“Risk in the shadows: Macroeconomic shifts and their effects on Bangladeshi mutual funds”

AUTHORS	Shaikh Masrick Hasan Tawfiq Taleb Tawfiq Md. Mahedi Hasan K. M. Anwarul Islam

ARTICLE INFO	Shaikh Masrick Hasan, Tawfiq Taleb Tawfiq, Md. Mahedi Hasan and K. M. Anwarul Islam (2024). Risk in the shadows: Macroeconomic shifts and their effects on Bangladeshi mutual funds. *Investment Management and Financial Innovations*, *21*(4), 371-384. doi:10.21511/imfi.21(4).2024.30
DOI	http://dx.doi.org/10.21511/imfi.21(4).2024.30
RELEASED ON	Friday, 29 November 2024
RECEIVED ON	Sunday, 15 September 2024
ACCEPTED ON	Thursday, 21 November 2024

JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
51	0	5

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Shaikh Masrick Hasan (Bangladesh), **Tawfiq Taleb Tawfiq** (United States), **Md. Mahedi Hasan** (Bangladesh), **K. M. Anwarul Islam** (Bangladesh)

RISK IN THE SHADOWS: MACROECONOMIC SHIFTS AND THEIR EFFECTS ON BANGLADESHI MUTUAL FUNDS

Abstract

This study examines the downside risk, measured by semi-standard deviation and lower partial moment, and downside risk-adjusted return, measured by the Sortino ratio and Information ratio of Bangladeshi mutual funds. The study aims to explore the effect of macroeconomic variables such as deposit rate, broad money supply, GDP growth rate, remittance, exports and imports payments on downside risk and risk-adjusted returns. Month-wise downside risk and risk-adjusted return measures of 27 mutual funds are computed using the 12-month rolling window method, covering the period from January 2016 to December 2023. Here, the random effects model is utilized, and the results show that semi-standard deviation has a significant and positive relationship with deposit rate, broad money, and GDP growth rate and a negative relationship with export and remittance. Another downside risk measure, lower partial moment, is significantly and positively related to export and remittance but negatively related to deposit rate, broad money, and GDP growth. On the other hand, the risk-adjusted return Sortino ratio has a significant and positive relationship with the deposit rate, remittance, and GDP growth rate but also has a negative relationship with exports. Furthermore, the information ratio has a significant and positive relation with deposit rate, import and remittance, and a negative relation with GDP growth rate. Overall findings suggest that when broad macroeconomic factors performed well, mutual funds face reduced downside risk and increased risk-adjusted return, and vice versa. Practitioners and institutional investors can use this evidence in their decision-making in an asymmetric market situation.

Keywords downside risk, risk-adjusted return, semi-standard deviation, lower partial moment, Sortino ratio, information ratio

JEL Classification G10, G11, G12, G24

Received on: 15th of September, 2024
Accepted on: 21st of November, 2024
Published on: 29th of November, 2024

Shaikh Masrick Hasan, Ph.D., Associate Professor, Faculty of Business Studies, Department of Finance, Jagannath University, Bangladesh. (Corresponding author)

Tawfiq Taleb Tawfiq, Research Assistant, Ph.D. Candidate in Financial Economics, Department of Economics and Finance, University of New Orleans, United States of America.

Md. Mahedi Hasan, Lecturer, MBA, Department of Business Administration, Dhaka International University, Bangladesh.

K. M. Anwarul Islam, Ph.D., Professor and Head, Department of Business Studies, State University of Bangladesh, Bangladesh.

Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

Nowadays, mutual funds are essential financial intermediaries in the global economy, making a significant contribution to economic progress. A wide range of mutual funds in financial markets caters to investors' preferences, guiding their choices in different types of investments. In this context, investors are more concerned about two key factors: one is risk, and the other is risk-adjusted returns. The risk factors can be calculated by applying traditional risk measures such as standard deviation (total risk) and beta (systematic risk), and, on the other hand, downside risk measures such as semi-standard deviation, lower partial moment, and value at risk (Hasan, 2024). Investors are primarily concerned about a return that is anticipated to fall below their expected return rather than one that exceeds it. Thus, downside risk measures are more suitable for mutual fund risk analysis, as they account for returns falling below the investor's expectations. Consequently, downside risk-adjusted return measures are also more crucial than traditional risk-adjusted returns when evaluating mutual funds.

Downside risk measures are appropriate in situations where investors need to assess and manage the potential loss in value, especially during market downturns, and when investors want to understand the worst-case scenario for an investment (Bawa & Lindenberg, 1977). Investors prioritize managing downside risk in their investment strategies to protect them from extreme adverse events (Grootveld & Hallerbach, 1999). In declining markets, risk-averse investors aim to protect their returns by holding assets that can withstand negative market swings, and risk-neutral investors expect a greater average return to compensate for their potential loss associated with higher downside risk.

The capital market in Bangladesh faces significant volatility, which affects both the overall economy and the risk-return profile of mutual funds. Despite the importance of managing downside risk in investment decisions, there is a lack of research on this issue in the context of Bangladesh. Most research on mutual funds in Bangladesh has focused on traditional risk measures-standard deviation and beta and risk-adjusted performance measures – Treynor ratio, Sharpe ratio, and Jensen's Alpha (Qamruzzaman, 2014; Rahman & Mamun, 2022; Hasan & Hasan, 2024). In addition, there is little research on the impact of macroeconomic variables on the risk and risk-adjusted return of mutual funds in Bangladesh. Thus, a comprehensive study is needed in Bangladesh to identify the impact of macroeconomic variables on downside risk and risk-adjusted returns.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Downside risk pertains to returns linked to adverse events, specifically when returns drop below an investor's desired threshold (Estrada, 2006). Mutual fund returns vary, and downside risk occurs when returns decline from the target level (Qureshi et al., 2016). Investors prioritize minimizing losses over maximizing gains during market downturns, placing more emphasis on evaluating volatility in returns below than beyond their target return (Bodnaruk et al., 2018). Risk and return are conventionally associated with uncertainty, denoting the range of potential returns and their probabilities. Estrada (2006) asserts that standard deviation quantifies the volatility of returns relative to the mean, where both upside and downside variations are considered, and beta measures the systematic risk following unavoidable market conditions. Additionally, standard deviation and beta may insufficiently depict risk during times of excessive volatility or when relying exclusively on historical data, potentially misrepresenting overall risk exposure (Riddles, 2001).

A mutual fund is a pooled investment vehicle that collects funds from various investors and invests them in the capital market (Hussain, 2017). When investing in mutual funds, investors are typically more focused on avoiding potential losses than on maximizing profits. They prioritize ensuring their investment returns remain positive, as negative return volatility leads to downside risk. Consequently, investors are especially concerned with downside risk when selecting mutual funds (Bodnaruk et al., 2018). Downside risk can be measured using the below return from the investors' target return, which can be quantified using the semi-standard deviation, lower partial movements, and value-at-risk measures. Bawa and Lindenberg (1977) first applied semi-standard deviation and lower partial moment to quantify the downside risk of mutual funds, whereas Fishburn (1977) utilized two lower partial moments measures (one is focused on absolute negative deviation and another is focused on the square of the negative deviations) and value at risk. Consequently, Ang et al. (2006) measured the downside risk of mutual funds using the semi-variance and value at risk.

Investors generally prioritize gains rather than losses, differentiating between positive and negative price fluctuations. This behavioral tendency leads to the notion of downside risk, emphasizing the possibility of negative returns, especially in periods of market decline (Meer et al., 2001). Downside risk is often associated with the expectation of higher returns, especially when an asset's performance is closely tied to market fluctuations. Such investments can generate significant profits during favorable market conditions, offsetting potential losses during market declines (Ang et al.,

http://dx.doi.org/10.21511/imfi.21(4).2024.30

2006; Estrada, 2006). As such, downside risk is a concern and a strategic consideration for investors seeking to balance risk and return in volatile markets. This dynamic highlights the necessity of assessing downside risk alongside traditional risk metrics, especially in the context of decision-making (Fishburn, 1977; Bawa & Lindenberg, 1977; Meer et al., 2001; Hasan, 2024).

The Arbitrage Pricing Theory (APT) explains the connection between asset returns and multiple macroeconomic factors, including inflation, interest rates, exchange rates, and industry-specific variables (Gyimah et al., 2021; Roll & Ross, 1980). Although the APT model's primary goal is to forecast asset returns, it also takes risk into consideration. The model states that volatility in asset returns is caused by variations in macroeconomic variables and other systematic influences, creating risk. Consequently, the downside risk is similarly affected by macroeconomic factors due to the downside volatility of returns from the perspective of the APT model (Baghdadabad & Glabadanidis, 2014; Beenstock & Chan, 2009).

Macroeconomic factors, including inflation rate, GDP growth rate, interest rates, exchange rates, remittances, exports, imports, broad money supply, and unemployment rate, significantly influence the capital market of an economy (Aggarwal & Saqib, 2017; Gjerde & Saettem, 1999). Gjerde and Saettem (1999) identified a significant relationship between inflation, interest rates, and oil prices with stock market performance in Norway. Kwon and Shin (1999) examined the influence of exchange rates, production index, trade balance, and money supply on the stock market. Consequently, the risk and return dynamics of mutual funds are also influenced by macroeconomic factors, which are essential elements of the capital market (Panigrahi et al., 2020). Kisoi and Onyango (2017) identified that interest rates, exchange rates, and GDP growth exert significant long-term influences on the risk profile of mutual funds. In contrast, Tram and Hoai (2021) identified a negative correlation between interest rates and economic development concerning systemic risk, while exchange rates demonstrated a positive relationship. Hamid and Hasan (2017) explored the adverse effects of semi-variance on macroeconomic variables, while Bodnaruk et al. (2018) demonstrated that controlling the macroeconomic factors improves the downside risk. Moreover, Gyimah et al. (2021) identified significant positive effects of inflation rates, exchange rates, T-bill rates, and GDP growth on mutual fund performance. Hussain (2017) observed an inverse relationship between mutual fund returns and interest rates. In contrast, Krishnamurthy et al. (2018) and Sahoo et al. (2024) identified that mutual fund returns generally rise as inflation rates decline. This research emphasizes the complex relationships between macroeconomic factors and mutual fund risk and return, highlighting the necessity for investors to understand these dynamics to reduce risk and improve risk-adjusted returns.

A significant gap exists in the literature regarding mutual funds' downside risk and risk-adjusted return assessment, especially in Bangladeshi funds. Previous research predominantly focuses on traditional risk and risk-adjusted return measures, including standard deviation, beta, the Treynor ratio, Sharpe ratio, and Jensen's Alpha, for evaluating fund performance (Qamruzzaman, 2014; Rahman & Mamun, 2022). Although these measures offer important insights, they are inadequate for assessing downside risk, which is essential for investors in a market downturn. Several researchers, including Reddy et al. (2017), Hoepner et al. (2016), and Baghdadabad and Fooladi (2015), have investigated downside risk; however, their studies did not encompass Bangladeshi mutual funds. Furthermore, Hasan (2024) explores the downside risk in Bangladeshi mutual funds, but downside risk-adjusted return measures like the Sortino ratio and Information ratio were not included. Utilizing downside-risk-adjusted return measures offers a more refined perspective on risk-adjusted returns, essential for investors aiming to minimize loss potential while enhancing gains. The impact of macroeconomic variables on mutual fund performance, particularly regarding downside risk and risk-adjusted return, is insufficiently examined in the context of Bangladesh. Research conducted by Panigrahi et al. (2020), Gyimah et al. (2021), and Hussain (2017) has explored the relationship between macroeconomic variables and mutual fund performance where traditional risk and risk-adjusted return measures are mainly focused; thus, there is scope to study on downside risk and risk-adjusted return focusing mutual funds of Bangladesh.

Moreover, while previous studies employ fixed-effects models (Valahzaghard et al., 2012), this study introduces a random-effects model combined with the 12-month rolling window method to compute downside risk and risk-adjusted returns. This methodological approach offers a dynamic and comprehensive view of how macroeconomic factors impact Bangladesh's downside risk and risk-adjusted return of mutual funds. This study outlines three main objectives to address the gaps in the existing literature and provide a comprehensive analysis of the performance of Bangladeshi mutual funds. This study aims to (i) quantify the downside risk and risk-adjusted returns of Bangladeshi mutual funds through a 12-month rolling window method, (ii) evaluate the impact of macroeconomic variables on downside risk, and (iii) analyze the influence of these macroeconomic variables on risk-adjusted returns within a multivariate framework. Therefore, taking the APT model perspective, the following hypotheses are proposed:

$H1_a$: *Macroeconomic variables significantly influence the downside risk of Bangladeshi mutual funds.*

$H2_a$: *Macroeconomic variables significantly influence the risk-adjusted return of Bangladeshi mutual funds.*

2. DATA AND METHODOLOGY

In Bangladesh, 37 mutual funds are operating in Dhaka Stock Exchange Limited[1]. Out of 37 mutual funds, 27 conventional mutual funds were selected due to the time frame of the research and the preparation of a balanced dataset from January 2016 to December 2023. The remaining conventional mutual funds, incorporated after January 2016, are excluded from the sample as they fall outside the study period. Following previous studies, this study incorporates three types of variables: downside risk measures, risk-adjusted return measures, and macroeconomic variables (Hoepner et al., 2016; Baghdadabad & Fooladi, 2015; Hasan, 2024). Initially, the secondary source of monthly closing price data is collected from Investing.com[2] from January 2016 to December 2023. Then, the monthly return for each mutual fund will be calculated from February 2016 to December 2023. The following formula is applied to calculate monthly return (Miskolczi, 2017):

$$\overline{R_i} = ln\left(\frac{P_{i,t-1}}{P_{i,t}}\right), \quad (1)$$

where *ln* stands for natural logarithm, *t* is time, *i* is the unit of the fund, $P_{i,t-1}$. stands for the price of the period at *t-1*, which is the previous period, and $P_{i,t}$ is the price at period *t*.

Two downside risk measures, semi-standard deviation and lower partial moment, are used in this study (Hoepner & Schopohl, 2016; Nawrocki, 1999; Bawa & Lindenberg, 1977), which are acknowledged for their superior ability to capture risk asymmetry and possible losses compared to traditional deviation matrices. Furthermore, two risk-adjusted return parameters, namely the Sortino ratio and the Information ratio, are used in this study to assess the performance of funds in a downside risk-adjusted context (Baghdadabad & Fooladi, 2015; Nafees et al., 2011). Subsequently, monthly downside risk parameters and risk-adjusted return metrics from January 2017 to December 2023 were calculated using the monthly returns from February 2016 to December 2023 of mutual funds with a 12-month rolling window methodology that is aligned with Gao et al. (2017) and Hasan (2024). Following previous research, this study also incorporates six macroeconomic variables to analyze their impact on downside risk and risk-adjusted return of mutual funds (Ali, 2023; Hasan & Hasan, 2024; Imsar et al., 2022; Osamwonyi & Osagie, 2012; Aggarwal & Saqib, 2017; Panigrahi et al., 2020) and collects data from Bangladesh Bank[3]. A detailed description of downside risk, risk-adjusted return measures, and macroeconomic variables is shown in Table 1.

This study uses panel data analysis to capture dynamic interactions of both time series and cross-

1 https://www.dsebd.org/companylistbyindustry.php?industryno=12

2 https://www.investing.com/

3 https://www.bb.org.bd/en/index.php/publication/publictn/3/10

http://dx.doi.org/10.21511/imfi.21(4).2024.30

Table 1. Description of variables

Serial No.	Variables/ Parameters	Definition of Variables	Authors
Dependent Variables (Risk & Risk-adjusted Return Measures)			
1	Semi-Standard Deviation	The semi-standard deviation is a method to measure the negative deviation from mean returns. It ignores the positive or upside deviation. The semi-standard deviation only considers variances smaller than zero when calculating expected returns.	Nawrocki (1999); Hoepner & Schopohl (2016)
2	Lower Partial Moment	Lower Partial Moment (LPM) is widely used in more volatile market settings. The LPM defines risk-averse investors since it severely penalizes big negative returns (by cubing them instead of squaring them) but has no effect on tiny negative returns.	Fishburn (1977); Hoepner et al. (2016)
3	Sortino Ratio	Sortino's Sortino ratio is perhaps the most well-known method for analyzing the impact of negative deviation. The Sortino ratio only considers returns that are below a user-specified goal or needed rate of return.	Nafees et al. (2011); Baghdadabad & Fooladi (2015)
4	Information Ratio	An alternative Sharpe ratio is identified by dividing the fund's excess return above the return on the benchmark index by the fund's standard deviation instead of the risk-free rate. It uses the rate of return on Treasury bills as a baseline for all funds.	Israelsen (2005); Baghdadabad & Fooladi (2015)
Independent Variables (Macroeconomic Factors)			
5	Deposit Rate	This is the weighted average rate of interest of all scheduled banks in Bangladesh. The percentage that a bank uses to determine the interest that customers get on their checking savings or fixed-deposit accounts is known as the deposit rate. The deposit rate significantly impacts the performance of mutual funds.	Panigrahi et al. (2020); Kabir & Chowdhury (2016)
6	GDP Growth Rate	The whole value of all products and services produced inside a nation's borders during a specific period and then sold to customers is measured by the gross domestic product or GDP. The performance of the stock market and mutual funds, as well as the GDP growth rate, are directly correlated.	Osamwonyi & Osagie (2012); Gyimah et al. (2021)
7	Broad Money Supply (M2)	Money in circulation M1 (i.e. physical currency, like coins and banknotes), small time deposits, demand deposits and savings deposits held by people and organizations, and other monetary aggregates (money market mutual funds) are all considered to be part of "broad money," sometimes referred to as M2. The money supply has a significant effect on the performance of the Nigerian capital market.	Osamwonyi & Osagie (2012)
8	Exports	Exporting refers to the practice of selling goods and services manufactured in one country to buyers in another country. Researchers confirmed that exports significantly influence mutual funds' performance.	Imsar et al. (2022); Katsikeas et al. (2000)
9	Imports	When a goods or service is purchased in one country and then brought into another country, it is said to have been imported into that country. A study finds that imports have a significant impact on stock markets.	Ali (2023); Hasan (2024)
10	Remittances	A remittance is the transfer of funds from an individual working abroad to family and friends in their home country. A study shows that remittance has a significant impact on mutual funds.	Ali (2023)

sectional features (Dougherty, 2011). The study employs a stepwise data normalization method following Templeton (2011) to address potential normality issues in raw data. Several diagnostic tests are also conducted to ensure the robustness of the model; for example, the Shapiro-Wilk test is applied to measure the normality of data, while variance inflation factors (VIF) assess multicollinearity to avoid potential biases in coefficient estimation. The Breusch-Pagan test is applied for identifying the heteroscedasticity problem, and Pesaran's CD and Wooldridge test for identifying autocorrelation problems in data (Dougherty, 2011; Hasan et al., 2024). Therefore, the following four sets of regression equations have been developed for this study

$$SSD_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 EXP_{i,t} + \beta_3 IMP_{i,t} + \beta_4 REM_{i,t} + \beta_5 BM_{i,t} + \beta_6 GDPGR_{i,t} + \varepsilon_{i,t}, \quad (2)$$

$$LPM_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 EXP_{i,t} + \beta_3 IMP_{i,t} + \beta_4 REM_{i,t} + \beta_5 BM_{i,t} + \beta_6 GDPGR_{i,t} + \varepsilon_{i,t}, \quad (3)$$

$$SORT_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 EXP_{i,t} + \beta_3 IMP_{i,t} + \beta_4 REM_{i,t} + \beta_5 BM_{i,t} + \beta_6 GDPGR_{i,t} + \varepsilon_{i,t}, \quad (4)$$

$$IR_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 EXP_{i,t} + \beta_3 IMP_{i,t} + \beta_4 REM_{i,t} + \beta_5 BM_{i,t} + \beta_6 GDPGR_{i,t} + \varepsilon_{i,t}, \quad (5)$$

where *SSD* indicates Semi-Standard Deviation, *LPM* indicates Lower Partial Moment, *SORT* indi-

cates Sortino Ratio and *IR* indicates Information Ratio. Additionally, *DR*, *EXP*, *IMP*, *REM*, *BM*, and *GDPGR* indicate Deposit Rate, Exports, Import Payments, Remittance, Broad Money, and Gross Domestic Product Growth Rate, respectively. Here, *t* indicates time, *i* indicates units of fund, β indicates coefficients, and ε indicates the error term.

3. RESULTS

Table 2 shows the descriptive statistics for two downside risk measures, two risk-adjusted return measures, and six macroeconomic variables. This study applies a 12-month rolling window method to calculate downside risk and risk-adjusted return. From the downside risk perspective, the mean of the semi-standard deviation is 0.042, and the standard deviation is 0.029, which is half of the mean value, indicating that the downside volatility is high for mutual funds. The average of the lower partial moment is negative (–0.080), and the volatility is lower than the semi-standard deviation compared to the mean value. From a risk-adjusted return measures perspective, the mean value of the Sortino ratio is negative, and the information ratio is positive, indicating mixed risk-adjusted performance of mutual funds. Due to the volatility of downside risk, the risk-adjusted performance of mutual is negative. Among the macroeconomic variables, the deposit has the lowest mean value, which is 4.81%, and the upper and lower volatility of the deposit rate is 0.54% every month. Besides, broad money has the highest mean value of BDT. 1649988.70 crore, and the standard deviation is BDT. 277182.66 crore every month.

Table 3 represents the correlation matrix, which shows the correlation between the downside risk and risk-adjusted return and macroeconomic variables. The correlation matrix shows that the deposit rate and GDP growth rate coefficients have a statistically significant and positive correlation, and exports and remittances have a significant negative correlation with semi-standard deviation. Additionally, the lower partial moment is significantly positively correlated with export and remittance; however, it is significantly negatively correlated with deposit rate, money supply (M2), export, and GDP growth rate. On the other hand, macroeconomic variables export has a significant negative correlation, and other variables remain insignificant in correlation with risk-adjusted return measures in the Sortino ratio. Moreover, export, remittance, and broad money have a significant positive correlation; others remain insignificant correlations with the Information ratio. Furthermore, multicollinearity is absent among the independent variables in this study, as indicated by correlation coefficients below 0.80 across all variables, which are aligned with Bohrnstedt and Carter (1971) and Hasan (2024).

Table 2. Descriptive statistics

Variables	Obs.	Mean	Std. Dev	Median	Maximum	Minimum
Semi-Std. Deviation	2,268	0.041	0.029	0.0464	0.140	–0.090
Lower Partial moment	2,268	–0.080	0.033	–0.0874	0.070	–0.180
Sortino Ratio	2,268	–12.548	8.354	–1.0946	14.280	–40.360
Information Ratio	2,268	35.156	26.409	–6.9618	123.03	–45.800
Deposit Rate	2,268	4.813	0.535	4.8493	6.18	3.460
Export	2,268	3574.105	799.043	3430.57	5363.43	1491.80
Import	2,268	4978.493	1101.636	4929.94	7826.05	2180.67
Remittances	2,268	14243.903	3765.429	13345.83	23550.619	4907.61
Money Supply (M2)	2,268	1649988.7	277182.66	1637638.14	2302542.8	945411.44
GDP Growth Rate	2,268	6.337	1.058	6.4663	9.010	3.720

Notes: Descriptive statistics, including observation, mean, standard deviation, maximum, and minimum values for each variable, are shown in this table. A two-step data normalization method is used, whereby fractional rank is computed first and then normalized the data using the Inverse of the Document Frequency (IDF) method. In this table, downside risks are lower partial moment and semi-standard deviation, and risk-adjusted return measurements are the Sortino ratio and Information ratio. Both measurements are calculated by applying the 12-month rolling window method. Moreover, GDP growth rate, deposit rate (weighted average rate of interest), remittance, exports, imports, and broad money (M2) are considered macroeconomic factors. The data on downside risk, risk-adjusted return, and macroeconomic factors were collected from January 2017 to December 2023.

http://dx.doi.org/10.21511/imfi.21(4).2024.30

Table 3. Correlation matrix

Variables	SSD	LPM	SORT	Inf.R	DR	Export	Import	Remittance	B.Money	GDPGR
Semi-standard Deviation	1									
Lower Partial Moments	–0.81***	1								
Sortino Ratio	0.12***	–0.04*	1							
Inflation Rate	–0.11***	0.03	–0.95***	1						
Deposit Rate	0.07***	–0.12***	0.03	–0.02	1					
Export	–0.16***	0.15***	–0.04*	0.03*	–0.55***	1				
Import	–0.03	–0.06***	–0.02	0.03	–0.59***	0.73***	1			
Remittance	–0.22***	0.27***	–0.03	0.04**	–0.39***	0.58***	0.38***	1		
Broad Money Supply	–0.01	–0.06***	–0.03	0.04*	–0.61***	0.60***	0.64***	0.66***	1	
GDP Growth Rate	0.21***	–0.23***	0.02	–0.02	–0.19***	0.01***	0.19***	–0.38***	–0.24***	1

Notes: ***, **, and * indicate the Pearson correlation at the significance of 0.001, 0.01, and 0.05 levels, respectively. Table 3 presents Pearson's' correlation matrix, with abbreviations defined as follows: SSD represents Semi-Standard Deviation, LPM stands for Lower Partial Moment, SORT is the Sortino Ratio, Inf. R indicates the Information Ratio, DR refers to the Deposit Rate, B.Money represents Broad Money, GDPGR is Gross Domestic Product Growth Rate, and others are Exports, Imports, and Remittances. The analysis utilizes monthly panel data covering six macroeconomic variables and incorporates monthly closing prices of 27 conventional mutual funds. Downside risk and the risk-adjusted returns were calculated by applying a 12-month rolling window method along with collected six macroeconomic variables for the period from January 2017 to December 2023.

In the regression analysis, several fundamental assumptions of panel data regression are checked to ensure the robustness and reliability of the findings. The diagnostic test using the Kolmogorov-Smirnova test confirms the normality of the data (Berger & Zhou, 2014), and the variance inflation factor (VIF) shows no multicollinearity among variables (Schroeder et al., 1990). Additionally, the Breusch-Pagan/Cook-Weisberg test identifies no heteroscedasticity (Glejser, 1969), and the Wooldridge test confirms no autocorrelation issues (Born & Breitung, 2016). Finally, fol-

Table 4. Regression results of the impact of macroeconomic factors on downside risk and risk-adjusted return of mutual funds (Random effect model)

Variables	Model 1	Model 2	Model 3	Model 4
	Semi-Standard Deviation (T- Value)	Lower Partial Moments (T- Value)	Sortino Ratio (T- Value)	Information Ratio (T- Value)
Deposit Rate	**0.0099*** **	–0. 0249***	0. 2019**	0.5545*
	(6.82)	(–16.68)	(2.06)	(1.89)
Export	–0.00001***	0.0001***	–0.0004***	0. 0002|
	(–5.55)	(6.29)	(–5.24)	(0.87)
Import	–0.00001	–0.00001	0.0001	0. 0005***
	(–1.38)	(–1.46)	(1.07)	(2.77)
Remittance	–0.00002***	0.00003***	0.00003*	0. 0002***
	(–7.13)	(14.22)	(1.89)	(3.85)
Broad Money Supply	0.00005***	–0.00009***	–0.00003	0.0006
	(12.74)	(–23.12)	(–1.12)	(0.77)
GDP Growth Rate	0. .0078***	–0. 0106***	0. 2228***	–0.3766***
	(11.69)	(–15.51)	(4.95)	(–2.79)
Constant	–0. 0801***	0. 1819***	–13.7630***	28.3508***
	(–6.06)	(13.38)	(–7.42)	(4.88)
Adj. R-Square	0.140***	0.300***	0.002***	0.002***
Chi^2	404.68***	1083.06***	114.56***	128.73***
No of Obs.	2,268	2,268	2,268	2,268

Notes: ***, **, and * indicate the significance level at 0.001, 0.01, and 0.05, respectively. The results of panel data analysis applying the panel random effect model are shown in this table. In the column section, downside risk measures (Semi-Standard Deviation, and Lower Partial Moment) and risk-adjusted return measures (Sortino Ratio and Information Ratio) are shown. In the row, macroeconomic factors are deposit rate, money supply (M2), GDP growth rate, remittance, exports and imports shown. The 12-month window method is applied to calculate the monthly downside risk and the risk-adjusted return along with collected macroeconomic factors data from January 2017 to December 2023.

lowing Dougherty (2011) and Wooldridge (2010), the Hausman test and Breusch-Pagan Lagrange Multiplier test are performed to determine the model's suitability, confirming that the random effect model is suitable for regression analysis. The random effect model is performed for four regression analyses, i.e., lower partial moment (LPM), semi-standard deviation (SSD), Sortino ratio (SORT), and Information ratio (IR), and the results are given in Table 4.

Model 1 and 2 of Table 4 exhibit that overall macroeconomic factors have statistically significant effects on downside risk, supporting hypothesis H_{1a}. The results indicate that semi-standard deviation (SSD) has a statistically significant ($p < 0.05$) positive relationship with the coefficient of broad money supply, deposit rate, and GDP growth, indicating that increases in these factors elevate downside risk. In contrast, SSD exhibits a statistically significantly negative relationship with the coefficients of export and remittances at 5% significant level, implying their risk-reducing role. Additionally, LPM has a statistically significant positive relationship with the coefficient of exports and remittances, while the coefficients of broad money supply, deposit rate, and GDP growth rate exhibit a statistically significant relationship with LPM at 5% significant level. However, similar to SSD, import payment has no statistically significant relationship with LPM.

Furthermore, this analysis also evaluates the effect of macroeconomic factors on downside risk-adjusted returns, represented by the Sortino Ratio and Information Ratio. Overall results show that macroeconomic factors have a statistically significant influence on downside risk-adjusted returns, which validates H_{2a} (Model 3 and 4). The results indicate that the Sortino ratio has a statistically significant positive relationship with the coefficient of deposit rate, remittance, and GDP growth rate at a 5% significant level, demonstrating their role in enhancing mutual fund performance. However, Sortino ratio exhibits a negative relationship with the coefficient of export ($p < 0.05$), while import and broad money remain statistically insignificant ($p > 0.05$) with respect to the Sortino ratio. The information ratio has a statistically significant positive relationship with the coefficients of deposit

Table 5. Regression results of the impact of macroeconomic factors on mutual funds' downside risk and risk-adjusted return (Robust Random Effect Model)

Variables	Model 1	Model 2	Model 3	Model 4
	Semi-Standard Deviation (T-Value)	Lower Partial Moments (T-Value)	Sortino Ratio (T-Value)	Information Ratio (T-Value)
Deposit Rate	0.0099***	–0. 0249***	0. 2019***	0.5545
	(3.38)	(–9.35)	(4.16)	(1.04)
Export	–0.00001***	0.0001***	–0.0004***	0. 0002**
	(–4.21)	(5.47)	(–2.61)	(2.12)
Import	–0.00001	–0.00001	0.00006*	0. 0005**
	(–1.26)	(–1.37)	(1.69)	(2.34)
Remittance	–0.00002***	0.00003***	0.00003	0. 0002***
	(–4.11)	(10.31)	(0.69)	(3.80)
Broad Money Supply	0.00005***	–0.00009***	–0.00003***	0.0006*
	(8.75)	(–18.02)	(–4.36)	(1.83)
GDP Growth Rate	0.0078***	–0. 0107***	0. 2228***	–0.3766***
	(5.88)	(–7.81)	(3.39)	(–3.94)
Constant	–0. 0802***	0. 1818***	–13.7630***	28.3508***
	(–3.35)	(6.98)	(–9.96)	(3.76)
Adj. R–Square	0.140***	0.298***	0.002***	0.002***
Chi^2	101.978***	576.703***	359.750***	287.164***
No of Obs.	2,268	2,268	2,268	2,268

Notes: ***, **, and * indicate the level of significance at 0.001, 0.01 and 0.05, respectively. This table is for robust panel regression analysis to check the authenticity of the result from the random effect model. In the column section of this table, downside risk measures (Semi-Standard Deviation and Lower Partial Moment) and risk-adjusted return measures (Sortino Ratio and Information Ratio) are shown. In the row, macroeconomic factors are deposit rate, money supply (M2), GDP growth rate, remittance, exports and imports shown. The 12-month window method is applied to calculate the monthly downside risk and the risk-adjusted return along with collected macroeconomic factors data from January 2017 to December 2023.

http://dx.doi.org/10.21511/imfi.21(4).2024.30

rate, import, and remittances and a negative relationship with the coefficients of GDP growth rates at a 5% significant level. Exports and broad money supply do not significantly affect the Information Ratio. These findings highlight the varied influence of macroeconomic factors on downside risk and risk-adjusted returns, emphasizing their role in shaping risk and return profiles of mutual funds.

Additionally, the results of the robust random effects model are shown in Table 5, which is performed as a part of the robustness analysis to determine the reliability of the findings of the random effect model (Table 4). Overall, the findings of the robust random effect model show similar results to the random effect model. Analysis shows that the coefficients of macroeconomic variables remain at the same significance level with downside risk measures, which justifies the authenticity of the findings of the random effect model. From the perspective of risk-adjusted returns, the results of the robust random effects model show minor variations compared to the initial random effects model. These small changes further affirm the robustness and consistency of the findings, validating the reliability of the random effects model in capturing the relationships under study.

4. DISCUSSIONS

From the downside risk perspective, Models 1 and 2 in Table 4 display the coefficients of macroeconomic factors in relation to semi-standard deviation (SSD) and lower partial moment (LPM). The results show that SSD has a significant negative relationship with the coefficient of exports and remittances, which indicates that when exports and remittances increase, the SSD decreases. This result is compatible with the findings of Tram and Hoai (2021) and Hamid and Hasan (2017), who also found that broad macroeconomic factors significantly negatively affect systematic risk and semi-variance. The negative relationship indicates that a higher export level is generally associated with economic stability and growth. Mutual funds with significant exposure to export-driven sectors benefited from this stability, which reduced downside risk. Remittances enhance household income, consumption, and savings and stabilize the economy. This stability reduces economic uncertainty and volatility, which leads to a decrease in downside risk (semi-standard deviation) for mutual funds. On the other hand, SSD has a statistically significant and positive relationship with the coefficients of deposit rate, broad money supply and GDP growth rate. That indicates that the SSD increases when the deposit rate, broad money supply, and GDP growth rate increase. These results also supported the conclusions of Bodnaruk et al. (2018) and Tram and Hoai (2021), who identified that macroeconomic factors significantly positively impact systemic risk and downside risk. The positive findings suggest that an increase in deposit rate pushes mutual funds managers to take more aggressive investment positions to generate returns that compete with safer deposits. This can increase the fund's risk exposure to riskier assets and lead to higher downside volatility or SSD. Also, an increase in broad money supply raises the liquidity in the financial market, leading to the rapid growth of mutual funds. However, due to the speculative bubbles and greater volatility in the stock market, the SSD of mutual funds is higher. However, a higher GDP growth rate overheats the financial markets and creates asset bubbles. Due to the burst of bubbles, mutual funds face sharp downturns, increasing the SSD. The significant positive relationship suggests that due to the heightened market volatility during periods of robust GDP growth, mutual funds are more exposed to downside risk. Conversely, import has a statistically insignificant relationship with SSD. This implies that import does not influence the increase or decrease of downside risk measures SSD, which is aligned with the results of Valahzaghard et al. (2012), who found no impact on credit risk.

Model 2, Lower Partial Moment (LPM), shows that it has a statistically significant and negative relationship with the coefficients of broad money supply, deposit rate, and GDP growth rate. This result aligned with the findings of Tram and Hoai (2021) and Hamid and Hasan (2017), who found that macroeconomic factors significantly negatively impact risk. The negative results suggest that the increase in deposit rate leads investors to deposit more over mutu-

al funds, which reduces the inflow into mutual funds. As a result, mutual funds focus on more stable investments to lower the risk of the investment, thereby reducing the downside risk LPM. However, an increase in broad money supply increases the liquidity in the market, which lowers the borrowing rate and gives investors more access to funds. Due to the lower borrowing rate, investors earn higher returns than their target threshold, leading to lower downside risk LPM. Moreover, increasing the GDP growth rate reduces the uncertainty in financial markets. As a result, mutual funds earn more than the minimum returns, leading to lower downside risk LPM. On the other hand, LPM has a statistically significant positive relationship with exports and remittances. This finding also supported the conclusion of Bodnaruk et al. (2018) and Tram and Hoai (2021), who assert that macroeconomic factors have a significant positive impact on risk. The positive coefficients of exports indicate that fluctuations in export-driven sectors increase the likelihood of returns falling below the target returns, leading to higher LPM for mutual funds. The positive coefficient of remittances indicates that the remittances-dependent economy highly depends on global labor markets and geopolitical factors. Investors invest more in consumption or housing, which leads to a lower level of investment in mutual funds. As a result, mutual funds' performance becomes poor and increases the LPM. Conversely, similar to SSD, no statistically significant relationship exists between import and LPM.

The Sortino ratio shows a statistically significant and positive relationship with the coefficients of deposit rate and remittances (Model 3, Table 4), indicating that an increase in deposit rate and remittances increases the performance of mutual funds. This result is compatible with the findings of Gyimah et al. (2021), who explored the fact that broad macroeconomic factors have a significant positive impact on mutual funds' performance. The positive findings suggest that with the increase in deposit rate, mutual funds push their investment more optimized and stable investments, which leads to increased performance of mutual funds. However, an increase in remittances leading to more stable financial markets and better mutual fund performances caused funds with exposure to consumer-driven sectors to benefit from remittances. Also, the Sortino ratio has a statistically significant and positive relationship with the GDP growth rate, indicating that an increase in GDP growth rate increases the performance of mutual funds. Because a higher GDP growth rate increases the performance of mutual funds due to the stability of financial markets. While GDP is strong, the downside risk is minimized because the economy is expanding, leading to better mutual funds' performance.

On the other hand, the Information ratio has a significant negative relationship with the coefficients of GDP growth rate (Model 4, Table 4), indicating that an increase in GDP growth rate reduces the performances of mutual funds. This result is consistent with the findings of Hussain (2017) and Krishnamurthy et al. (2018), who found that macroeconomic factors have a significant negative impact on mutual funds' performance. However, the information ratio has a statistically significant and positive relationship with the coefficient of import payments, indicating that mutual funds with exposure to import-dependent sectors and strong import activity increase revenue growth and stable cash flows, which lead to mutual funds outperforming relative to benchmark return. As a result, it increases the performance of mutual funds. Conversely, imports have a statistically insignificant relationship with the Sortino ratio, indicating that imports have no influence on the performance of mutual funds. Moreover, exports have a significant negative relationship with the Sortino ratio because a decline in international demand, trade disruptions, and currency fluctuations decrease the performance of export-dependent investments. So mutual funds highly depend on exports and face losses, leading to a lower performance level. Conversely, it has a statistically insignificant relationship with the information ratio, indicating that export has no influence on the performance of mutual funds. Finally, it is found that broad money supply has no significant relationship with the Sortino and Information ratios, indicating no influence of broad money supply on the performance of mutual funds.

http://dx.doi.org/10.21511/imfi.21(4).2024.30

CONCLUSIONS

This study focuses on the impact of macroeconomic variables on the downside risk and risk-adjusted returns of Bangladeshi mutual funds, utilizing monthly data of 27 mutual funds and six macroeconomic variables from January 2017 to December 2023. Semi-standard deviation and lower partial moment are utilized as the downside risk measures, and the Sortino and information ratios are applied as the risk-adjusted return measures. Data are normalized using the two-step data normalization method and have no multicollinearity, heteroscedasticity, or autocorrelation issues. Subsequently, the Hausman test and Breusch-Pagan Lagrange Multiplier test results suggest that the random effect model is appropriate for the regression analysis. Additionally, a robust random effect model is applied to test the robustness of the findings of the random effect model, and the results are consistent and reliable in both models.

The findings of the study show that both the downside risk and risk-adjusted measures have a statistically significant relationship with macroeconomic factors. In the case of downside risk, deposit rate, export, remittance, broad money, and GDP growth rate have significantly influenced downside risk by affecting economic activity, investment decisions, consumer behavior, and the overall stability of financial markets. Subsequently, the risk-adjusted performance of mutual funds has a statistically significant relationship with macroeconomic factors like deposit rate, remittance, GDP growth rate, imports, and export amounts. It is seen that when broader economic factors perform well, the risk-adjusted performance of mutual funds performs as well. These findings offer valuable insights for practitioners, investors, and asset managers to make informed decisions on mutual fund investments, particularly in times of market asymmetry. As mutual funds drive growth in Bangladesh's capital market, this study is essential for Bangladeshi investors seeking high returns in this expanding sector. The study highlights which macroeconomic factors significantly influence downside risk and risk-adjusted performance, equipping investors to better anticipate fund performance based on these economic indicators.

This study has limitations due to its reliance on monthly data, a restricted set of downside risk and risk-adjusted performance measures, and a limited selection of macroeconomic variables. Future research could address these gaps by incorporating high-frequency data (e.g., weekly or daily) to capture more dynamic impacts of macroeconomic factors on mutual fund performance. Additionally, expanding the range of risk metrics to include measures like Value at Risk (VaR) and exploring more macroeconomic indicators, such as exchange rate volatility or oil prices, would enhance the analysis. Applying this approach to other sectors, such as financial institutions or insurance, could further validate the findings.

AUTHOR CONTRIBUTIONS

Conceptualization: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Data curation: Md. Mahedi Hasan.
Formal analysis: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Funding acquisition: Tawfiq Taleb Tawfiq.
Investigation: Shaikh Masrick Hasan, Tawfiq Taleb Tawfiq, Md. Mahedi Hasan, K. M. Anwarul Islam.
Methodology: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Project administration: Shaikh Masrick Hasan, K. M. Anwarul Islam.
Resources: Shaikh Masrick Hasan, Tawfiq Taleb Tawfiq, Md. Mahedi Hasan, K. M. Anwarul Islam.
Software: Shaikh Masrick Hasan.
Supervision: Shaikh Masrick Hasan.
Validation: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Visualization: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Writing – original draft: Shaikh Masrick Hasan, Md. Mahedi Hasan.
Writing – review & editing: Shaikh Masrick Hasan, Tawfiq Taleb Tawfiq, Md. Mahedi Hasan, K. M. Anwarul Islam.

REFERENCES

1. Aggarwal, P., & Saqib, N. (2017). Impact of macroeconomic variables of India and USA on Indian stock market. *International Journal of Economics and Financial Issues, 7*(4), 10-14. Retrieved from https://ideas.repec.org/a/eco/journ1/2017-04-02.html
2. Ali, M. B. (2023). Co integrating Relation between Macroeconomic Variables and Stock Return: Evidence from Dhaka Stock Exchange (DSE). *IJESPG (International Journal of Engineering, Economic, Social Politic and Government), 1*(1), 1-14. https://doi.org/10.26638/ijespg.v1i1.3
3. Ang, A., Chen, J., & Xing, Y. (2006). Downside risk. *Review of Financial Studies, 19*(4), 1191-1239. https://doi.org/10.1093/rfs/hhj035
4. Baghdadabad, M. R. T., & Glabadanidis, P. (2014). An extensile method on the arbitrage pricing theory based on downside risk (D-APT). *International Journal of Managerial Finance, 10*(1), 54-72. https://doi.org/10.1108/ijmf-12-2011-0095
5. Baghdadabad, M. R., & Fooladi, M. (2015). Using downside risk in evaluating the performance of Malaysian Mutual Funds. *International Journal of Emerging Markets, 10*(3), 427-447. http://dx.doi.org/10.1108/IJoEM-08-2011-0071
6. Bawa, V. S., & Lindenberg, E. B. (1977). Capital market equilibrium in a mean-lower partial moment framework. *Journal of Financial Economics, 5*(2), 189-200. https://doi.org/10.1016/0304-405X(77)90017-4
7. Beenstock, M., & Chan, K. (2009). Testing the arbitrage pricing theory in the United Kingdom. *Oxford Bulletin of Economics and Statistics, 48*(2), 121-141. https://doi.org/10.1111/j.1468-0084.1986.mp48002002.x
8. Berger, V. W., & Zhou, Y. (2014). Kolmogorov-Smirnov Test: Overview. *Wiley StatsRef: Statistics Reference Online.* https://doi.org/10.1002/9781118445112.stat06558
9. Bodnaruk, A., Chokaev, B., & Simonov, A. (2018). Downside risk timing by mutual funds. *The Review of Asset Pricing Studies, 9*(1), 171-196. https://doi.org/10.1093/rapstu/ray003
10. Bohrnstedt, G. W., & Carter, T. M. (1971). Robustness in regression analysis. *Sociological Methodology, 3,* 118-146. https://doi.org/10.2307/270820
11. Born, B., & Breitung, J. (2016). Testing for serial correlation in fixed-effects panel data models. *Econometric Reviews, 35*(7), 1290-1316. https://doi.org/10.1080/07474938.2014.976524
12. Dougherty, C. (2011). *Introduction to econometrics*. Oxford university press, USA.
13. Estrada, J. (2006). Downside risk in practice. *Journal of Applied Corporate Finance, 18*(1), 117-125. https://doi.org/10.1111/j.1745-6622.2006.00080.x
14. Fishburn, P. C. (1977). Mean-Risk Analysis with Risk Associated with Below-Target Returns. *The American Economic Review, 67*(2), 116-126. http://www.jstor.org/stable/1807225
15. Gao, L., Wang, Y., & Zhao, J. (2017). Does local religiosity affect organizational risk-taking? Evidence from the hedge fund industry. *Journal of Corporate Finance, 47,* 1-22. https://doi.org/10.1016/j.jcorpfin.2017.08.006
16. Gjerde, Ø, & Sættem, F. (1999). Causal relations among stock returns and macroeconomic variables in a small, open economy. *Journal of International Financial Markets, Institutions and Money, 9*(1), 61-74. https://doi.org/10.1016/S1042-4431(98)00036-5
17. Glejser, H. (1969). A new test for heteroskedasticity. *Journal of the American Statistical Association, 64*(325), 316-323. https://doi.org/10.1080/01621459.1969.10500976
18. Grootveld, H., & Hallerbach, W. (1999). Variance vs downside risk: Is there really that much difference? *European Journal of Operational Research, 114*(2), 304-319. https://doi.org/10.1016/S0377-2217(98)00258-6
19. Gyimah, A. G., Addai, B., & Asamoah, G. K. (2021). Macroeconomic determinants of mutual funds performance in Ghana. *Cogent Economics & Finance, 9*(1), 1-20. https://doi.org/10.1080/23322039.2021.1913876
20. Hamid, K., & Hasan, A. (2017). Volatility modeling and asset pricing: Extension of GARCH model with macroeconomic variables, value-at-risk and semi-variance for KSE. *Pakistan Journal of Commerce and Social Sciences, 10*(3), 569-587. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2894885
21. Hasan, S. M. (2024). Does Islamic Mutual Fund Bear Higher Risk than Conventional Mutual Funds? An Empirical Analysis from Bangladesh: Islamic Mutual Fund vs. Conventional Mutual Fund. *Jahangirnagar University Journal of Business Research, 24*(01), 43-62. https://doi.org/10.53461/jujbr.v24i01.43
22. Hasan, S. M., & Hasan, M. M. (2024). Effect of Macroeconomic Factors on Mutual Funds Risk and Return: An Empirical Study from Bangladesh: Mutual Funds Risk and Return. *Jahangirnagar University Journal of Business Research, 24*(01), 101-120. https://doi.org/10.53461/jujbr.v24i01.31
23. Hasan, S. M., Tawfiq, T. T., Hasan, M. M., & Islam, K. M. A. (2024). Corporate Governance Dynamics in Financial Institution Performance: A Panel Data Analysis. *Investment Management and Financial Innovations, 21*(3), 292-303. http://dx.doi.org/10.21511/imfi.21(3).2024.24
24. Hoepner, A. G., & Schopohl, L. (2016). On the price of morals in markets: An empirical study of the Swedish AP-funds and the Norwegian Government Pension Fund. *Journal of Business Ethics, 151*(3), 665-692. https://doi.org/10.1007/s10551-016-3261-0

http://dx.doi.org/10.21511/imfi.21(4).2024.30

25. Hoepner, A. G., Oikonomou, I., Sautner, Z., Starks, L. T., & Zhou, X. (2016). ESG shareholder engagement and downside risk. *European Corporate Governance Institute*. https://doi.org/10.2139/ssrn.2874252

26. Hussain, N. (2017). Mutual Fund Performance; Funds and Country Specific Characteristics: A Comparative Study of Pakistan and India Equity Funds. *Journal of Poverty, Investment and Development, 37,* 18-24. Retrieved from https://iiste.org/Journals/index.php/JPID/article/view/38093#google_vignette

27. Imsar, I., Tambunan, K., Silviani, R., & Harahap, M. I. (2022). The effect of export, Islamic Mutual Fund, and labor force on economic growth in Indonesia. *At-tijaroh: Jurnal Ilmu Manajemen Dan Bisnis Islam, 8*(1), 104-114. https://doi.org/10.24952/tijaroh.v8i1.4580

28. Israelsen, C. (2005). A refinement to the Sharpe Ratio and information ratio. *Journal of Asset Management, 5*(6), 423-427. https://doi.org/10.1057/palgrave.jam.2240158

29. Kabir, M. R., & Chowdhury, A. H. (2016). A Comparative Analysis of Profit Rate on Deposit in Islamic Banks in Bangladesh. *IIUC Studies, 10,* 81-98. https://doi.org/10.3329/iiucs.v10i0.27428

30. Katsikeas, C. S., Leonidou, L. C., & Morgan, N. A. (2000). Firm-Level Export Performance Assessment: Review, Evaluation, and development. *Journal of the Academy of Marketing Science, 28*(4), 493-511. https://doi.org/10.1177/0092070300284003

31. Kisoi, S., & Onyango, P. (2017). Effect of macroeconomic variables on portfolio risk of commercial banks listed on NSE. *International Journal of Economics, 2*(3), 31-53. Retrieved from https://ideas.repec.org/a/bdu/ijecon/v2y2017i3p31-53id248.html

32. Krishnamurthy, S., Pelletier, D., & Warr, R. S. (2018). Inflation and equity mutual fund flows. *Journal of Financial Markets, 37,* 52-69. https://doi.org/10.1016/j.finmar.2017.12.001

33. Kwon, C. S., & Shin, T. S. (1999). Cointegration and causality between macroeconomic variables and stock market returns. *Global Finance Journal, 10*(1), 71-81. https://doi.org/10.1016/s1044-0283(99)00006-x

34. Meer, V. D., R., Sortino, F., & Plantinga, A. (2001). The impact of downside risk on risk-adjusted performance of mutual funds in the Euronext markets. *SSRN Publication,* 1-14, http://dx.doi.org/10.2139/ssrn.277352

35. Miskolczi, P. (2017). Note on simple and logarithmic return. *Applied Studies in Agribusiness and Commerce, 11*(1-2), 127-136. https://doi.org/10.19041/apstract/2017/1-2/16

36. Nafees, B., Shah, S. M., & Khan, S. (2011). Performance evaluation of open-end and close-end mutual funds in Pakistan. *African Journal of Business Management, 5*(28), 11425-11434. https://doi.org/10.5897/ajbm11.305

37. Nawrocki, D. N. (1999). A brief history of downside risk measures. *The Journal of Investing, 8*(3), 9-25. https://doi.org/10.3905/joi.1999.319365

38. Osamwonyi, I. O., & Osagie, E. I. (2012). The relationship between macroeconomic variables and stock market index in Nigeria. *Journal of Economics, 3*(1), 55-63. https://doi.org/10.1080/09765239.2012.11884953

39. Panigrahi, C. A., Karwa, P., & Joshi, P. (2020). Impact of Macroeconomic Variables on the Performance of Mutual Funds: A Selective Study. *Journal of Economic Policy & Research, 15*(1), 29-41. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3653076

40. Qamruzzaman, M. (2014). Comparative Study on Performance Evaluation of Mutual Fund Schemes in Bangladesh: An Analysis of Monthly Returns. *Journal of Business Studies Quarterly, 5*(4), 190-209. Retrieved from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=8c5c6eeb5a55b2dc2f74b36627d4a067f73d73f1

41. Qureshi, F., Ismail, I., & Chan, G. S. (2016). Mutual funds and market performance: New evidence from Asean Markets. *Investment Analysts Journal, 46*(1), 61-79. https://doi.org/10.1080/10293523.2016.1253137

42. Rahman, M. H., & Mamun, A. A. (2022). Performance Evaluation of Mutual Fund Sector in Bangladesh, and Identification of Major Drawbacks. *International Journal of Science and Business, IJSAB International, 8*(1), 76-94. http://dx.doi.org/10.5281/zenodo.5948533

43. Reddy, K., Mirza, N., Naqvi, B., & Fu, M. (2017). Comparative risk-adjusted performance of Islamic, socially responsible and conventional funds: Evidence from United Kingdom. *Economic Modelling, 66,* 233-243. https://doi.org/10.1016/j.econmod.2017.07.007

44. Riddles, N. (2001). A portfolio manager's view of downside risk. *Managing Downside Risk in Financial Markets,* 93-100. https://doi.org/10.1016/b978-075064863-9.50008-6

45. Roll, R., & Ross, S. A. (1980). An empirical investigation of the arbitrage pricing theory. *The Journal of Finance, 35*(5), 1073-1103. https://doi.org/10.1111/j.1540-6261.1980.tb02197.x

46. Sahoo, T. K., Yarso, A., Das, A., Borah, N., & Gachuiwo, H. (2024). A Panel Data Exploration of Macroeconomic Factors Influencing The Optimal Capital Structure of The Indian Automotive Sector. *Bangladesh Journal of Multidisciplinary Scientific Research, 9*(4), 1-15. https://doi.org/10.46281/bjmsr.v9i4.2239

47. Schroeder, M. A., Lander, J., & Silverman, S. L. (1990). Diagnosing and dealing with multicollinearity. *Western Journal of Nursing Research, 12*(2), 175-187. https://doi.org/10.1177/019394599001200204

48. Templeton, G. F. (2011). A two-step approach for transforming continuous variables to normal: implications and recommendations for IS research. *Communications of*

the Association for Information Systems, 28(4), 41-58. https://doi.org/10.17705/1CAIS.02804

49. Tram, T. X., & Hoai, N. T. T. (2021). Effect of macroeconomic variables on systemic risk: Evidence from Vietnamese economy. *Economics and Business Letters, 10*(3), 217-228. https://doi.org/10.17811/ebl.10.3.2021.217-228

50. Valahzaghard, M. K., Kashefi, M., Alikhani, A., & Hosseini, S. E. (2012). The effect of macroeconomic factors on credit risk in the banking system of Iran. *Management Science Letters, 2*(5), 1747-1754. https://doi.org/10.5267/j.msl.2012.04.012

51. Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.

http://dx.doi.org/10.21511/imfi.21(4).2024.30