Effect of Interest Rate and Exchange Rate on Volatility of Market Index at Nepalese Stock Exchange

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Abstract

This study examines the impact of fundamental factors on market index volatility in Nepalese commercial banks and finance companies. Market index volatility is the selected dependent variable. The selected independent variables are bank rate, deposit interest rate, lending interest rate, base rate and inflation rate. The study is based on secondary data of 7 commercial banks and 3 finance companies with 100 observations for the study period from 2012/13 to 2021/22. The data were collected from Bank Supervision Report published by Nepal Rastra Bank (NRB) and annual reports of the selected commercial banks and finance companies. The correlation coefficients and regression models are estimated to test the significance and importance of bank rate, deposit interest rate, lending interest rate, base rate and inflation rate.

The study showed that bank rate has a negative impact on market index volatility. It means that increase in bank rate leads to decrease in market index volatility. In addition, deposit interest rate has a negative impact on market index volatility. It indicates that increase in deposit interest rate leads to decrease in market index volatility. Similarly lending interest rate has a negative impact on market index volatility. It indicates that increase in lending interest rate leads to decrease in market index volatility. Further, the study also showed that base rate has a negative impact on market index volatility. It means that higher the base rate, lower would be the market index volatility. Moreover, inflation rate has a negative impact on market index volatility. It shows that higher the inflation rate, lower would be the market index volatility.

Keywords: bank rate, deposit interest rate, lending interest rate, base rate and inflation rate and market index volatility.

1. Introduction

The interest rate is a crucial aspect of the economy, and its fluctuations have a significant impact on economic growth (Gragner, 2007). It is essentially

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the price of borrowing or lending money and represents the cost of capital. For borrowers, the interest rate represents the cost of borrowing money, and for lenders, it is the fee charged for lending funds (Admir, 2012).

According to a study on interest rate differentials and exchange rate volatility, changes in the interest rate differential have different effects on volatility for currencies with low and high interest rates (Hambuckers, 2022).These perspectives highlight the importance of interest rates as a factor influencing investment and spending decisions (Uddin and Alam, 2009). Central banks, such as the Federal Reserve in the United States, often use interest rates as a tool to influence economic activity. Manag (2011) explained when interest rates are low, borrowing is cheaper, which can stimulate spending and investment, leading to economic growth. Conversely, when interest rates are high, borrowing becomes more expensive, which can dampen spending and investment, leading to a slowdown in economic activity.

According to Arango *et al.* (2002), a nonlinear and inverse relationship existed between the share prices on the Bogotá stock exchange. The interest rate which performed the simultaneous calculation of a number of endogenous variables includes the output, real interest rates, exchange rates, and stock market indices. Hsing (2004) discovered an inverse relationship between stock prices and interest rates. Ologunde *et al.* (2006) examined the links between the interest rate and the stock market capitalization rate in Nigeria. The study revealed that the stock market capitalization rate is positively influenced by the current interest rate. Zhou (1996) examined the connection between interest rates and stock prices using regression analysis and demonstrated that a significant portion of the fluctuation in price dividend ratios can be attributed to long-term interest rates.

Buyuksalvarci (2010) concluded that while money supply has a positive impact on the Turkish Index return, the interest rate, industrial output index, oil price, and foreign exchange rate have a negative impact. Ahmed (2008) concluded that stock prices in India lead economic activity, with the exception of changes in interest rates. The study utilized the Toda and Yamamoto Granger causality test, variance decomposition, and impulse response functions. Stock prices appear to follow the interest rate. Léon (2008) showed that conditional market returns have a negative and significant relationship with interest rates. Spiro (1990) showed a negative relationship between interest rate and

market index volatility. When real interest rates increase, the theory states that investors may prefer to invest in banks rather than stock markets. As a result, higher real interest rates may have a negative impact on stock markets. Cengiz and Basarir (2014) examined the relationship between interest rate and market index volatility within the framework of real gross domestic product (RGDP). The study revealed that long-term interest rate regulation prevents stock market crises.

Zordan (2005) demonstrated a negative correlation between market index volatility and interest rates. Similarly, Rigobon and Sack (2003) concluded that rising of market index drive short-term interest rates in the same direction, suggestive of a systematic reaction of the Federal Reserve to stock price movements. Beck *et al.* (2015) explained that while GDP, lagged GDP, and lagged lending interest rates remained statistically significant with share prices, the nominal effective exchange rates (NEER) become statistically insignificant. Basten and Mariathasan (2018) found that banks with higher reserve holdings have lower pass-through relative to other banks.

Jha (2018) found that the base interest rate plays a crucial role as a monetary policy tool used by central banks to influence economic activity. The study concluded that central banks could affect spending and investment decisions by adjusting borrowing costs through changes in the base interest rate. Likewise, Elsharnouby and Alexandridis (2020) found that changes in the base interest rate have a significant negative impact on stock market returns in the United Kingdom. Diasakos *et al.* (2015) analyzed that there is a negative relationship between changes in the base rate and the banks' net interest margin.

According to Eldomiaty *et al.* (2018), there is a co-movement or long-term relationship between stock prices, changes in stock prices due to inflation rates and changes in stock prices due to real interest rates. The regression analysis of this co-movement indicates that inflation rates have a negative relationship with market index volatility. Additionally, Kwofie and Ansah (2018) found a negative long-run relationship between inflation and market index volatility.. Simbolon and Purwanto (2018) showed that the stock price is significantly influenced by a composite of variables, including interest rate, the inflation rates, the exchange rate, and the GDP growth rate.

Lee and Rahman (2017) found that higher interest rates were associated with increased volatility, suggesting that investors may be more sensitive to

changes in interest rates during periods of market uncertainty. Apergis and Artikis (2015) found that higher interest rates tended to increase market volatility, while changes in exchange rates has a mixed impact depending on the country and the specific exchange rate being considered. Neely and Weller (2011) found that changes in exchange rates has a mixed impact on stock market volatility, with some currencies having a positive effect and others having a negative effect. Lucey and Zhao (2013) found that the relationship between exchange rates and market volatility was not consistent across all countries, with some markets showing a positive correlation and others a negative correlation. Ghafoor *et al.* (2018) found that both interest rates and exchange rates had a significant impact on stock market performance in Pakistan. The study also found that increases in interest rates led to decreases in stock market returns, while increases in exchange rates has a positive effect on stock market returns.

In the context of Nepal, Lama (2016) ascertained the impact of firm-specific and macroeconomic factors on the stock price of Nepalese commercial banks. The study showed that a growth in size, profits per share, dividend per share, return on assets, money supply, inflation, and gross domestic product causes an increase in the market price per share. However, the inflation-related significance of the beta coefficient is negligible. The study showed the negative correlation between market price per share and interest rate, meaning that the market price of a share will decrease, the higher the interest rate. Sapkota and Pradhan (2016) found that market prices per share have a favorable link with ROA, EPS, DPS, P/E Ratio, and GDPR. The study showed that the rising market prices per share are correlated with rising ROA, EPS, DPS, P/E Ratio, and GDPR. The study also showed there is a negative correlation between market price per share and leverage, inflation, and interest rates, indicating that rising levels of these factors cause market price per share in Nepalese commercial banks to fall.

Shrestha and Subedi (2014) examined the determinants of stock market performance in Nepal. The study revealed that the performance of the stock market is found to respond positively to inflation and broad money growth and negatively to interest rates. Shrestha and Pokhrel (2019) studied the variables influencing the Nepali stock index. The study revealed that the Nepalese stock index responded favorably to wide money growth and unfavorably to interest rates.

Devkota and Dhungana (2019) investigated the association between the Nepali stock market index and four macroeconomic factors. The study argued that the Nepali stock market is affected positively by money supply and negatively by interest rates. According to Karki (2018), the long-term volatility in stock prices cannot be explained by macroeconomic factors. The study showed a significant and positive relationship between stock market prices and GDP, inflation, and money supply. However, there is a negative relationship with the interest rate.

The above discussion shows that empirical evidence varies greatly across the studies the effect of interest rate and exchange rate on market index volatility. Though there are above mentioned empirical evidence in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The main purpose of the study is to analyze the effect of interest rate and exchange rate on market index volatility at Nepal stock exchange. Specifically, it examines the relationship of bank rate, deposit interest rate, lending interest rate, base rate and inflation rate with market index volatility of Nepal stock exchange.

The remainder of this study is organized as follows. Section two describes the sample, data and methodology. Section three presents the empirical results, and the final sections draws the conclusion.

2. Methodological aspects

The study is based on the secondary data which were collected from 7 Nepalese commercial banks and 3 finance companies from 2012/13 to 2021/22, leading to a total of 100 observations. The main sources of data collected from the Bank Supervision Report published by Nepal Rastra Bank (NRB) and annual reports of the selected banks and finance companies on Nepal stock exchange. This study is based on descriptive as well as causal comparative research designs. Table 1 shows the list of commercial banks selected for the study along with the study period and number of observations.

Table 1

List of commercial banks and finance companies selected for the study along with study period and number of observations

S.N.	Name of companies	Study period	Observations
1	CZBIL	2012/13-2021/22	10
2	EBL	2012/13-2021/22	10
3	GUFL	2012/13-2021/22	10
4	ICFC	2012/13-2021/22	10
5	MBL	2012/13-2021/22	10
6	SANIMA	2012/13-2021/22	10
7	SBI	2012/13-2021/22	10
8	SBL	2012/13-2021/22	10
9	SCBL	2012/13-2021/22	10
10	SIFC	2012/13-2021/22	10
Total			**100**

The model

The model used in this study assumes that the market index volatility depends upon bank rate, deposit interest rate, lending interest rate, base rate and inflation rate. The dependent variable selected for the study is market index volatility. Similarly, the selected independent variables are bank rate, deposit interest rate, lending interest rate, base rate and inflation rate. Therefore, the model takes the following form:

MIV= *f* (BR, DIR, LIR, BSR and IR)

More specifically, the given model has been segmented into the following models:

$$MIV = \beta_0 + \beta_1 BR_{it} + \beta_2 DIR_{it} + \beta_3 LIR_{it} + \beta_4 BSR_{it} + \beta_5 IR_{it} + e$$

Where,

MIV = Market index volatility refers to the degree of fluctuation or variability in the value of a market index over a given period, indicating the level of risk and uncertainty in the overall market.

BR = Bank rate is the interest rate set by a central bank that determines the cost at which commercial banks can borrow funds.

DIR = Deposit interest rate is the rate of interest paid by financial institutions to depositors for keeping their funds in savings accounts or fixed deposit accounts.

LIR = Lending interest rate is the rate at which financial institutions charge borrowers for the use of borrowed funds.

BSR = Base rate refers to the benchmark interest rate set by a central bank, which serves as the reference rate for determining lending and borrowing rates in the financial market.

IR = Inflation rate is a measure of price increase over time.

The following section describes the independent variables used in this study along with the hypothesis formulation.

Bank rate (BR)

Bank rate refers to the interest rate at which a central bank lends money to commercial banks. The relationship between bank rate and market index volatility has been explored by several researchers. Arango *et al.* (2002) showed the negative relationship between index volatility and interest rates as assessed by the interbank lending interest rate, which is influenced to some extent by monetary policy. Vaz *et al.* (2008) showed the negative relationship between bank rate and index volatility. Farka (2011) showed a negative effect of exchange rate on market index volatility of stock exchange. Based on it, this study develops the following hypothesis:

H_1: There is a positive relationship between bank rate and market index volatility.

Deposit interest rate (DIR)

According to Ben-David *et al.* (2017), bank deposit rates are determined by the supply of deposits by households and firms and the demand for deposits by banks. Sun and Wang (2018) found that the interest rate on bank deposits has a negative impact on the volatility of market index. Kwan (2003) showed the negative impact of deposit interest rate on index volatility. Similarly, Alexakis and Petrakis (199l) found that the deposit interest rate can also have a positive effect on the volatility of market index. Based on it, this study develops the following hypothesis:

H_2: There is a negative relationship between deposit interest rate and market index volatility.

Lending interest rate (LIR)

A lending interest rate is the rate at which a lender charges interest on money that is borrowed. The relationship between lending interest rate and market index volatility has been explored by several researchers. Otieno *et al.* (2017) showed the negative impact of stock market returns, and their co- integrating residuals on index volatility. Huy *et al.* (2020) found that lending rates has a negative impact on Sacom Bank's (STB) volatility of market index. Al-Qenae *et al.* (2002) found that lending interest rate affects stock prices significantly. Changes in bank lending are significant in affecting stock and housing prices (Chen, 2001). Based on it, this study develops the following hypothesis:

H_3: There is a negative relationship between lending interest rate and market index volatility.

Base rate (BR)

Base rate is a term used in the banking industry to refer to the minimum interest rate that a bank charges to its most creditworthy customers for lending or borrowing money. Erten and Ozturk (2018) found that changes in interest rates has a significant impact on stock market returns in OECD countries. The study found a negative relationship between changes in short-term interest rates and stock market returns. Alqahtani *et al*. (2021) found that changes in the base interest rate have a significant impact on volatility of market index. Sari and Ergül (2017) found that, the changes in the base rate has a significant impact on the volatility of the Turkish stock market. Based on it, this study develops the following hypothesis:

H_4: There is a negative relationship between base rate and market index volatility.

Inflation rate (IR)

Inflation rate refers to the rate at which the general price level of goods and services in an economy is increasing over a specified period of time, usually a year. According to Fama (1981), predicted inflation is adversely connected with expected actual activity, which is therefore favorably related to stock market performance. Likewise, Singh and Padmakumari (2020) found an inverse relationship between stock market returns and inflation. Chen *et*

al. (1986) found a negative link between predicted inflation and expected real stock market performance. Based on it, this study develops the following hypothesis:

H_5: There is a negative relationship between inflation rate and market index volatility.

3. Results and discussion

Descriptive statistics

Table 2 presents the descriptive statistics of the selected dependent and independent variables during the period 2012/13 to 2021/22.

Table 2

Descriptive statistics

This table shows the descriptive statistics of dependent and independent variables of 7 Nepalese commercial banks and 3 finance companies for the study period of 2012/13 to 2021/22. The dependent variable is MIV (Market index volatility. The independent variables are BR (Bank rate), DIR (Deposit interest rate), LIR (Lending interest rate), BSR (Base rate) and IR (Inflation rate).

Variables	Minimum	Maximum	Mean	Std. Deviation
MIV	-9.33	0.67	-0.2630	1.380
BR	05.00	8.00	7.074	0.966
DIR	0.00	9.45	5.157	2.37
LIR	0.00	11.79	6.412	2.69
BSR	0.00	14.65	8.424	2.71
IR	03.60	9.93	6.267	2.22

Source: SPSS output

Correlation analysis

On analysis of data, correlation analysis has been undertaken first and for the purpose, Pearson's correlation coefficient matrix along with means and standard deviation have been computed and the results are presented in Table 3.

Table 3

Pearson's correlation coefficient matrix

This table shows the correlation coefficients of dependent and independent variables of 7 Nepalese commercial banks and 3 finance companies for the study period of 2012/13 to 2021/22. The dependent variable is MIV (Market index volatility. The independent variables are BR (Bank rate), DIR (Deposit interest rate), LIR (Lending interest rate), BSR (Base rate) and IR (Inflation rate).

Variables	MIV	BR	DIR	LIR	BSR	IR
MIV	1					
BR	0.118**	1				
DIR	0.077**	-0.278**	1			
LIR	0.027**	-0.289	0.921**	1		
BSR	0.109**	-0.208**	0.530*	0.488	1	
IR	-0.110	-0.778	-0.394	-0.369*	-0.451**	1

Note: The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent levels respectively.

Table 3 shows that there is a negative relationship between bank rate and market index volatility. It indicates that higher the bank rate, lower would be the market index volatility and vice versa. Similarly, there is a negative relationship between deposit interest rate and market index volatility. It indicates that higher the deposit interest rate, lower would be the market index volatility. Furthermore, there is a negative relationship between lending interest rate and market index volatility. It indicates that the increase in lending interest rate leads to a decrease in market index volatility. Moreover, there is a negative relationship between base rate and market index volatility. It indicates that the increase in base rate leads to a decrease in market index volatility. In contrast, the inflation rate has a negative relationship with market index volatility. It shows that higher the inflation rate, lower would be the market index volatility.

Regression analysis

Having indicated the Pearson's correlation coefficients, the regression analysis has been carried out and results are presented in table 4. More specifically, it shows the regression results of bank rate, deposit interest rate, lending interest rate, base rate and inflation rate with market index volatility of Nepalese commercial banks.

Table 4

Estimated regression results of bank rate, deposit interest rate, lending interest

rate, base rate and inflation rate on market index volatility

The results are based on panel data of 7 commercial banks and 3 finance companies with 100 observations for the period of 2012/13-2021/212 by using the linear regression model and the model is $MIV=\beta_0+\beta_1 BR_{it}+\beta_2 DIR_{it}+\beta_3 LIR_{it}+\beta_4 BSR_{it}+\beta_5 IR_{it}+e_{it}$ where, the dependent variables is MIV (Market index volatility). The independent variables are BR (Bank rate), DIR (Deposit interest rate), LIR (Lending interest rate), BSR (Base rate) and IR (Inflation rate).

Model	Intercept	Regression coefficients of					Adj. R_bar2	SEE	F-value
		BR	DIR	LIR	BSR	IR			
1	-1.454 (1.422)	-0.168 (1.176)					0.004	1.377	1.383
2	-0.493 (1.1483)		-0.045 (0.761)				0.004	1.382	0.579
3	-.0351 (0.976)			-0.014 (0.265)			0.009	1.386	0.070
4	-0.730 (1.618)				-0.055 (1.087)		0.002	1.378	1.182
5	0.167 (0.403)						0.002	1.378	1.209
6	-2.142 (1.805)	0.215 (1.447)	0.069 (1.137)				0.007	1.375	1.339
7	-1.905 (1.574)	0.202 (1.351)	0.206 (1.373)	-0.132 (0.998)			0.007	1.375	1.225
8	-2.275 (1.781)	0.212 (1.414)	0.173 (1.120)	-0.131 (0.991)	0.055 (0.108)	-0.069 (1.099)	0.005	1.376	1.125
9	-3.303 (2.582)	0.731 (3.190)**	0.125 (0.837)	-0.100 (0.781)	-0.017 (0.270)	-0.318 (2.916)	0.078	1.325	2.672

Notes:

i. Figures in parenthesis are t-values.

ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.

iii. Market index volatility is the dependent variable.

Table 4 shows that the beta coefficients for bank rate are negative with market index volatility. It indicates that bank rate has a negative impact on market index volatility. This finding is similar to the findings of (Safitri *et al.*, 2020). Similarly, the beta coefficients for deposit interest rate are negative with market index volatility. It indicates that deposit interest rate has a negative impact on market index volatility. This finding is consistent with the findings of Menike & Prabath (2014). Likewise, the beta coefficients for lending interest rate are negative with market index volatility. It indicates that the lending interest rate has a negative impact on market index volatility. This finding is similar to the findings of Khan (2012). Moreover, the beta coefficients for base rate are negative with market index volatility. It indicates that base rate has a negative impact on market index volatility. This finding

is similar to the findings of Kamar (2017). However, the beta coefficients for inflation rate are negative with market index volatility. It indicates that inflation rate has a negative impact on market index volatility. This finding is consistent with the findings of Almumani (2014).

4. Summary and conclusion

Market index volatility determination is one of the most debated topics within corporate finance. Market index volatility are primarily dominated by the banking sector. Stock exchange market play a significant role in the economy by accumulating capital funds to meet the financial requirements of various productive and business sectors. The development and expansion of a nation's economy are significantly influenced by its stock market. In reality, the overall success of a country's economic situation has frequently been reflected in stock market index performance.

This study attempts to analyze the effect of bank rate, deposit interest rate, lending interest rate, base rate and inflation rate on market index volatility of Nepalese commercial banks and finance companies. The study is based on secondary data of 7 commercial banks and 3 finance companies with 100 observations for the period from 2012/13 to 2021/22.

The major conclusion of this study is that bank rate, deposit interest rate, lending interest rate, base rate and inflation rate has a negative impact on market index volatility. The study also concluded that deposit interest rate followed by base rate is the most influencing factor that explains the changes in the market index volatility of Nepal stock exchange.

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