and Subedi (2014) analyzed NEPSE data from August 2000 to July 2014, using dummy variables to capture political and NRB shifts. Their correlation analysis exposed strong links between Consumer Price Index, Broad Money, Treasury Bill Rate, and NEPSE index. NEPSE responded positively to inflation and broad money but negatively to Treasury bills. Fan et al., (2018) explored the causal relationship between stock markets and Chinese housing, employing wavelet analysis. The results showed that housing prices and stock prices have positive effects. Furthermore, the positive effect of the stock prices shows a positive effect on housing prices. Thapa (2019) investigated factors affecting stock prices in Nepalese commercial banks (2008-2018), using financial data and questionnaires. A linear regression model exhibited dividends, earnings per share, regulations, company profiles, market rumors, and investor luck positively impact stock prices, while price-to-earnings ratios and interest rates negatively affect them. Liquidity accessibility was found to enhance market performance. Lingaraja et al. (2020) assessed stock market movements and connections between Asian emerging markets and developed markets, identifying short-term relationships. Naik and Reddy (2021) examined the effect of macroeconomic factors on the liquidity of the Indian stock market, finding significant impacts. Collectively, these studies contribute to the

understanding of the intricate relationship between stock markets and macroeconomic variables, offering insights into various methodologies, theoretical frameworks, and empirical findings across different economic contexts. Bhattarai et al. (2021) investigated the relationship between stock market development and economic growth in Nepal using an ARDL model with bound testing procedures. The analysis spans from 1994 to 2019 annual data. Findings indicated a one-way causality from the stock market development index to economic growth. liquidity plays a significant role in mobilizing the capital market. Inflation does not significantly impact the capital market.

Previous research on the Nepalese capital market has been limited in its focus on specific macroeconomic variables, whereas the extensive analyses seen in international markets. This study seeks to address this gap by examining crucial factors such as Inflation, money supply, exchange rate, and remittance using modern econometric models like Vectors Auto-regressive (VAR). While previous studies in emerging economies have explored microeconomic-stock market links, this research aims to uncover the simultaneous impact of broader economic variables on Nepalese stock market. By establishing causal relationships, this study seeks to enrich existing knowledge, providing valuable insights into Nepal's stock market dynamics for investors, policymakers, and stakeholders.

The study reviews relevant theories, develops hypotheses based on previous research, describes a research design and statistical techniques, performs data analysis using various tests and models, and interprets empirical findings to understand stock market dynamics influenced by macroeconomic factors in Nepal. Based on the research questions and objectives, the following research hypotheses can be developed for empirical research on stock and macroeconomic factors: These hypotheses are aligned with the research methodology and guide the analysis and interpretation of the empirical data:

H0: *There is no relationship between the current values of variable with the past values (lagged values) of the variables.*

H0: *There is no long-run relationship between the stock market and selected macroeconomic factors.*

H0: *There is no causal relationship between the stock market and macroeconomic factors.*

Research Methodology

The study utilized quantitative research methodology. The study employed secondary data. The data collected from NEPSE, NRB, SEBON, World Bank, and listed company financial statements from June 2005 to November 2023. Around 310 observations gathered using a judgmental sampling method, ensuring relevance and significance of selected macro variables. The study employed quantitative analysis to understand the factors that affect the performance of the stock market. Data analysis employed on the Excel, and Eviews-10 for time series regression analyses. The study used inferential statistics to explore long-term and causal relations between macroeconomic variables and the stock market. Through an econometric model, it examines how selected macroeconomic indicators influence stock prices, aiming to gauge their impact and causal links.

The study uses an econometric technique called the auto-regression model to examine the relation between equity market and macroeconomic variables in time series data. To estimate the unknown parameters in a linear regression model, the study also utilizes a method called Ordinary Least Squares (OLS). OLS evaluates by finding the best-fitting line that minimizes the sum of the squared differences between the actual values of the dependent variable (Stock market) in the dataset and the values predicted by the linear function. By applying these methods, the study aims to test the hypothesis and draw conclusions about the relationship between Stock market and macroeconomic variables. Based on the research objectives, here is a suggested sequential order for the research tools are employed such as stationary tests, lag selection criteria, co-integration, VAR tests, and granger causality tests.

Results and Discussions

The researcher employed the econometric analysis, on the variables like LINDEX, LCPI, LEXR, LMS, and LREMIT, which could be economic indicators (like lagged indexes, consumer price index, exchange rates, money supply, remittances, etc.). The tests are conducted under the assumption of a linear deterministic trend, and the

analysis is based on a specific lag interval. The table 1 exhibited the results from co-integration tests, specifically the Trace test and the Maximum Eigenvalue test. These tests are employed to determine whether there exists a long-term equilibrium relationship among several time series variables.

Table 1: *Trace and Max-Eigen Value Tests of MS, EXR, CPI, REMIT to Index Lags interval (in first differences): 1 to 1 Unrestricted Co-integration Rank Test (Trace)*

Hypo No. of CE(s)	Trace Values					Max-Eigen Values				
	None	At most1	At most2	At most3	At most 4	None	At most1	At most2	At most3	At most4
Eigenvalue	0.123	0.068	0.051	0.028	0.003	0.123	0.068	0.051	0.028	0.003
Trace Statistic	55.207	29.816	16.231	6.078	0.666	25.391	13.585	10.153	5.413	0.666
5% Critical Value	69.819	47.856	29.797	15.495	3.841	33.877	27.584	21.132	14.265	3.841
Prob.**	0.410	0.728	0.696	0.686	0.415	0.359	0.850	0.730	0.689	0.415

Trace and Max test indicate no co-integration at the 0.05 level

*Note: **MacKinnon-Haug-Michelis (1999) p-values*

Source: Author Calculation by using Eviews-10

Table 1 revealed that the Trace Statistic is 55.21, which is less than the 5 percent Critical Value of 69.82. Similarly, the Max-Eigen Statistic of 25.39 is less than its Critical Value of 33.88. Therefore, researcher do not reject the null hypothesis. This pattern continues for "At most 1", "At most 2", "At most 3", and "At most 4" - in each case, both the Trace Statistic and the Max-Eigen Statistic are lower than their respective Critical Values. Given these results, it fails to reject the null hypothesis for all hypothesized numbers of co-integrating equations. Therefore, the test indicates no co-integration at the five percent significance level. In this situation, researcher do not allow to apply VEC model, it should adopt the VAR model.

Vector Auto-regression Estimation

Table 2 presented VAR model and suggested strong persistence in each variable, with most showing a significant relationship with their (lagged) past values but less interdependence between different variables. The table suggested a strong positive relationship between LINDEX in the previous period and the current period. A coefficient close to 1 indicated high persistence in the LINDEX variable, meaning that its past value is a strong predictor of its current value. The coefficient of LCPI is positive but insignificant, indicating a minimal direct influence on the current value of LINDEX. This might imply that consumer price changes have a negligible immediate effect on the market index. This positive coefficient of the LEXR(-1) suggests that an increase in the exchange rate in the previous period could have a significant positive effect on the current market index. This could be interpreted as a market reaction to currency value changes, affecting investor sentiment or international investment flows. The positive of LMS(-1) but insignificant indicates a slight influence of past money supply on the market index. The negative coefficient of LREMIT(-1) suggests that an increase in remittances in the previous period might slightly decrease the market index in the current period.

Table 2: *Vector Autoregression Estimates*

	LINDEX	LCPI	LEXR	LMS	LREMIT
LINDEX(-1)	0.97097	-0.00288	-0.00338	-0.00412	-0.02567
	-0.01507	-0.01298	-0.00376	-0.00379	-0.03102
	[64.4187]	[-0.22157]	[-0.89966]	[-1.08696]	[-0.82737]
LCPI(-1)	0.00137	0.935445	-0.00695	0.01201	-0.06662
	-0.02956	-0.02545	-0.00737	-0.00743	-0.06085
	[0.04646]	[36.7558]	[-0.94274]	[1.61638]	[-1.09490]

	LINDEX	LCPI	LEXR	LMS	LREMIT
LEXR(-1)	0.17681	-0.01041	0.94808	0.01152	-0.20122
	-0.08328	-0.07169	-0.02076	-0.02094	-0.1714
	[2.12301]	[-0.14525]	[45.6651]	[0.54996]	[-1.17394]
LM2(-1)	0.02233	0.00238	0.005241	1.00743	0.21734
	-0.03143	-0.02705	-0.00783	-0.0079	-0.06468
	[0.71078]	[0.08792]	[0.66904]	[127.509]	[3.36025]
LREMIT(-1)	-0.04506	-0.01509	0.00905	-0.0075	0.81408
	-0.0216	-0.0186	-0.00539	-0.00543	-0.04446
	[-2.08577]	[-0.81126]	[1.68131]	[-1.38040]	[18.3111]
C	-0.44919	0.51217	0.12586	-0.0998	0.24498
	-0.31256	-0.26906	-0.07791	-0.07858	-0.64326
	[-1.43714]	[1.90356]	[1.61531]	[-1.27010]	[0.38084]

Source: Author calculation by using Eviews-10

The high persistence in LINDEX advocates market stability or inertia, where the index tends to follow its historical trend. The negligible effect of LCPI on LINDEX could imply that inflation or consumer prices do not have a strong immediate impact on the market index, perhaps due to delayed market reactions or other overriding market forces. The exchange rate (LEXR) shows a significant relationship with LINDEX, representing that currency value fluctuations might affect investor behavior or international investment decisions. The slight influence of money supply (MS) on the market index could be linked to how monetary policy impacts economic activity and, consequently, the stock market. The negative relationship with remittances (LREMIT) is exciting and might warrant further investigation into how remittances impact domestic investment, consumption, and financial markets.

Pairwise Granger Causality Tests

Table 3 presented the analysis of the pairwise Granger causality tests among various economic variables. It reveals distinct relationships in terms of predictability. Specifically, for the pairs LCPI and LINDEX, LMS and LINDEX, as well as LREMIT and LINDEX, the test results indicated no Granger causality in either direction. In the case of LCPI and LINDEX, LCPI does not Granger Cause LINDEX (F-Statistic: 1.26, Prob.: 0.26) and LINDEX does not Granger Cause LCPI (F-Statistic: 1.86, Prob.: 0.17). Both probabilities are above the common significance level (e.g., 5%), so researcher fails to reject the null hypotheses. This suggested that neither LCPI nor LINDEX Granger-cause each other. As well as LMS does not Granger Cause LINDEX (F-Statistic: 1.44, Prob.: 0.23) and LINDEX does not Granger Cause LMS (F-Statistic: 1.39, Prob.: 0.24). Both probabilities are above 0.05, indicating that there was no evidence of Granger causality in either direction between LMS and LINDEX. Additionally, LREMIT does not Granger Cause LINDEX (F-Statistic: 0.41, Prob.: 0.53). LINDEX does not Granger Cause LREMIT (F-Statistic: 1.06, Prob.: 0.31). Again, both probabilities are above 0.05, suggesting no Granger causality between LREMIT and LINDEX.

Table 3: *Pairwise Granger Causality Tests* (*Lags: 1*)

Null Hypothesis:	F-Statistic	Probability
LCPI does not Granger Cause LINDEX	1.25874	0.2633
LINDEX does not Granger Cause LCPI	1.86311	0.1739
LEXR does not Granger Cause LINDEX	7.55647	0.0065
LINDEX does not Granger Cause LEXR	1.58679	0.2092
LM2 does not Granger Cause LINDEX	1.44146	0.2313
LINDEX does not Granger Cause LMS	1.39208	0.2394
LREMIT does not Granger Cause LINDEX	0.40426	0.5256

Null Hypothesis:	F-Statistic	Probability
LINDEX does not Granger Cause LREMIT	1.0657	0.3031

Source: Author calculation by using Eviews-10

The causality between LEXR and LINDEX, LEXR does Granger Cause LINDEX (F-Statistic: 7.55, Prob.: 0.006) and LINDEX does not Granger Cause LEXR (F-Statistic: 1.58, Prob.: 0.21). The probability for LEXR Granger-causing LINDEX is 0.0065, which is below the 0.05 threshold, expressing that LEXR does Granger-cause LINDEX. However, LINDEX does not Granger-cause LEXR. This is evidenced by the fact that the probabilities linked with the F-statistics for these pairs are all above the conventional significance level of 0.05. For LCPI and LINDEX, as well as LMS and LINDEX, and LREMIT and LINDEX, this suggested that values of these variables do not provide significant information for forecasting the other in the pair. Whereas, the relationship between LEXR and LINDEX stands out as an exception. The test results suggested that LEXR does Granger-cause LINDEX, as the probability value (0.0065) is below the 0.05 threshold, suggesting that past values of LEXR are statistically significant in forecasting LINDEX.

The findings from the VAR model analysis disclosed a high level of persistence in the market index (INDEX), indicating that the index is strongly influenced by its own historical (lagged) values which consisted with the (Al-Sharkas 2004; Muthike & Sakwa, 2012). Other variables, such as consumer price index (CPI) and money supply (MS), showed minimal immediate impact on the stock market index, whereas exchange rates (LEXR) and remittances (LREMIT) exhibited marginal but potentially significant relationships, the findings are supported with the (Lingaraja et al. 2020; Naka et al. 1998). Pairwise Granger causality tests further elucidate these relationships, finding no evidence of causality between LCPI, LMS, LREMIT, and the stock market index, both ways. Even though, an exception is noted in the case of LEXR and LINDEX, where LEXR is found to Granger-cause LINDEX, indicating that past values of the exchange rate are significant in forecasting the stock market index, these findings are supported with the (Naik & Reddy 2021; Rahman et al. 2009).

Conclusions

The stock market has a vibrant role in financial systems, acting as a capital channel and reflecting national economic growth. It highlights the market's dependency on buyer-seller dynamics, where stock prices oscillate based on demand and supply, leading to varied investment returns. The study aims to explore the intricate relationship between the Nepalese stock market and selected macroeconomic factors (like INDEX, CPI, EXR, MS, and REMIT) through statistical analyses, focusing on regression, and causality to understand their impact on market dynamics. The researcher employed the quantitative research methodology with the various statistical techniques to investigate the long-term equilibrium and causal connections between the stock market and macroeconomic variables, aiming to contribute to the broader knowledge of financial market dynamics in emerging economies like Nepal.

The conclusions from the VAR model analysis disclosed a high level of persistence in the market index (INDEX), indicating that the index is strongly influenced by its own historical (lagged) values. Other variables, such as consumer price index (CPI) and money supply (MS), showed minimal immediate impact on the stock market index, whereas exchange rates (EXR) and remittances (REMIT) exhibited marginal but potentially significant relationships. Pairwise Granger causality tests further elucidated these relationships, finding no evidence of causality between CPI, MS, REMIT, and the stock market index, both ways. Even though, an exception exhibited that the case of EXR and INDEX, where EXR was found to Granger-cause INDEX, indicating that past values of the exchange rate were significant in forecasting the stock market index. These understandings provided valuable perspectives for investors, policymakers, and stakeholders in understanding and directing Nepalese stock market. Future research could broaden its scope by linking with other markets, incorporating more diverse variables, extending the study time-period, examining policy implications, utilizing advanced analytical methods, including microeconomic factors, and exploring the role of investor psychology in market dynamics.

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