# Does Islamic Mutual Fund Bear Higher Risk than Conventional Mutual Fund? An Empirical Analysis from Bangladesh

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*Abstract: This study aims to identify whether Islamic mutual funds bear higher risk exposure than conventional mutual funds due to implementing their shariah screening criteria to select assets on the portfolio. For this purpose, monthly closing price data of Islamic and conventional funds operated in Bangladesh are collected from January 2016 to August 2023. A total of 2320 observations of each risk measure (e.g., standard deviation, beta, semi-standard deviation, and lower partial moment) are computed using a 12-month rolling window method to compare risk exposure between Islamic and conventional funds using univariate and multivariate analysis. The univariate analysis is conducted by performing an independent samples t-test, which confirms that overall, Islamic funds bear lower risk exposure than conventional funds. In multivariate analysis, the Feasible Generalized Least Square (FGLS) method, a dynamic panel data analysis model, is applied where the effects of macroeconomic variables such as GDP growth rate, exports, imports, broad money, deposit rate, and remittances are controlled. The results of the multivariate analysis also confirm that Islamic mutual fund risk exposure is lower than that of conventional mutual funds. This finding indicates that asset screening criteria of Islamic funds do not have any negative impact on the risk exposure of Islamic funds compared to unrestricted conventional funds. The findings of the study will be helpful for practitioners and institutional investors as well as risk-averse investors in making their investment decisions as screened Islamic mutual fund investment is safer than conventional mutual funds.*

*Keywords: Risk, downside risk, Islamic Funds, Shariah, Bangladesh, Mutual Fund, conventional funds.*

## Introduction

Mutual funds have become an increasingly popular investment over the past twenty years, including in Bangladesh. While investors see mutual funds as a safe option due to professional management and pooling of resources, it is vital to note that they carry risks. (Rahman, & Mamun, 2022). Policymakers become concerned with the level of investors' knowledge regarding the risk and return of the mutual funds (Hasan, 2016). Investors generally choose mutual funds, which create relatively high-risk investment portfolios because professionally managed funds aim to generate potentially high returns through strategic investments in

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risky assets (Noor, et al., 2023; Elton, et al., 2007). Ali, et al., (2023) stated that attitude towards risk preferences of investors are related to the investment types, risk-taking tendencies of individuals, and retirement plans. In the strategic and planned investment decision-making process, risk is considered an important factor thus risk exposure of mutual funds is crucial (Ali et al., 2023).

Islamic Shariah law is the basis for selecting assets in Islamic funds which prohibits investors from investing their money in Haram businesses, such as businesses related to Gharar, Maysir, and Riba (Hayat & Kraeussl, 2011). Securities of conventional financial institutions, treasury bonds, treasury bills, and highly leveraged firms are excluded from the investment of Islamic funds (Rahman, et al., 2022). Thus, Islamic funds may not be able to create a well-diversified optimal portfolio due to their shariah screening criteria when selecting assets, a challenge highlighted by the modern portfolio theory (MPT) proposed by Markowitz in 1952 (Dimmock, et al., 2024).

Islamic finance is growing in importance within the global financial system such as United States, United Kingdom, China, European Union, and Japan (IFSB, 2023; Climent, et al., 2020; Renneboog, et al., 2008). Increased demand for Islamic mutual funds, followed by improved returns, can contribute to ongoing progress in Islamic finance in the current financial. An analysis of investment and financial performance from 20 different nations shows that in the developed Islamic financial markets, Islamic funds exhibit greater returns than the underdeveloped or developing nations (Hoepner, et al., 2011). This indicates that the performance of Islamic funds varies in different nations due to fund managers' analytical skills, and overall market conditions.

Previously many authors (Climent et al., 2020; Mansor & Bhatti, 2011; Rodriguez, 2015; Hayat & Kraeussl, 2011) conducted their research on the risk exposure of Islamic mutual funds and conventional mutual funds separately, where no comparison of risk exposure is shown between these two distinct groups of funds. Rodriguez (2015) investigates only conventional mutual funds and explores the systematic and total risk of mutual funds. Vidal at al. (2016) also focus on conventional mutual funds and try to identify the idiosyncratic risk exposure. Moreover, Hayat & Kraeussl (2011) show the downside and systematic risk exposure of Islamic mutual funds. Whereas, Reddy, et al. (2017) compare the risks of Islamic mutual funds with Conventional and Socially responsible funds using systematic risk measures. Naveed, et al. (2020) compared the risk exposure (e.g. systematic risk, idiosyncratic risk, and downside risk) between Islamic and conventional mutual funds, and found that Islamic funds bear lower risk than conventional funds in Pakistan.

Thus, this study asks the following research questions: 1) Do Islamic funds bear higher risk than conventional funds in Bangladesh? And 2) Do macroeconomic variables influence the risk? To answer these questions, this study collects monthly closing price data from January 2016 to August 2023, and all risk measures are calculated using the 12-month rolling window method. Based on 2320 observations, the risk measures of Islamic mutual funds are compared with

the conventional mutual funds where both univariate and multivariate data analyses are applied. Independent samples t-test is performed for the univariate data analysis, and the Feasible Generalized Least Square (FGLS) method of panel data analysis is applied for the multivariate analysis. In multivariate analysis, macroeconomic variables, such as GDP growth rate, broad money, remittance, deposit rate, exports, and import payments, are used as control variables.

This study contributes to the existence knowledge in several ways. Firstly, most of the researchers (Hoepner et al., 2011; Abdelsalam, et al, 2014; Kreander, et al., 2005; Climent, & Soriano, 2011; Capelle & Monjon, 2014) focus on the performance comparison of ethical or socially responsible funds with conventional funds. This indicates that there is a lack of research on risk comparison between Islamic and conventional mutual funds, so, this study helps to extend knowledge in the existing literature of Islamic and conventional funds.

Secondly, this study utilized both traditional risk measures (standard deviation and beta) (following Humphrey & Lee, 2011; Bodnaruk, et al., 2019) and downside risk measures (semi-standard deviation and lower partial moment) (following Hoepner & Schopohl, 2016). Thus, the findings of the study are robust for considering various types of risk measures, risk-averse investors can utilize these findings of downside risk measures to make investment decisions according to their low-risk-taking aptitude.

Thirdly, there is a methodological contribution in this research which is the utilization of a 12-month rolling window method to compute risk measures, and the application of both univariate (t-test) and multivariate data (FGLS method) analysis to compare risk exposure between Islamic and conventional funds. The fund managers and investors can use this rolling window method to compute the risk exposure of mutual funds. Moreover, this research includes the macroeconomic factors in the multivariate analysis as control variables, which also helps fund managers or investors evaluate their investment decisions considering the effect of macroeconomic factors.

**Literature Review**

Since the creation of Islamic mutual funds, researchers have been enquiring to find out whether their performance differs from that of conventional funds. Reddy et al. (2017) show that the performance of Islamic equity mutual funds differs from that of conventional equity mutual funds due to their differences in risk exposure. Islamic mutual funds are fundamentally different from traditional investment funds since Islamic funds are strictly prohibited from investing in human cloning, wine production, pornography, gambling, and interest-bearing businesses (Hayat & Kraeussl, 2011). The comprehensive market risk analysis in Saudi Arabia reveals that Islamic mutual funds are significantly less vulnerable than conventional mutual funds (BinMahfouz & Hassan, 2012).

A study conducted on Pakistani Islamic Funds using beta (systematic risk) and

standard deviation (total risk) reveals that a greater proportion of funds have lower risk exposure and positive returns (Shah, 2020). Another research conducted in Pakistan finds that Islamic mutual funds' risk exposures are lower than conventional mutual funds (Nafees, et al., 2018). These results, however, conflict with a Malaysian study that explores that Islamic portfolios offer marginally lower returns as well as carry a higher level of risk than their conventional funds (Mansor & Bhatti, 2011).

Moreover, a study conducted by Deb (2019) on Islamic mutual funds found that Indian mutual funds bear the downside risk. Chowdhury, Habibullah & Nahar (2018) performed a study in Bangladesh and found that mutual funds bear higher risks than conventional counterparts. Bodnaruk et al. (2019) identify that mutual funds are affected by downside risk. Yang & Hou (2016) explore that the performance of mutual funds is positively correlated with risk. Marco, et al. (2011) performed a comparative analysis and found that risks vary from conventional fund to Islamic fund. Consequently, in an investigation conducted in Malaysia, the economic situation affected the funds' efficiency and found that Islamic funds perform better than conventional funds in a downturn economic situation (Abdullah, et al., 2002).

Islamic mutual funds perform better than conventional mutual funds, and their risk-adjusted return is superior to conventional funds (Nafees et al., 2018). Climent et al. (2020) find that the performance of Islamic mutual funds is higher than that of conventional funds. Another investigation in Malaysia identifies that Islamic mutual funds' performance is not superior to that of conventional funds (Mansor & Bhatti, 2016). Anwar, et al. (2017) show that Islamic mutual funds do not perform better than conventional funds because Islamic funds have less diversification and get stable returns, whereas conventional funds have more volatility and get higher returns. Elmanizar & Aveliasari (2023) find that systematic risk has no significant difference between Islamic and conventional mutual funds.

In addition, Ahmed & Siddiqui (2019) explore that conventional mutual funds perform better than Islamic funds during the financial and non-financial crisis period. Agussalim, Limakrisna & Ali (2017) show that Islamic mutual funds' performance is higher than conventional funds. Naveed, et al. (2021) revealed that better governance lowers the risk exposures of mutual funds. A study in Indonesia shows that Islamic mutual funds perform better than conventional funds (Pratama, et al., 2021).

### *Impact of Macroeconomic Variables on the Risk Exposure of Mutual Fund*

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Like the risk exposure of other business sectors, the risk and return of mutual funds are also influenced by macroeconomic factors (Dash & Kumar, 2008; Ahmed & Siddiqui, 2019; Hussain, 2017; Singh, et al., 2011). For example, Dash & Kumar (2008) identify those macroeconomic factors such as interest rate, exchange rate, inflation and crude oil price have a significant influence on the risk and return of mutual funds. Also, Ahmed & Siddiqui (2019) identify that macroeconomic variables have a significant influence on the performance of mutual funds. Moreover, Hussain (2017) shows that interest rate has a negative relation with the return of mutual funds but the inflation rate has a positive relation with mutual funds' return. Philpot, et al. (1998) find the inverse relation between interest rate and performance of mutual funds.

Similarly, researchers like Rizwan, et al. (2020), Shankar, et al. (2021), and Duan et al. (2021) show that macroeconomic variables have a significant impact on the risk or the performance of mutual funds. Based on the discussion, this research also considers that macroeconomic variables have an impact on the risk of mutual funds and aims to control the effects of macroeconomic variables while comparing risk exposure between Islamic and conventional funds.

### *Are Islamic Mutual Funds Exposed to Higher Risk than Conventional Funds?*

The proposition of modern portfolio theory (MPT) suggests that Islamic funds have fewer diversification opportunities because they have a smaller asset universe than conventional funds (Hakim & Rashidian, 2004). Islamic Shariah considerations reduce the number of securities from the investable asset universe of Islamic funds; therefore, investors may be forced to choose risky assets from limited options (Reddy et al., 2017). BinMahfouz & Hassan (2012) state that when screening criteria are applied to Shariah-compliant investments, securities of specific companies and sectors are removed from the asset universe regardless of the risk-return profile. As a result, Islamic funds have a lower risk-sharing capacity than conventional funds and are exposed to a higher level of risk than funds with no screening criteria (conventional funds) according to MPT (Nainggolan, et al., 2016).

Moreover, conventional funds do not miss out on any opportunities in the financial market as they have no regulatory restrictions. Lack of diversification of Islamic funds also increases the risk exposure compared to conventional funds (Nainggolan et al., 2016). Islamic funds may also have higher costs for screening and monitoring than conventional funds because of the emphasis on non-financial performance, which increases the volatility of returns (Hong & Kacperczyk, 2009). Furthermore, if investors want to reduce risk with limited investment options, it might come at the cost of low returns (Reddy et al., 2017). Thus, the intensity of the screening and monitoring process of Islamic funds is associated with additional risks compared to conventional funds. Based on the above discussion, the following hypotheses are posited in connection with the research question 1:

*$H_1$: Islamic funds bear higher risk than conventional mutual funds.*

**Materials and Methods**

This section provides a concise explanation of the procedures, materials, and methods of research, indicates how research is conducted, data is collected, and what statistical tools are used.

*Sample Development and Data Collection*

The study period is from January 2016 to August 2023 as before 2016 the number of Islamic funds was very low. Here, 29 mutual funds are selected for this study, of which 27 are conventional mutual funds and 2 are Islamic mutual funds. To create a balanced dataset none of the funds included that were established after January 2016 because balanced data has fewer biases than unbalanced data (Hido, et al., 2009). Thus, the number of Islamic mutual funds is low in the sample.

The monthly closing price data of funds and DSEX index data is collected from January 2016 to August 2023 from investing.com[1] and the Dhaka Stock Exchange[2]. Additionally, macroeconomic variables data, i.e., exports, imports, remittances, broad money supply, deposit rate, and GDP growth rate, are collected from the Bangladesh Bank. Monthly mutual fund return is calculated using the formula below (Miskolczi, 2017)-

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

Here, *ln* is the natural logarithm; *i* is unit of the fund, *t* is time, and $P_{i,t-1}$ stands for the previous period close price, $P_{i,t}$ is the current period close price.

*Risk Measures*

Following the previous researchers (Bodnaruk et al., 2019; Hoepner & Schopohl, 2016; Naveed, 2021), this study utilized traditional risk measures like standard deviation and beta along with downside risk measures like semi-standard deviation, and lower partial moment. Each risk measure is computed following a 12-month rolling window method in agreement with Brown & Goetzmann (1997). Thus, risks are calculated from January 2017 to August 2023. A brief discussion of risk measures is given below-

*Standard Deviation (SD)*

Standard deviation or total risk measures the maximum and minimum volatility of funds return from the average return. The formula for calculating standard deviation is given below (Hasan, 2017)

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[1] https://www.investing.com/
[2] https://www.dsebd.org/

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$$SD_{i,t} = \sqrt{\frac{1}{t-1} \sum_{t=1}^{T} (r_{i,t} - \bar{r}_{i,t})^2} \quad \dots \dots \dots \dots \dots \dots \dots (ii)$$

Here, *SD* stands for standard deviation of return, *r* is monthly return, $\bar{r}$ is mean return, *i* is the fund and *t* is the time.

### Beta

Beta or systematic risk measures the sensitivity of an investment return which is a change relative to the market return. Formula for calculating beta is given below (Bodnaruk et al., 2019).

$$(r_{i,t} - r_{f,t}) = \propto_{i,t} + \beta_{i,t}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \dots \dots \dots \dots \dots \dots \dots (iii)$$

Here, *i* stands for fund, *t* stands for time, *m* stands for market, *f* is the risk-free rate, *r* is monthly return, $\beta$ is the beta which measures the systematic risk, $\propto$ is the model constant and $\varepsilon$ is the error of the model.

### Semi-Standard Deviation (SSD)

SSD considers the variances that are less than zero (Hoepner & Schopohl, 2016). Formula for calculating SSD is given below:

$$SSD_p = \sqrt{\frac{1}{T-1} \sum_{t=1}^{T} \max[(\bar{r}_p - r_{p,t}), 0]^2} \quad \dots \dots \dots \dots \dots \dots \dots (iv)$$

Here, $SSD_p$ indicates a semi-standard deviation of a portfolio, $\bar{r}_p - r_{p,t}$ indicates the maximum functions which ensure that only returns below $\bar{r}_p$ are considered.

### Lower Partial Moment (LPM)

LPM considers the negative returns and cubes them instead of squaring those (Hoepner & Schopohl, 2016). The formula for calculating LPM is given below:

$$LPM_p^3(R_f) = \frac{1}{T-1} \sum_{t-1}^{1} \max[(R_f - r_{p,t}), 0]^3 \quad \dots \dots \dots \dots \dots \dots \dots (v)$$

Here, $LPM_p^3(R_f)$ indicates the lower partial moment of the portfolio, $R_f$ indicates the risk-free return is considered the minimum accepted return for investors.

### Macroeconomic Variables

Macroeconomic variables are used as control variables in the multivariate *analysis*. This study aims to control the effects of macroeconomic variables such as deposit rate, GDP growth rate, broad money, exports, imports, and remittances while comparing the risks of Islamic and conventional funds. The yearly data, such as GDP, is converted to monthly data by applying the proportional Denton method "*dentonmq'* using the EViews software (Baum 12-month rolling window method, 2006). A brief discussion of these variables is given below:

### Deposit Rate

The deposit rate is the rate banks or financial institutions provide depositors or investors for depositing their money.

### GDP growth rate

Gross domestic product is the amount of goods and services produced by a nation over a certain period and sold to the consumers.

### Exports

The quantity of exports is the money made from exporting goods or services made in one country to customers in another country.

### Imports

The price paid for the purchase of products and services that are transported from one nation to another for first use is called an import payment.

### Broad Money

"Broad money" is defined as money in circulation, demand deposits, savings and time deposits held by individuals and businesses, and other monetary aggregates.

### Remittances

A remittance is a financial transaction made by someone working abroad to their family members back home.

### Methods of Data Analysis

Both the univariate and multivariate data analysis methods are applied in this study for the robustness of the findings. Independent sample t-test is used for univariate data analysis where each risk measures a comparison between Islamic and conventional funds. This study also uses multivariate analysis to identify which funds bear higher risk between the Islamic and conventional mutual funds while controlling the effects of macroeconomic variables on the risk exposure of mutual funds. The two-step data normalization method is used to normalize the data following (Templeton, 2011). In the first step, the rank percentile of data is computed and in the second step, normal inverse documented frequency is applied to the results of step 1 along with mean and standard deviation of data.

Following the previous researchers (Dhiab, 2021; Malkawi & Pillai, 2018), the FGLS method of panel data analysis is applied in this research. Additionally, the random effect model of panel data analysis is also utilized for the robustness of the results of FGLS methods. The equation for panel data analysis is given below:

$$risk_{i,t} = \beta_0 + \beta_1 Islamic.dummy_{1_{i,t}} + \beta_2 Controls_{1_{i,t}} + \varepsilon_i \dots\dots\dots\dots..(vi)$$

Where $i$ indicates the unit of funds, $t$ indicates time, risk is dependent variables i.e. standard deviation, beta, semi-standard deviation and lower partial moment, $\beta$ indicates coefficients, *Islamic.dummy* indicates dummy variables for Islamic mutual funds where if the fund type is Islamic then 1 otherwise 0, Controls

indicate the macroeconomic variables i.e. Deposit rate, GDP growth rate, broad money, remittance, exports and import payments and $\varepsilon$ is the error term.

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### Results and Discussion

This section is designed to show data analysis results and discussion. This section shows the descriptive statistics, univariate data analysis to compare risk exposure between Islamic and conventional funds, correlation matrix, and multivariate panel data analysis where the influence of macroeconomic variables are controlled while comparing risk between Islamic and conventional funds.

### *Descriptive Statistics*

All the risk measures and macroeconomic variables data are transformed to improve their normality following a two-step data normalization approach (Templeton, 2011). The mean of raw data and transformed data is not statistically significantly different. Therefore, transformed data is used for conducting data analysis in this study. Table 1 shows the descriptive statistics for risk measures and macroeconomic variables. Panel *A* shows the risk measures for Islamic mutual funds, panel *B* shows conventional mutual funds, and Panel *C* shows the description of macroeconomic variables.

Panel *A* and *B* of Table 1 show that Islamic mutual funds are exposed to lower risk for all the risk measures than conventional funds. This indicates that the screening criteria don't negatively influence the risk exposure of Islamic funds. In panel *C*, descriptive statistics of macroeconomic variables are shown where the monthly mean deposit rate is 4.82%. The monthly mean value of exports and imports shows that there is a monthly trade deficit of 1,420.01 million dollars in Bangladesh. Additionally, the monthly mean of remittance is 13916.27 million dollars, which may help in managing trade imbalance of Bangladesh. Lastly, the GDP growth rate has a monthly mean value of 6.390%.

**Table 1: Descriptive Statistics**

| Variables | Obs. | Mean | Std. Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| **Panel A: Islamic Mutual Funds** | | | | | |
| Standard Deviation | 160 | 0.058 | 0.018 | 0.020 | 0.100 |
| Beta | 160 | 0.494 | 0.454 | -0.650 | 1.281 |
| Semi-Standard Deviation | 160 | 0.037 | 0.020 | 0.000 | 0.082 |
| Lower Partial Moment | 160 | -0.076 | 0.018 | -0.110 | -0.041 |
| **Panel B: Conventional Mutual Funds** | | | | | |
| Standard Deviation | 2160 | 0.072 | 0.035 | 0.000 | 0.171 |
| Beta | 2160 | 0.672 | 0.614 | -2.635 | 3.061 |

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| Variables | Obs. | Mean | Std. Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| Semi-Standard Deviation | 2160 | 0.043 | 0.027 | 0.000 | 0.194 |
| Lower Partial Moment | 2160 | -0.083 | 0.03 | -0.180 | -0.030 |
| **Panel C: Control Variables** | | | | | |
| Deposit Rate | 2320 | 4.820 | 0.543 | 3.461 | 6.191 |
| Exports | 2320 | 3545.933 | 801.324 | 1537.620 | 5571.952 |
| Imports | 2320 | 4965.941 | 1118.312 | 2163.140 | 7793.471 |
| Remittances | 2320 | 13916.27 | 3516.872 | 5102.130 | 22808.1091 |
| Broad Money | 2320 | 1648706 | 280765.330 | 942958.190 | 2286988 |
| GDP Growth Rate | 2320 | 6.390 | 1.050 | 3.762 | 9.042 |

*Notes: This table is descriptive statistics that show the observation, mean value, standard deviation, maximum, and minimum value of data. Panels A and B show the risk measures for Islamic and conventional mutual funds, Panel C shows macroeconomic variables.*

*Closing price data is collected from January 2016 to August 2023 for 27 funds conventional funds and 2 funds Islamic funds. And then, calculate fund returns from February 2016 to August 2023, and lastly, calculate risk measures from January 2017 to August 2023 using the 12-month rolling window method. The two-step data normalization method is followed to normalize the data. Here, standard deviation and beta are traditional risk measures, and semi-standard deviation and lower partial moment are downside risk measures.*

### Univariate Risk Comparison Between Islamic and Conventional Funds

Mean difference analysis of different risk measures is performed using independent samples t-test to identify whether there is a statistically significant difference in risk between Islamic and conventional mutual funds. Before performing the t-test, the normality of data is tested using the Kolmogorov-Smirnov test (Berger & Zhou, 2014), and it is found that data is normally distributed. Consequently, the equality of data is tested using Levene's test (Schultz, 1985), and found that data is equally distributed. The results of the mean difference analysis using a t-test are shown in Table 2:

**Table 2: Mean risk exposure comparison between Islamic and conventional funds**

| Risk Measures | Mean | | Diff. of Mean |
|---|---|---|---|
| | Islamic Fund | Conventional Fund | |
| Standard Deviation | 0.05693 | 0.07231 | -0.01537*** |
| | | | (-5.5344) |
| Beta | 0.48889 | 0.67178 | -0.18289*** |
| | | | (-3.6926) |
| Semi-Standard Deviation | 0.03605 | 0.04302 | -0.00696*** |
| | | | (-3.2038) |

| | | | | |
|---|---|---|---|---|
| Lower Partial Moment | -0.07419 | -0.08347 | 0.00927*** | **JUJBR** |
| | | | (3.8845) | |
| No. of Observation | 160 | 2,160 | - | |

*Note: *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.*

*Notes:* The above table shows the results of the independent t-test for comparing the risks of Islamic and conventional mutual funds from January 2017 to August 2023. Standard deviation and beta are used as traditional risk measures, and semi-standard deviation and lower partial moments are used as downside risk measures.

Table 2 shows that traditional risk measures like standard deviation and beta exhibit statistically significantly lower risk for Islamic mutual funds than conventional mutual funds. Consequently, downside risk measures like semi-standard deviation and lower partial moment also exhibit similar results that Islamic funds bear lower risk than conventional funds. Because Islamic funds select assets for their portfolios following the Sharia screening criteria, that is why risk of Islamic funds is lower than that of conventional mutual funds, which is aligned with the result of Naveed et al. (2020).

### *Correlation Matrix*

The correlation matrix confirms that all risk measures have a statistically significant relationship with all macroeconomic variables that are used in this research. These findings primarily justify the reasons for choosing these specific macroeconomic variables in the multivariate analysis. Moreover, there is little chance of multicollinearity problems among the independent variables because the correlation coefficient for all variables is less than 0.80 (Hasan, 12-month rolling window method, 2023; and Hasan & Islam, 2023). The results of the correlation matrix are shown in Table 3

### Table 3: Correlations Matrix

| Variables | SD | BETA | SSD | LPM | DR | EXP | IMP | REMI | BM | GDP |
|---|---|---|---|---|---|---|---|---|---|---|
| SD | 1.000 | | | | | | | | | |
| BETA | 0.53*** | 1.00 | | | | | | | | |
| SSD | 0.71*** | 0.42*** | 1.00 | | | | | | | |
| LPM | -0.69*** | -0.38*** | -0.84*** | 1.00 | | | | | | |
| ISL.DUMMY | -0.10*** | -0.08*** | -0.06*** | 0.06*** | | | | | | |
| DR | -0.008 | 0.24*** | 0.05** | -0.11*** | 1.00 | | | | | |
| EXP | -0.27*** | -0.31*** | -0.12*** | 0.09*** | -0.54*** | 1.00 | | | | |
| IMP | -0.10*** | -0.29*** | -0.011 | -0.09*** | -0.57*** | 0.73*** | 1.00 | | | |
| REMI | -0.16*** | -0.29*** | -0.11*** | 0.11*** | -0.39*** | 0.56*** | 0.39*** | 1.00 | | |
| BM | -0.05** | -0.28*** | -0.018 | -0.08*** | -0.58*** | 0.59*** | 0.63*** | 0.72*** | 1.00 | |
| GDP | 0.09*** | 0.04** | 0.16*** | -0.15*** | -0.19*** | 0.05** | 0.21*** | -0.33*** | -0.26*** | 1.00 |

*Note:*, **, *** indicate 10%, 5%, 1% level of significance respectively.*

*Notes*: This table is a Pearson correlation matrix that shows the correlation coefficient for 27 conventional funds and 2 Islamic funds. The monthly panel data is used from January 2017 to August 2023. In this table, risk measures are standard deviation (SD), beta, semi-standard deviation (SSD), and lower partial moment (LPM), and

macroeconomic variables are deposit rate (DR), exports (EXP), imports (IMP), remittances (REMI), broad money (BR) and gross domestic product growth rate (GDP).

### *Multivariate Analysis of Risk Exposure of Islamic Funds*

Panel data analysis is undertaken to compare risk exposure of Islamic funds with conventional funds in a multivariate setting where the effects of macroeconomic variables are controlled. As a prerequisite of panel data analysis, normality of data is tested using the Kolmogorov-Smirnov (following Berger & Zhou, 2014), multicollinearity of data is tested using Variance Inflation Factor (VIF) (following Schroeder, et al., 1990), heteroscedasticity in data is tested using Breusch-Pagan test (following Glejser, 1969) and finally, autocorrelation problem is checked using Wooldridge test (in agreement with Born & Breitung, 2016). The test results indicate that the data is normally distributed, and there is no issue of multicollinearity, heteroscedasticity, and autocorrelation in the dataset.

In this research, a dynamic panel data analysis method, e.g., FGLS, is applied for multivariate analysis following Dhiab (2021) and Malkawi & Pillai (2018) for plausible results. Overall results of the multivariate analysis show that Islamic mutual funds bear lower risk than conventional mutual funds in terms of traditional risk measures and downside risk measures. Details results of the panel data analysis are shown in Table 4.

**Table 4: Regression results of different risk measures for Islamic funds using FGLS method**

|  | Model-01 | Model-02 | Model-03 | Model-04 |
|---|---|---|---|---|
|  | **Std. Deviation (T- Value)** | **Beta (T- Value)** | **Semi-Std. Deviation (T- Value)** | **Lower Partial Moment (T- Value)** |
| Islamic Dummy | -0.013838*** (-5.33) | -0.1788287*** (-3.88) | -0.0061505*** (-2.94) | 0.0070255*** (3.25) |
| Deposit Rate | -0.0072975*** (-4.29) | 0.0781889*** (2.59) | 0.0067715*** (4.94) | -0.0200592*** (-14.16) |
| Export | -0.0000178*** (-13.24) | -0.0000657*** (-2.75) | -0.00006*** (-5.92) | 0.000078*** (7.02) |
| Import | 0.00002 (0.24) | -0.0000871*** (-4.75) | 0.00008 (0.10) | -0.000036*** (-4.24) |
| Remittance | -0.00001*** (-3.40) | -0.0000333*** (-6.29) | -0.00067*** (-2.72) | 0.000016*** (6.50) |
| Broad Money | 0.00002*** (6.10) | 0.00007* (1.83) | 0.00002*** (7.77) | -0.000056*** (-14.93) |
| GDP Growth Rate | 0.0036081*** (4.48) | 0.0279508* (1.95) | 0.0062019*** (9.55) | -0.0077306*** (-11.51) |

| Constant | 0.1146963*** | 1.001611*** | -0.0443823*** | 0.1239102*** | **JUJBR** |
|---|---|---|---|---|---|
| | (7.47) | (3.67) | (-3.59) | (9.68) | |
| Chi$^2$ | 370.782*** | 364.829*** | 195.609*** | 511.705*** | |
| Obs. | 2320 | 2320 | 2320 | 2320 | |

*Note: *, **, *** indicate 10%, 5%, and 1% level of significance respectively.*

*Notes:* This table shows the result of FGLS model of panel data analysis where 2320 observations of each variable are utilized from January 2017 to August 2023. The following equation $risk_{i,t} = \beta_0 + \beta_1 Islamic.dummy_{1_{i,t}} + \beta_2 Controls_{1_{i,t}} + \varepsilon_i \ldots \ldots \ldots (vi)$ is used for the regression analysis. Here, the columns show the risk measures such as standard deviation, beta, semi-standard deviation, and lower partial moment, which are used as dependent variables in the regression equation. In the row, the Islamic fund dummy variable indicates that if the fund type is Islamic mutual funds, then 1; otherwise, 0 indicates that the fund type is conventional mutual funds. Besides, rows present macroeconomic factors which are used as control variables of the regression equations.

Model 01 of Table 4 shows that the total risk (standard deviation) of Islamic mutual funds is statistically significantly lower than conventional mutual funds while controlling the effect of macroeconomic variables. Besides, the macroeconomic variables like deposit rate, exports, and remittances have a significantly negative relation with the total risk of mutual funds, which indicates that when deposit rate, exports, and remittances are increased, the risk of mutual funds decreases and vice-versa. On the other hand, broad money and GDP growth rates have a significant and positive relationship with risk. That is, when the GDP growth rate and broad money circulation in the economy increased, the risk of mutual funds also increased.

The results of Beta (Model 02, Table 4) show that Islamic mutual funds have a statistically significant negative relationship with beta, confirming that Islamic mutual funds bear lower systematic risk than conventional mutual funds. This result is aligned with Reddy et al. (2017) who report that UK Islamic funds have a lower beta (0.9992) than ethical funds (1.000). Macroeconomic variables deposit rate, broad money supply and GDP growth rate have a significant positive relationship with the systematic risk of mutual funds, indicating that when these variables perform better in the economy, the systematic risk of mutual funds increases. On the other hand, exports, imports and remittances have significant negative relations with the systematic risk which confirms that when these variables increase, the systematic risk of mutual funds decreases and vice-versa.

Islamic mutual funds are exposed to a statistically significant negative relationship with the Semi-standard deviation (Model 03, Table 4). This indicates that Islamic mutual funds bear lower semi-standard deviation risk than conventional mutual funds. Subsequently, the deposit rate, broad money supply, and GDP growth rate have a significant positive relationship with semi-standard deviation risk, indicating that when these macroeconomic variables increase, the risk of mutual funds also increases. Besides, exports and remittances have a significant negative relationship with the semi-standard deviation risk of mutual funds, indicating that when these variables increase, the risk of mutual funds

decreases and vice-versa.

In the case of lower partial moments ((Model 04, Table 4)), Islamic mutual funds are exposed to statistically significantly higher downside risk than conventional mutual funds. Besides, deposit rate, imports, broad money, and GDP growth rate have a significant negative relationship with the lower partial moment risk of mutual funds, which indicates that when they increase, the lower partial moment risk of mutual funds decreases and vice-versa. However, exports and remittances have a significant and positive relation with the risk of mutual funds, indicating that when they increase, the risk of mutual funds also increases.

Overall findings of multivariate analysis show that Islamic funds exhibit lower risk exposure than conventional funds, which is consistent with previous authors such as Hayat & Kraeussl (2011), Nainggolan et al. (2016), and Mahfouz & Hassan (2012). This finding indicates that due to implementing Shariah screening criteria, Islamic funds do not invest in securities of traditional financial institutions, interest-bearing securities such as bonds, highly leveraged firms and highly volatile assets. Thus, Islamic funds are less affected during financial downturns like the worldwide economic crisis and COVID-19, which brings lower risk for Islamic funds compared to conventional funds (Reddy et al., 2017; Derigs & Marzban 2008; Renneboog et al., 2008).

### Robustness Analysis

The risk exposure of Islamic funds was also compared with conventional funds using the random effects model of panel data analysis (Table 5). The random effects model is applied further to justify the results of the feasible generalized least square (FGLS) method. In general, the results are consistent in both FGLS and random effect models. Both models confirm that Islamic fund bears lower risk than conventional funds. Moreover, the impact of macroeconomic variables on the risk exposure of mutual funds is also similar to the FGLS model.

**Table 5: Regression results of different risk measures for Islamic funds using the Random Effect Model**

|  | Model-01 | Model-02 | Model-03 | Model-04 |
|---|---|---|---|---|
|  | **Std. Deviation (T- Value)** | **Beta (T- Value)** | **Semi-Std. Deviation (T- Value)** | **Lower Partial Moment (T- Value)** |
| Islamic Dummy | -0.013838*** (-4.87) | -0.1788287 (-1.12) | -0.0061505** (-2.25) | 0.0070255*** (2.69) |
| Deposit Rate | -0.0072975*** (-2.93) | 0.0781889*** (2.72) | 0.0067715** (2.41) | -0.0200592*** (-7.46) |
| Export | -0.0000178*** (-15.04) | -0.0000657*** (-2.89) | -0.00066*** (-4.37) | 0.000078*** (6.31) |
| Import | 0.00020 (0.27) | -0.0000871*** (-4.99) | 0.00088 (0.08) | -0.000036*** (-4.21) |

| | | | | | **JUJBR** |
|---|---|---|---|---|---|
| Remittance | -0.00001*** | -0.0000333*** | -0.00067*** | 0.000016*** | |
| | (-3.03) | (-6.62) | (-2.67) | (6.54) | |
| Broad Money | 0.00027*** | 0.00007* | 0.00028*** | -0.000056*** | |
| | (5.41) | (1.92) | (5.96) | (-11.20) | |
| GDP Growth Rate | 0.0036081** | 0.0279508** | 0.0062019*** | -0.0077306*** | |
| | (2.45) | (2.05) | (4.72) | (-5.75) | |
| Constant | 0.1146963*** | 1.001611*** | -0.0443823* | 0.1239102*** | |
| | (4.95) | (3.83) | (-1.90) | (4.72) | |
| $R^2$ | 0.149*** | 0.145*** | 0.082*** | 0.201*** | |
| $Chi^2$ | 382.406*** | 167.286*** | 79.563*** | 316.803*** | |
| Obs. | 2320 | 2320 | 2320 | 2320 | |

*Note: *, **, *** indicate 10%, 5%, and 1% level of significance respectively.*

*Notes:* This table shows the result of the random effect model of panel data using 2320 observations from January 2017 to August 2023. Here, the columns show the risk measures such as standard deviation, beta, semi-standard deviation, and lower partial moment, which are used as dependent variables in the regression equation. In the row, the Islamic fund dummy variable indicates that if the fund type is Islamic mutual funds, then 1; otherwise, 0 indicates that the fund type is conventional mutual funds. Besides, rows present macroeconomic factors which are used as control variables of the regression equations. ``The following equation $risk_{i,t} = \beta_0 + \beta_1 Islamic.dummy_{1_{i,t}} + \beta_2 Controls_{1_{i,t}} + \varepsilon_i \ldots \ldots \ldots \ldots$ $(vi)$ is used for the regression analysis.

## Conclusion

This study is conducted on mutual funds in Bangladesh to quantify the risk exposure of Islamic mutual funds relative to conventional mutual funds. For this purpose, the monthly closing price data is collected from January 2016 to August 2023 for 29 mutual funds in Bangladesh. Then monthly return is calculated using the close price data and subsequently, by applying 12-month rolling window method all the risk measures i.e. standard deviation, beta, semi-standard deviation, and lower partial moment are calculated from January 2017 to August 2023. At first, the univariate analysis is performed using an independent *t*-test known as mean difference analysis which confirms that the mean differences in risk exposure of Islamic mutual funds are lower than the conventional mutual funds. After that, the multivariate analysis FGLS method is applied and finds that Islamic mutual funds bear lower risk than conventional mutual funds. These findings indicate that due to implementing Shariah screening criteria, Islamic funds do not invest in securities of traditional financial institutions and highly leveraged firms, bonds or treasury bills which bring lower risk for Islamic funds compared to conational funds (Reddy et al., 2017). Additionally, this analysis finds that all macroeconomic variables have a statistically significant impact on the risk exposures of mutual funds. The findings of the study will be beneficial for mutual funds investors when they choose mutual funds whether invest in Islamic mutual funds or conventional mutual funds. Moreover, the fund

managers and investors can use the rolling window method to compute the risk exposure of mutual funds.

This research considers monthly data and uses a 12-month rolling window method to calculate each risk measure. The sample size for Islamic funds is low in this research. This research only focuses on measuring the different types of risk using market data, where investor sentiment and expectations about risk are yet to be studied. The future researcher can perform their research on mutual funds using the weekly or daily data and can also increase the sample size and data period. Moreover, other risk factors such as idiosyncratic risk and extreme event risk measures can be utilized in such research. Apart from these, future research can consider other macroeconomic factor such as inflation rate, exchange rate, and unemployment rate to identify their effect on the risk of mutual funds. Also, they can show the effect of COVID-19 on the risk exposure of Islamic mutual funds compared to conventional mutual funds. One of the most important research opportunities is that future researchers can collect primary data to identify the investors' perceptions and expectations about mutual fund risk.

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