

IMPACT OF MACROECONOMIC VARIABLES ON ISLAMIC STOCK MARKET RETURNS: EVIDENCE FROM NIFTY 50 SHARIAH INDEX

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Abstract *The present paper tries to establish the impact of various macroeconomic variables on the performance of the Islamic stock market for India. Compatible with the Efficient Market Hypothesis (EMH), a number of macroeconomic variables have been documented to impact the performance of the stock market. The Arbitrage Pricing Theory (APT) laid the theoretical basis for the relationship between stock returns and macroeconomic variables which has been later on empirically tested by a large number of studies. We have used the Ordinary Least Square (OLS) Regression to study the impact of macroeconomic variables including inflation, industrial production, exchange rate, interest rates and money supply on the Islamic stock returns. The various diagnostic tests including the Breusch-Godfray Serial Correlation Lagrange Multiplier (LM) test, the Breusch-Pagan-Godfray test and the Jarque-Berra test have been used to check whether the residuals of OLS are pure white noise. The findings of our study suggest that exchange rate and interest rates have a significant impact on the Islamic stock market. The implications of the study are that exchange rates and interest rates should be controlled so as to improve the performance of the Islamic stock market in India.*

Keyword: *Islamic Stock Returns, Macroeconomic Variables, OLS*

JEL Classification: *G12, G14*

INTRODUCTION

Stock market plays an important role in allocation of scarce resources to their most productive uses and thus acts as a medium for the flow of funds between funds surplus sectors to funds deficient sectors. A number of idiosyncratic and systemic factors have been identified to have an impact on the functioning of the stock market. As per the Arbitrage Pricing Theory (APT) by Ross in 1976, various macroeconomic factors like, industrial production, unexpected inflation, and interest rates primarily affect the stock market. The claim that macroeconomic variables influence stock market indices is a well-established theory in the financial economics literature. However, during the last two decades lot of efforts were made by researchers to study these macroeconomic effects. Most of the studies are focused on the developed markets such as the USA, UK and Japan. Examples of such studies are Fama (1981) and Chen (1991) for the US market, Hamao (1988) on Japanese market and Poon and Taylor (1992) on the UK market. Studies have also been made in case of emerging markets like Boyd, Levine, and Smith (2000); Chatrath, Ramchander, and Song (1996).

During the past few decades, the Islamic finance has gained significant attention at international level and has attracted

huge capital flows from both Muslim and non-Muslim investors. Islamic finance is guided by the principles of Islamic law (Sharia), which prohibits interest (riba), excessive risk-taking (gharar), gambling (maysir), and promotes risk and profit-sharing, asset-backed financial transactions, and ethical investment. One area of Islamic finance that has attracted much attention is the development of Islamic equity indices designed to track the performance Sharia-compliant companies. The Islamic indices are exposed to rigorous screenings for business activities and financial ratios. Hundreds of Islamic Indices exist as of now to gauge performance of Shariah-compliant companies for different countries and different sectors. Nifty50 Shariah being one such index is based on the premier market bellwether for India, the Nifty 50. The Nifty includes the largest and most liquid companies listed on the National Stock Exchange.

While the dynamic relationship between macroeconomic variables and share returns have been widely discussed and debated in case of conventional Indices, limited studies have been made which explore the impact of macroeconomic variables on Islamic Indices. In particular in a growing economy like India, no such study has been conducted to the best knowledge of the author.

The rationale behind this paper is that, first, the theory of Islamic finance emphasizes that interest rate (riba) is

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forbidden under Islamic law; therefore Islamic transaction should be free from interest. While as others argue that Islamic indices being a subset of the economy hence the influence of the interest rate change might be indirectly influencing them. The third rationale of this study is that it studies the systematic risk gauged by selected macroeconomic variables. Therefore, this study intends to focus on the following objectives:

OBJECTIVES OF THE STUDY

1. To identify the various macroeconomic variables that have an impact on the Islamic stock returns.
2. To establish the relationship between macroeconomic variables and the Islamic stock market.

REVIEW OF LITERATURE

The relationship between the stock indices and macroeconomics variables such as inflation, money supply, exchange rate, interest rates and others has been captured by a number of studies. Ross (1976) proposed that stock returns are preliminarily affected by some macroeconomic forces like industrial production, inflation, and interest rates. Fama (1981) studied the relationship between stock returns and macroeconomic variables and found a negative relationship between inflation and stock returns. Other studies include Lintner (1973), Jaffe and Mandelker (1977), and Fama and Schwert (1977) who explored the relationship between inflation and stock prices and found a negative relation between stock returns and inflation.

Chen, Roll, and Ross (1986) while studying NYSE stocks have found strong positive correlation between industrial production, interest rates and stock returns. In another study, Mukherjee and Naka (1995) have studied relationship between six macroeconomic indicators and Japanese stock returns and found a positive long-run relationship between short-term interest rate, money supply and stock prices. Their evidence also revealed a negative relationship between inflation, long-term interest rate and stock prices. Boyd, Levine, and Smith (2000) have studied the relationship between inflation and financial sector performance for 65 countries and found that predictable, high rates of inflation hamper the financial sector to allocate resources effectively.

Number of attempts have also been made to study the impact of macroeconomic variables on conventional stock indices in case of India for example, Chatrath, Ramchander, and Song (1996) examined the relationship between stock returns and macroeconomic variables in the Indian context for a period from April 1984 to December 1992. Using ARMA model, the study revealed a negative relationship between inflation and real activity. In another study Vuyyuri (2005) investigated the cointegrating relationship and the causality between the

financial and the real sectors of the Indian economy using monthly observations from 1992 through December 2002. The financial variables used were interest rates, inflation, exchange rate, stock return, and real sector. The study revealed a long-run equilibrium relationship between the financial sector and the real sector, and the Granger Causality test showed unidirectional causality between the financial sector and real sector of the economy.

In a recent study, Islam and Habib (2016) examined the relationship between macroeconomic variables and stock returns over a period of 10 years from 2005 to 2015 using monthly observations. The results revealed that only exchange rate has a significant negative impact on stock returns. The other macroeconomic variables were not significantly affecting stock returns.

While hundreds of Shariah compliant indices have been launched to meet the growing demand but very few studies have been conducted on such Indices despite their increasing popularity. Most of the studies (Elfakhani, Hassan, & Sidani, 2005; Hoepner, Rammal, & Rezec, 2010; Islam & Habib, 2014a) made on Islamic indices assess and compare the performance of Islamic Indices with that of the parent conventional indices. Few researchers (Hakim & Rashidian, 2002; Islam & Habib, 2014b) have also studied the relationship between Islamic indices and interest rates and found that the two are not cointegrated. A very few studies have examined the relationship between macroeconomic variables and Islamic stock indices for example Shabri, Majid and Yusof (2009) found that real effective exchange rate, money supply M3, treasury bill rate (TBR), and federal fund rate (FFR) affect the Islamic stock market. They also found that when interest rates rise either domestically or internationally, the Muslim investors will buy more Shariah compliant stocks; thereby escalating the Islamic stock prices.

Using GARCH analysis, Albaity (2011) studied the relationship of Islamic and conventional indices with macroeconomic variables. The study has found that in case of conventional indices, M1, M3, inflation rate, and real growth in GDP are significantly influencing KLCI volatility, while M2, M3, inflation rate and interest rate affected DJINA volatility. While as, in case of Islamic indices, KLSI and DJIMI variance was found to be influenced by M2, M3, and inflation rate. In addition, in the multivariate model, DJIMI was influenced by the interest rate and the inflation rate in the mean and variance equations. In contrast, KLSI was influenced commonly in the mean and variance equations by M3, and the inflation rate.

Sakti and Harun (2013) investigated the impact of conventional stock index returns, inflation rate, short-term interest rate, the slope of the yield curve and money supply on Islamic stock market returns for twenty developed and emerging markets using Markov switching regression

models. They have found that both developed and emerging Islamic stock indices are influenced by conventional stock indices returns and money supply for both the low and high volatility regimes. However, no relation was found between the other macroeconomic variables and Islamic stock indices.

Vejzagic and Zarafat (2013) studied the long-term relationships between macroeconomic variables and the FTSE Bursa Malaysia Hijrah Shariah Index. The study revealed statistically significant relationship between FTSE Bursa Malaysia Hijrah Shariah Index and interest rate, money supply, consumer price index, and exchange rate. While as, the index was reported to have a negative effect on interest rate and exchange rate, a positive relationship was found in case of money supply.

Naseriand Masih (2013) studied the long-term relationships between FTSE Bursa Malaysia Emas Shariah Index as a proxy for Islamic stock market and three macroeconomic variables namely, money supply, consumer price index and exchange rate. Using VECM and variance decomposition techniques, they found that there is cointegration between Islamic stock market and chosen macroeconomic variables and as expected, macroeconomic variables have had influences on Islamic stock market in Malaysia.

Since most of the studies exploring the relationship between macroeconomic variables and Islamic stock indices pertain to Malaysia and few developed country indices, no such study has been made in case of India. This study attempts to fill this gap by studying the relationship between Nifty 50 Shariah Index and the various macroeconomic variables chosen on the basis of the above review of literature.

DATA AND METHODOLOGY

Data Description

The impact of macroeconomic variables on the Islamic stock market returns has been analysed in the Indian stock market in the present study. The log returns of the Nifty 50 Shariah index have been taken as the proxy for the Islamic stock market performance. On the basis of APT and the available literature on this subject matter we have identified a number of macroeconomic variable which affect the performance of the Islamic stock market including exchange rate, industrial production, inflation, interest rate and money supply. The data for the study includes 113 monthly observations from Feb 2007 to Jun 2016. The choice of the sample period is based on the fact that the Nifty 50 Shariah was launched at the beginning of the selected sample period. The data for Islamic index was taken from investing.com. The description of the macroeconomic variables chosen in this study along with their operational definitions and source have been given in Table 1.

Table 1: Variable Description

S.no.	Macroeconomic Variables	Operational Definition	Source	Symbol
1.	Inflation	Consumer Price Index, Base 2010	OECD	CPI
2.	Industrial Production	General Index of Industrial Production	RBI	IIP
3.	Interest Rate	Weighted Average Call Money Rates	RBI	IR
4.	Exchange Rate	One US Dollar in Indian Rupees	Quandl	EX
5.	Money Supply	Broad Money M3	OECD	MS

Methodology

Unit Root Test

Before estimating any time series regression model the issue of non-stationarity should be dealt with. A series is said to be non-stationary if its mean and variance is time variant. With increasing order the autocorrelation coefficients of such a series decay very slowly. Generally it has been observed that time series data are non-stationary in their levels form. Estimation of ordinary least squares (OLS) regression on non-stationary time series data would provide inaccurate estimates, that is, the R^2 and t-values of the regression would be high but the results will not have any economic meaning. This kind of regression has been called as spurious or non-sense regression by Granger and Newbold (1974). Thus differencing of the series can lead to a stationary series and the autocorrelation function of such a series rapidly reach to zero. To check whether our variables are stationary or not we have used the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests.

Augmented Dickey Fuller (ADF) Test

The ADF test is residual autocorrelation corrected version of the Dickey Fuller test. We have used the ADF test under Akaike Information Criteria (AIC) which is a higher lag length criterion. The null and alternative hypotheses of this test are;

H0: Variable has a unit root.

H1: Variable does not have a unit root.

Phillips-Perron Test

The PP test is a nonparametric used under Newey-West adjusted variance method which is actually the conventional Dickey-Fuller test corrected for autocorrelation as well as heteroscedasticity. The null and alternative hypotheses for this test are;

H0: Variable has a unit root

H1: Variable does not have a unit root

Ordinary Least Squares Regression Model

We have used the Ordinary Least Squares as our regression model to establish the impact of macroeconomic variables on the Islamic stock returns. The advantage of this regression model based on its name is that it minimizes the sum of the squared distances between the actual observations and the fitted regression line. Based on the unit root test results which will be presented later in this paper we have come up with the following specification of the OLS model;

$$DLog(NiftyShariah)_t = \alpha_0 + \beta_1 DLog(CPI)_t + \beta_2 DLog(IIP)_t + \beta_3 DLog(ER)_t + \beta_4 DLog(MS)_t + \beta_5 Log(IR)_t + \varepsilon_t \quad (1)$$

Here D is the 1st difference, ε_t is the random disturbance term and β 's are the respective partial regression coefficients explaining the percentage change in the dependent variable due to 1 percent change in the independent variable while controlling for all the other independent variables.

Residual Diagnostics

The error term " ε_t " or the residuals of equation (1) should be tested to confirm that they are pure white noise in order to validate the OLS regression model. The logic behind these tests is to check whether any information of the independent variables has not been captured by the model which eventually gets reflected in the residuals. If the model passes the residual diagnostic tests we can be assured of the fact that our model perfectly explains the variation in the dependent variable and the unexplained portion of our model reflected in the error term represents the inherent randomness. We have used the following residual diagnostic tests;

Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test

The Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test checks the presence of autocorrelation in the residuals of the regression. If we find that the residuals are auto-correlated it implies that there is a problem of model specification. The null and alternative hypotheses of the test are;

H0: No Autocorrelation

H1: Autocorrelation

Breusch-Pagan-Godfrey Test

To check whether the residuals are heteroscedastic we have used the Breusch-Pagan-Godfrey test. If the model is having

heteroscedasticity (not homoscedastic) it violates the basic assumptions of the Gauss-Markov theorem. Even though presence of heteroscedasticity does not estimate biased coefficients, but leads to biased standard errors which can cause a problem of inference. The null and the alternative hypotheses of the test are;

H0: No heteroscedasticity

H1: Heteroscedasticity

Jarque-Berra Test

The Jarque-Berra test has been used to test whether the regression residuals are normally distributed or not. Even though the violation of normality assumption does not lead to estimation of biased and inefficient estimation in small samples it causes a problem of statistical inference. Thus, choosing a higher confidence interval and equivalently a conservative significance level can solve the problem of statistical inference. However in large samples, based on the central limit theorem, even in case of violation of the normality assumption the t-statistics can be relied upon. The null and the alternative hypotheses of this test are:

H0: Residuals are normally distributed.

H1: Residuals are not normally distributed.

RESULTS AND DISCUSSIONS

The OLS regression cannot be estimated using non-stationary variables. Before proceeding to run the regression model we have applied the unit root tests to check whether our variables are stationary or not. Two tests of unit root have been used including the ADF test and the PP test. The results of both these tests for all the variables at their log levels and 1st differences are reported in Table 2.

Table 2: Unit Root Test Results

Variables	Augmented Dickey Fuller (ADF) Test		Phillips-Perron (PP) Test	
	Log Level	1st Differenced	Log Level	1st Differenced
NiftyShariah	-0.52	-4.28*	-0.63	-10.89*
CPI	0.74	-7.25*	0.49	-7.94*
ER	-0.24	-4.18*	-0.18	-10.26*
IIP	-1.16	-4.43*	-3.76*	-34.01*
IR	-3.96*		-3.52*	
MS	3.51	-1.91	4.77	-7.18*

Source: All the above measures have been calculated using the monthly time series data obtained from their respective sources as mentioned in Table I: Variable Description.

Notes: 1. Here 'NiftyShariah' Stands for Nifty50 Shariah closing prices, 'CPI' for consumer prices, 'IIP' for Industrial Production, 'EX' for USD/INR exchange rate, 'IR' for interest rate and 'MS' for money supply.

2. * denotes significance at 1% level.

From the results of both the unit root tests it can be seen that all the variables including NiftyShariah, CPI, ER IIP and MS have statistically insignificant t-ratios at 1% level of significance at their log levels. We cannot thus reject the null hypothesis of presence of unit root for these variables. These variables are non-stationary at their levels and cannot be used for estimation of OLS regression in their level form. The t-ratio for the IR variable, however, is statistically significant at 1% level of significance and we can reject the null hypothesis that the variable is having a unit root. The variable IR is thus stationary and can be used for estimation of OLS regression in its level form. For all the other variables we apply both the unit root tests at their 1st differences. From the test results in Table II we find that these variables have statistically significant t-ratios at 1% level of significance at their 1st differences. Thus the null hypothesis of presence of unit root for all these variables at their 1st differences can be rejected indicating that they are stationary.

The OLS model estimating the impact of macroeconomic variables on the Islamic stock returns thus takes the form as in equation (1);

Table 3 summarizes the OLS regression results.

Table 3: Impact of Macroeconomic Variables on the Islamic Stock Returns

Variable	Coefficient	t-statistics	p-value
C	0.084	2.433*	0.016
DLog(CPI)	0.578	0.842	0.401
DLog(IIP)	0.101	1.090	0.278
DLog(ER)	-1.381	-6.676*	0.000
DLog(MS)	-1.768	-1.611	0.110
Log(IR)	-0.029	-1.978**	0.050
R-Squared	0.351		
Adj. R-Squared	0.320		
F-statistics	11.486		0.000
N	113		

Source: All the above measures have been calculated using the monthly time series data obtained from their respective sources as mentioned in Table I: Variable Description.

Note: 1. DLog(Nifty Shariah), DLog(CPI), DLog(IIP), DLog(EX) and DLog(MS) represent the first difference of the log values of Nifty Shariah, CPI, IIP, EX and MS respectively, and Log(IR) represent the logarithmic transformation of IR.

2. "*" and "**" denotes significance at 1% and 5% level respectively.

From the OLS results in Table 3, it is evident that among all the macroeconomic variables only exchange rate significantly impacts the Islamic stock returns since the t-statistics is significant at 1% significance level. The coefficient of exchange rate is -1.381 which means that due to 1% change in the exchange rate the Islamic stock prices will decrease by 138.1%. However, at 5% level of significance apart from exchange rate, interest rate was also found to have a significant impact on the Islamic stock returns. The coefficient on the interest rate is -0.029 which means that by every 1 unit change in interest rates the Islamic stock prices will decrease by 2.9%. However, we have used a more conservative 1% significance level for testing of hypothesis since the residuals of the regression model were not found to be normally distributed (the test results for normality has been discussed later in the paper). All the other macroeconomic variables were found to be insignificant in explaining the variation in the Islamic stock returns at 1% level of significance. Our results are supported by the economic theory. The impact of exchange rate can be positive or negative depending upon whether the economy is a net exporter or net importer. India is a net importer economy which means any increase in exchange rates (rupee depreciates with respect to U S dollar) will lead to higher import prices resulting into lower profitability which will be eventually reflected in the price of stocks. Our results also show that depreciation of rupee viz-a-viz dollar will negatively impact the stock returns. The relationship between interest rates and Islamic stock returns should be independent based on the prohibition of interest in Islam. However the results show a negative impact of interest rates on the Islamic stock market. This may be due to the fact that the Shariah index used in this study is based on the screening criteria where only those companies are included in the index who have a minimum dealing in interest bearing securities. As a result, the impact of interest rates on the Islamic stock returns cannot be independent in the Indian scenario. Our results are supported by economic theory as per which an increase in interest rates results in higher cost of funds leading to a decline in stock returns.

The F-statistics of a multivariate regression model is very important to decide about the overall fit of the model. From Table 3 the F-statistics of the OLS regression model is 11.486 which is significant at 1% level of significance. Hence, we can conclude that all the macroeconomic variables in our regression model jointly have a significant impact on the Islamic stock returns. We conclude that the model is well specified. The R-Squared of the regression is 35.1% which means that 35.1% of the variation in Islamic stock returns is explained by the macroeconomic variables of the regression model.

Finally, we have performed the various residual diagnostic tests for the regression model in order to confirm the

t-statistics. The basic assumption here is that since OLS estimators are BLUE (i.e., best linear unbiased estimators) the residuals should be uncorrelated and have equal variances. Thus we check whether the regression residuals are pure white noise and represent inherent randomness only.

The results of the Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test are presented in Table 4.

Table 4: Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) Test

	Coefficient	Probability
F-statistics	0.449	0.639
Observed R-Squared	0.960	0.618

Source: All the above measures have been calculated using the monthly time series data obtained from their respective sources as mentioned in Table I: Variable Description.

Since it is evident from the results of LM test that both the F-statistics and Observed R-Squared are not significant at 1% level of significance we cannot reject the null hypothesis of no autocorrelation in the residuals. It implies that there is absence of autocorrelation in the regression residuals.

Further, we have used the Breusch-Pagan-Godfray test to check for the presence of heteroscedasticity in the OLS residuals. The results of the test are presented in Table 5.

Table 5: Breusch-Pagan-Godfray Test

	Coefficient	Probability
F-statistics	1.186	0.321
Observed R-Squared	5.934	0.312
Scaled Explained SS	14.456	0.013

Source: All the above measures have been calculated using the monthly time series data obtained from their respective sources as mentioned in Table I: Variable Description.

From the results of Table 5, the null hypothesis of no heteroscedasticity cannot be rejected because both the F-statistics and Observed R-Squared Coefficients are not significant at 1% level of significance. Hence we confirm that the OLS residuals are homoscedastic.

Finally, we have checked whether the OLS residuals are normally distributed or not by applying the Jarque-Berra test. Fig.1 provides the results of the normality test.

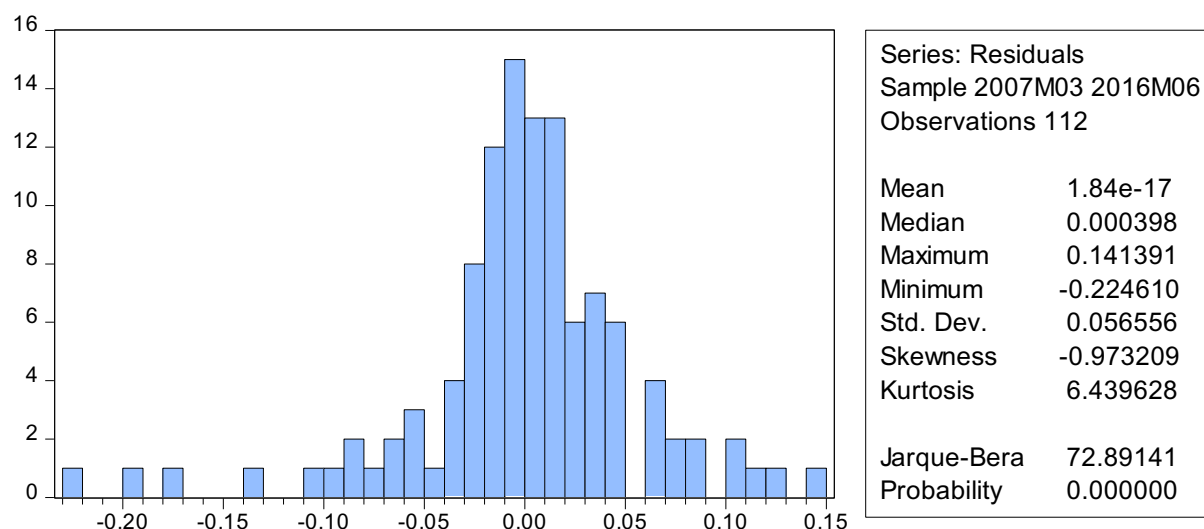


Fig. 1: Histogram and Jarque-Berra Test

Source: All the above measures have been calculated using the monthly time series data obtained from their respective sources as mentioned in Table I: Variable Description.

From the results of the Jarque-Berra test, we reject the null hypothesis that residuals are normally distributed since the Jarque-Berra statistic is significant at 1% level of significance. Thus the OLS residuals are not found

to be normally distributed which violates the normality assumption of the classical linear regression. However, we can rely on the t-statistics of our regression coefficients since we have used a more conservative 1% level of significance for hypothesis testing. Apart from that our sample period is fairly large enough we can do away with the normality assumption. Thus from the residual diagnostic test results

we conclude that the residuals of the regression model are pure white noise.

CONCLUSION

In this study we have tried to identify the macroeconomic variables that have a significant impact on the Islamic stock returns in India. The theory of efficient markets proposes that current stock prices reflect all the available information about the changes in the macroeconomic variables. Many studies including the Arbitrage Pricing Theory (APT) of Ross have established that macroeconomic variables do have a significant impact on the stock market. On the basis of the available literature and the financial theory we have identified five macroeconomic variables, including inflation, industrial production, exchange rate, interest rates and money supply, which are hypothesized to have a significant impact on the performance of the Islamic stock market. The data for the study have been taken from Feb 2007 to Jun 2016 because the Nifty Shariah index was launched prior to this date. We have applied the ordinary least squares regression to test whether the macroeconomic variables significantly explain variation in the Islamic stock returns. The results of the study have revealed that only exchange rates have a negative and statistically significant impact on the performance of the Islamic stock market. The present study has included only five macroeconomic variables and that too for a period of less than 10 years. Further study can be taken up on this subject while including more macroeconomic variables at long horizons. Apart from this more sophisticated econometric models can also be applied in order to find out the dynamics of the relationship in long-run.

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