



# GMM dependency model for Shariah and underlying indices of India during Covid-19 period

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## Abstract

The National Stock Exchange of India (NSE) has presented Nifty 50 Shariah and Nifty 500 Shariah indices to provide unconventional indices for Sharia-compliant companies. These indices follow Sharia laws and can be used in portfolios that are culturally dependable commodities for investors who do not wish to put their money into the undesired business. NSE witnessed big movements in the indices during the Covid-19 period. This study seeks to understand the association between Nifty 500 Sharia and Nifty 50 Sharia and their respective selected indexes, Nifty 500 and Nifty 50, during the Covid-19 pandemic. The period from 27/01/2020 to 31/05/2022 has been taken for this study. The techniques applied, like correlation, co-integration, GMM, etc. based on the objectives of this paper. We conclude that the return of Sharia indices is better compared to the other indices. Also, stocks compliant with Sharia Indices are less risky and a better alternative for the portfolio during pandemic times.

**Keywords:** Shariah Indices; GMM; NSE; Modelling; Covid-19

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## 1. Introduction

A Sharia index is referred to as an index of companies that needs to be compliant with the Sharia law. It focuses on socially responsible investment products of companies and is used as a measurement tool for valuing a section of the stock market. Shariah Board understands the Shariah principles and forms the foundation of Shariah Indices. The constituents of these indices are based on existing indexes screened by the Shariah Board. Investors worldwide are attracted by these products guided by the sharia principle, because they ensure that the investors' money is not used in stock options that are not aligned with Islamic beliefs. Being introduced in the mid-1970s, the Islamic finance industry has grown with numerous achievements in a brief amount of time. The assets in Islamic banking have shown an unexpected increase of 17.6% from 2009 to 2013 every year. Not



only this, growing companies like Ernst & Young predicted an increase of 19.7% by 2018. The sector is further predicted to grow annually by a percentage of 15 to 20, making it one of the quickest-growing sectors in the financial industry. Dow Jones, FTSE, S&P, and Morgan Stanley are some index providers that offer indices compliant with the sharia law to attract investments worldwide. In February 1999, Dow Jones became the first company to introduce the Islamic index. Bombay stock exchange (BSE) and the National Stock Exchange of India (NSE) are responsible for offering Sharia-based indices in India. Furthermore, the Nifty 50 Shariah and Nifty 500 Shariah were introduced by NSE on February 2008 and December 29, 2006, as their base date. With these indices, investors have the option to engage their money in activities that are compliant with Sharia law. In addition to NIFTY50 Shariah and NIFTY500 Shariah, NSE calculates NIFTY Shariah 25. The NIFTY 50 Index is the parent index to NIFTY50 Shariah Index, without any fixed number of companies. Moreover, the parent index, the nifty 50 index, constitutes Sharia-compliant indices. This index is used for various applications, including portfolio benchmarking, index funds, ETFs, and structured product launches. Additionally, Taurus, UTI, Kotak, Reliance, Bajaj Allianz, HSBC, TATAs, etc., are some financial institutions working towards introducing Shariah products in the Indian financial market.

This research paper aims to analyze the selected Sharia indices on different parameters for understanding the various investment options available under Sharia law while referring to the Indian financial market. The findings of this study will be helpful to fund/ portfolio managers in developing suitable portfolios.

## 2. Literature review

According to Kumar (2022), the Sharia Indices are highly volatile due to being a recent phenomenon and studied only four macroeconomic variables. The author tried to study the relationship between macroeconomic variables and Sharia stock indices. Johansen's co-integration test shows cointegration between interest rate and money supply for only FTSWIND Sharia indices.

Irfan et al. (2021) assessed the pandemic's influence on the Islamic stock markets BSE Shariah (India) and JII (Indonesia). Indian stock market showed a downward slope, while the stock market in Jakarta showed an upward slope after the declaration of the pandemic. This concludes that the efficient market hypothesis is true as the market reacts to information, and bad news has a clear effect.

Ahmad and Ibrahim (2020) compared KLSE Syariah Index with the KLSE Composite Index performance. Risk-adjusted returns were compared using the Adjusted Sharpe, Treynor, and Adjusted Jensen Alpha Index. For both unadjusted and risk-adjusted returns, the performance of these two indexes was similar. This indicates that one index is not superior to another. The author offers the possibility that market participants have not yet recognized the "value" of stocks certified by the Syariah Committee.

According to Jamaluddin (2013), the government of India is taking interest in the Shariah finance business in the country and is showing growth. Prof Rajan's report also contains a paragraph on Islamic Banking which the author has mentioned. Based on these, the author concludes that India is one of the world's potential markets for Islamic finance.

As reported by Arshad & Rizvi (2013), compared to traditional indexes, the Islamic index is subject to radical or short-term effects due to rapid changes in volatility. The author used a wavelet to analyse the selected indices by taking 15 years of data period. The study has a practical impact on the modern financial situation, where Islamic financial assets show steady growth despite the financial crisis.

Ashraf & Deo (2015) discovered the linearity of the Indian Sharia Indexes, CNX NIFTY, CNX500, and S&P BSE TATAS 50, from January 1, 2008, to June 30, 2013. The authors attempted to test non-linear dependence through the BDS test. The results implied that non-stationary and linear dependence don't cause linearity; rather, non-linearity is caused by volatility. The authors state the need for policy regulations for the Sharia market.

Al-Khazali et al. (2014) studied the performance of nine Dow Jones Islamic indexes with nine Dow Jones conventional indexes using stochastic modelling. The period taken is divided into three; from 1996 to 2000, 2001 to 2006 and 2007 to 2012. The period from 1996 to 2012 was also considered.

Syauqi Beik (2011) analysed the performance of JII with other Islamic and conventional stock indexes during the start of the catastrophe period. The data is from January 1, 2006, to December 31, 2008. In the long run, no cointegration and long-term relationship was found between the Indonesian markets and Malaysian markets and the USA however, in the short run, it significantly affects the JII. The author concludes that JII is the least volatile index of all the markets that should be used to attract more investment.



As reported by Charles et al. (2012), which studied the indices of global and local, Islamic indices fluctuate more than conventional indices. Daily data has been taken over 15 years from the Dow Jones Islamic and conventional indexes. ICCS (iterative, cumulative sum of the square) method has been used for analyzed data. The author concluded that variance had been affected in Islamic and conventional indices.

Hassan et al. (2005) investigate the potential effects of Islamic Shariah screening on the performance of Islamic investment portfolios compared to conventional portfolios. Transaction expenses or management fees do not impact their findings because they only look at index funds. They use DJIM databases of 8 years and a range of techniques comparable to those utilized in the current investigation. They come to similar conclusions as we did about the fact that Islamic funds sometimes outperform traditional index funds.

Hassan & Girard (2010) reported in their research that conventional funds outperformed Islamic ones in a bullish market, whereas conventional funds outperformed a bearish tone. In challenging economic times, including Islamic mutual funds in a portfolio helps to reduce downside risk. Islamic and conventional funds represent less than 50% of the market index represented by Kuala Lumpur's proxy for diversification.

Ahmad & Ibrahim (2020) compared the three-year performance of the KLSI and KLCI indexes. They looked at the performance as determined by the risk and return of both indices using a variety of approaches. The t-test for comparing means, the Treynor Index, the adjusted Jensen Alpha, and the adjusted Sharpe ratio (SR) were some of the methods employed. The sample was divided into three parts: the full sample, the growth period during the first year of the 2000 fiscal year, and the decrease period during the two years that followed. The KLSI had poor returns for both the overall and declining eras. However, it marginally outperformed the KLCI during the period of growth, according to a comparison of the raw returns and risks from 1999 to 2002.

Albaity & Ahmad (2008) looked at how KLSI and KLCI did in the short and long term. Our research shows no statistically significant difference between Islamic and traditional stock market indices regarding risk-adjusted returns over seven years. We also use the causality and Johansen cointegration tests to analyse their short- and long-term links. The long-term equilibrium shows that both indices move together in addition to a considerable short-run presence of bidirectional causality. This implies that the direction of KLSI's short- and long-term movement is well predicted by the movement of KLCI. Therefore, making a prediction based on the other is helpful.

Al-Khazali et al. (2014) investigated nine important Dow Jones indexes, including Asia Pacific, Canadian, Emerging Markets, US DJI, and others, to compare the performance of Islamic stock indices and that of their conventional counterparts. The study used a stochastic dominance analysis technique with data from 1996 to 2012. The study shows that, except for the European market, conventional indexes statistically outpace Islamic indices. However, globally, European and US Islamic indices outperformed their traditional equivalents throughout the financial crisis of 2007–2012. According to the study, Islamic indexes performed better than their traditional counterparts throughout the financial crisis.

In their study Abdullah et al. (2013) assessed the degree to which the Asian stock market fluctuates in response to intra-regional influences by analyzing the long- and short-term interconnections between the international and Asian emerging stock markets. It was determined that the United States controls other markets in both the short- and long-term on a global scale. Moreover, the established OECD and the growing Asian countries have significant long-term and short-term interactions. Regionally, the data indicate that Hong Kong plays a significant role in Southeast Asia. They are compatible with the "contagion effect" theory, which states that Asian markets are better described by their regional markets than by developed markets.

Over the course of four years, Ul Haq (2013) analyzed daily data from the Sensex and the BSE's Shariah 50 indexes to make a comparison between traditional and Shariah indices in the context of the Indian stock market. This paper uses some statistical methods, including a Granger causality test, a wavelet analysis, and cointegration. The findings indicate that there is long-term cointegration between the two indices, as well as a two-way flow of information.

In their study Biancone & Radwan (2016), assess the compliance of European businesses to Sharia Law. The authors conclude that their findings have shown a good opportunity for businesses to move towards the principle of Islamic finance. The authors also mention the qualitative and quantitative challenges towards this step, the qualitative being related to certifications and the quantitative being related to debt-structuring models.

Bollani & Chmet (2020) have conducted a bibliometric analysis of the publications related to Islamic Finance. This study helps to determine the direction the research in Islamic finance is moving. The authors see an increasing research interest in Islamic finance. The literature mainly focuses on "banking, rates, comparisons with traditional banks and portfolios, analysis of governance and control structures".



According to Siddiqui & Rizvi (2022), Copula's results suggest that Sukuk have strong dependency whether Shariah complaint indices have less dependency in the pre-crisis period. But MENA Sukuk and Nifty Shariah 50 showed an upsurge with a great margin during Covid-19. It also shows that GCC Sukuk and Nifty Shariah 50 are optimistically correlated in the context of their returns. GARCH results reveal the asymmetric co-movements for gains and losses. At last, the outcomes reveal higher and lower tail dependency among the Sukuk and Shariah markets. The results vary due to period variation of copulas, which shows dependence differentiation over time for all samples.

Siddiqui & Sheikh (2016) examined the effort to comprehend better the investments to be made in Shariah Indices, an analysis of the selected Shariah indices with the underlying indices on several factors has been done. They used the 3SLS and GMM tools for analysing the data over the period of 8 years. They used NSE and NSE Shariah indices. As a result, there is no cointegration between the underlying and shariah indices. The market for financial assets based on Shariah is expanding. This work represents a significant advancement in creating optimal portfolios that include assets from Shariah indexes.

In his study, Abbas (2012) attempted to find out the relationship between the shariah and conventional indices based on risk and return. He used the EGARCH to find the effect of risk in indices. Also, the CAPM and Sharpe ratio was used to find the return and difference between the Shariah and conventional indices. He took ten years of data to achieve the objectives of the study. The study concluded that there is no relationship between the conventional and shariah indices at risk, return, and performance-based; they are not affected by each other.

The literature review provides different and contradictory results in connection with various indices of different countries. As a result, it is impossible to portray a consistent relationship between Shariah and conventional indices. Earlier studies used techniques, including VAR, CAPM, ordinary least square, impulse response, DCC-GARCH, Granger causality, Treynor ratio, Jensen alpha, cointegration test, and others have been employed in earlier investigations. Still, we found that they have not used GMM.

Adding the advanced model Generalized Method of Moments is vital to the current study (GMM). Additionally, Simultaneous Equations (SE) are used, as the researcher did not use SE and advanced modeling approaches in earlier studies on the Shariah indices and NSE.

The present study is expected to answer the problem statement of what could be the change in dependency structure between Shariah and underlying indices in a pandemic period like covid -19.

Therefore, it is necessary to use sophisticated models to investigate whether the Shariah and underlying indices are related to the National Stock Exchange of India.

### 3. Research methodology

#### 3.1 Data

This study is empirical and causal in nature. It is based on secondary data sources. Data has been taken from NSE, India's largest stock exchange. Since NSE has the highest turnover, it is justified to use it in the current study in the context of India. For the current study, the Sharia indices include the Nifty 500 Shariah and Nifty 50 Shariah, while the Nifty 500 and Nifty 50 are Underlying indices. The official website of NSE has been used to collect the indices' daily closing price data from 27/01/2020 to 31/05/2021.

#### 3.2 Empirical framework

Statistical techniques used in this research include an empirical framework for measuring co-movement. Further, descriptive statistics have been used for analyzing the potential return and risk of the indices. Secondary data analysis, including Unit Root Test, Cointegration Test, GMM estimation, have also been employed for further analysis and hypothesis testing. The more standard methods like the Unit Root Test and Cointegration Test, OLS, when applied in the system equation environment. This is because it makes the use of an instrumental variable (IV) procedure for estimation in a consistent manner; the same is absent in OLS. Not only this but the standard errors are also reduced without requiring any known distribution of errors which is necessary while using OLS. GMM also works efficiently because it ensures that the endogeneity problem does not occur. The



endogeneity bias occurs when an independent variable is found to be correlated with an error term of the regression model. Ordinary Least Squares (OLS) might involve biased regression coefficients.

SN	Indices	Symbol	Log differenced
1	Nifty50	N	DN
2	Nifty50 Shariah	NS	DNS
3	Nifty 500	N5	DN5
4	Nifty 500 Shariah	NS5	DNS5

Table 1. Indices  
*Source: Authors' elaboration*

### 3.3 Objectives of the study

The study aims to build efficient models for advising stakeholders and assessing the returns and volatility of NSE Sharia indices relative to their underlying indices. To achieve this broad purpose, the following specific study objectives are highlighted:

1. To compare the volatility of the Nifty 50 and Nifty 500. Nifty50 Shariah, Nifty500 Shariah.
2. To create a cointegrate model of the Nifty 50 and Nifty 500. Nifty50 Shariah, Nifty500 Shariah.
3. To understand the model between the effect of Shariah and Nifty 50, Nifty 500. Nifty50 Shariah, Nifty500 Shariah over each other.
4. To model the returns of Shariah and Nifty 50, Nifty 500. Nifty50 Shariah, Nifty500 Shariah.

### 3.4 Hypotheses

- H01 = Shariah has a lower standard deviation than the underlying indices.  
H02 = Shariah, and the underlying indexes are not co-integrated over the long run.  
H03 = Shariah indices and the conventional indices are not related in any way.  
H04 = Nifty 500 does not significantly affect the return of Nifty 500 Shariah.  
H05 = The return of the Nifty 500 is not significantly influenced by the Nifty 500 Shariah.

## 4. Results

### 4.1 Descriptive statistics

Descriptive statistics reflect the fundamental characteristics of a variable. Table 2 shows that the Nifty 500 index has a mean return of 0.079252, which is more profitable than other indices. Here, we may observe an intriguing fact: compared to its underlying stock market index concerning the mean return, the Nifty 500 Shariah is a superior investment option. Concerning risk, the Nifty 500 Shariah is also the slightest unpredictable stock market index. The 1.62% and the Nifty 50 1.54% are considered the highest-volatility indexes.



	<u>DN</u>	<u>DN5</u>	<u>DNS</u>	<u>DNS5</u>
<b>Mean</b>	0.054668	0.585943	0.079252	0.070640
<b>S.D</b>	1.541837	5.347535	1.302763	1.623542
<b>Skewness</b>	-1.086919	-2.527403	-1.481654	-0.408204
<b>Jarque-Bera</b>	3412.130	4583.059	5379.772	11183.31
<b>Probability</b>	0.00000	0.00000	0.0000	0.0000

Table 2. Descriptive statistics  
*Source: Authors' elaboration*

It is seen in the descriptive statistic that the mean return is higher in the case of Nifty 50 and Nifty 50 shariah but contradictory results in the nifty 500 and Nifty 500 shariah which is higher in the underlying index. This shows that with larger base shariah index may give a lower return. Sharia indices have a lower level of volatility than their equivalent underlying indices. These returns have a lower standard deviation than those on the other investments. Compared to the Nifty 50 and Nifty 50 Shariah indices, the Nifty 500 and Nifty 500 Shariah indices exhibited a larger chance of a significant return decline. Additionally, the null hypothesis of normality is not confirmed by the Jarque-Bera test.

#### 4.2 Correlation

There is a relationship between the returns on the Nifty 50, the Nifty 50 Shariah, the Nifty 500, and the Nifty 500 Shariah. Correlation analysis is the quickest and most straightforward method for assessing an indicator's predictive power. All indices are significantly associated with one another, as evidenced by the correlation values ranging from 0.1096 to 1.000 (Table 3).

	<u>D_N</u>	<u>D_N5</u>	<u>D_NS</u>	<u>D_NS5</u>
<b>D_N</b>	1.000	0.3583	0.3506	0.3099
<b>D_NS</b>	0.3506	0.1569	1.000	0.7916
<b>D_N5</b>	0.3583	1.000	0.1569	0.1096
<b>D_NS5</b>	0.3099	0.1096	0.7926	1.000

Table 3. Correlation analysis  
*Source: Authors' elaboration*

#### 4.3 Unit root test

Since stationarity is required for modelling and non-stationarity is a need for co-integration, the stationarity of the variable is examined using the unit root test. We opted to use the Augmented Dickey Fuller (ADF) test to analyze the unit root in the data from the study. If there is a unit root in the Nifty 50, Nifty 50 Shariah, Nifty 500, and Nifty 500 Shariah indices, or if the data are not stationary, then the null hypothesis ( $H_0$ ) is confirmed to be correct.

Given that the probability values are more than 5% for all variables, the null hypothesis is accepted at level. In the case of the Nifty 50, the Nifty 500, and the Nifty 500 Shariah, each variable either possesses unit roots or is non-stationary at the level of the index. After accounting for the initial discrepancy, the variables have become more stable.

#### 4.4 Johansen Co-integration test:

The Johansen Co-integration test is utilized so that the long-term co-movement of the indices that are being looked at can be measured. In this test, there are two statistics - trace and maximum Eigen value - to identify the number of equations that demonstrate the existence or non-existence of co-integration.

The hypothesis is accepted and that there is no cointegrated equation. This is in accordance with the null hypothesis that there is no equation ( $r=0$ ), indicating that there is no cointegration among the variables. The outcome of this investigation also



demonstrates that the trace statistics (25.02992) are below the critical value (24.27596) and that the probability is 0.0401, which is over the significance level of 5%.

No. of CE(s)	Hypothesized		Trace	0.05
	Eigenvalue	Statistic	Critical Value	Prob**
None	0.045484	51.93622	40.17493	0.0022
At most 1	0.031281	25.02992	24.27596	0.0401
At most 2	0.011222	6.660781	12.32090	0.3602
At most 3	0.000238	0.137844	4.129906	0.7593

Table 4. Unrestricted Cointegration Rank Test (Trace), Johansen Co-integration test, Series: N NS N5 NS5  
*Source: Authors' elaboration*

*Trace test indicates 2 cointegrating eqn(s) at the 0.05 level*  
*\*denotes rejection of the hypothesis at the 0.05 level*  
*\*\*Mackinnon-Haug-Michelis (1999) p-values*

Hypothesized	Max- Eigen			0.05
	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.045484	26.90630	24.15921	0.0207
At most 1	0.031281	18.36914	17.79730	0.0410
At most 2	0.011222	6.522937	11.22480	0.2940
At most 3	0.000238	0.137844	4.129906	0.7593

Table 5. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)  
*Source: Authors' elaboration*

*Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level.*  
*\* Denotes rejection of the hypothesis at the 0.05 level*  
*\*\*MacKinnon-Haug-Michelis (1999) p-values*

When we tested the hypothesis for  $r=2$ ,  $r=3$ , and other numbers of equations. This was the same conclusion that we came to when we tested the hypothesis for other numbers of equations. The conclusion that the indices are not co-integrated is reached because of this, which leads to the acceptance of the null hypothesis.

The findings of the second statistic, a test known as the Max Eigen value test, are consistent with the conclusion that  $r = 0$  is true. As a result of the fact that the critical value, 24.15921, is lower than the maximum statistical value, 26.90630, and the probability, 0.0207, is lower than 5 percent, it can be concluded that the null hypothesis is correct. According to the similar results that we obtained, which support the null hypothesis, the Max Eigen values are less than the critical values. This indicates that the null hypothesis is correct.

As a result, the test reveals that there is no co-integration or long-term link between the indices, which translates to the conclusion that they do not ultimately move in tandem with one another.

#### 4.5 Granger Causality test

Since there is no causation between the series, the Null Hypothesis ( $H_0$ ) is chosen to examine Granger causality. The results of below Table show that there is no correlation between the returns of the Nifty 50, Nifty 50 Shariah, Nifty 500, and Nifty 500 Shariah. This is because each series has a Granger causal probability value greater than 5%.



Null Hypothesis:	Obs	F-Statistic	Prob.
D_N5 does not Granger Cause D_N	581	0.96011	0.3835
D_N does not Granger Cause D_N5	581	2.21204	0.1104
D_NS does not Granger Cause D_N	581	56.3929	4E-23
D_N does not Granger Cause D_NS	581	1.05639	0.3484
D_NS5 does not Granger Cause D_N	581	133.530	2.E-48
D_N does not Granger Cause D_NS5	581	2.37319	0.0941
D_NS does not Granger Cause D_N5	581	54.3795	2.E-22
D_N5 does not Granger Cause D_NS	581	0.91786	0.4000
D_NS5 does not Granger Cause D_N5	581	166.641	8.E-58
D_N5 does not Granger Cause D_NS5	581	4.03665	0.0182
D_NS5 does not Granger Cause D_NS	581	18.9745	1.E-08
D_NS does not Granger Cause D_NS5	581	1.78675	0.1684

Table 6. Granger Causality test  
Source: Authors' elaboration

#### 4.6 GMM Estimation:

We apply the Generalized Method of Moments (GMM) estimation to this model. We offer estimations based on methods to confirm the reliability of our findings.

Equations used are as under:

$$\begin{aligned} d_{ns} &= \alpha_1 + \beta_1 * d_n + \beta_2 * d_{n5} + \beta_3 * d_{ns5} \\ d_{ns5} &= \omega_1 + \beta_4 * d_n + \beta_5 * d_{ns} + \beta_6 * d_{ns5} \\ d_n &= \vartheta_1 + \beta_7 * d_{ns} + \beta_8 * d_{n5} + \beta_9 * d_{ns5} \\ d_{n5} &= \rho_1 + \beta_{10} * d_n + \beta_{11} * d_{ns} + \beta_{12} * d_{ns5} \end{aligned}$$

When it comes to choosing the Nifty 50, the GMM model suggests that none of the three independent indices—the Nifty 50 Shariah, the Nifty 500 Shariah, and the Nifty 500 Shariah—are significant. It is not possible to use the terms Nifty 50, Nifty 500, or Nifty 500 Shariah to refer to the same thing as Nifty 50 Shariah. When systems equations are used to estimate the returns of Nifty 500 Shariah as well as to calculate Nifty 500, the Nifty 500 Shariah index is simply a relevant index that may be used.

Dependent	Endogenous	Coefficient	Std. Error	t-Statistic	Prob.	
$\alpha_1$	$d_n$	C	208.2922	47.28753	4.404803	0.000
$\beta_1$	$d_{n5}$		1.439370	0.018205	79.06637	0.000
$\beta_2$	$d_{ns}$		2.632514	0.073837	35.65328	0.000
$\beta_3$	$d_{ns5}$		-2.885665	0.069294	-41.64378	0.000
$\omega_1$	$d_{n5}$	C	-130.0703	34.85340	3.731925	0.002
$\beta_4$	$d_n$		0.687071	0.009240	74.35628	0.000





$\beta_5$	$d_{ns}$		-1.796664	0.060997	-29.45489	0.000
$\beta_6$	$d_{ns5}$		2.004195	0.039838	50.30854	0.000
$\vartheta_1$	$d_{ns}$	C	-30.07721	24.33754	-1.235836	0.2170
$\beta_7$	$d_n$		0.363476	0.010465	34.73143	0.000
$\beta_8$	$d_{n5}$		-0.520310	0.018152	-28.66398	0.000
$\beta_9$	$d_{ns5}$		1.075798	0.023147	46.47776	0.000
$\rho_1$	$d_{ns5}$	C	30.05649	21.27050	1.413060	0.1582
$\beta_{10}$	$d_n$		-0.334977	0.008347	40.13316	0.000
$\beta_{11}$	$d_{n5}$		0.487673	0.009794	49.79307	0.000
$\beta_{12}$	$d_{ns}$		0.903603	0.020811	43.41874	0.000

Table 7. Estimation Method: Generalised Methods of Moments  
*Source: Authors' elaboration*

## 5. Conclusion and implication

The study focused on developing an efficient model which could forecast the returns of Shariah indices with its selected indices. During Covid-19, Shariah indexes show lesser volatility as compared to the underlying indices, which means they are a better investment as compared to conventional indices. Although the Nifty 500 is the most profitable index, the Nifty 500 Shariah is the better investment option as it offers the least risk among the underlying indices as offer the least volatility. The high positive correlation value shows the interdependence of all the selected indices. However, there is no cointegration and causal relationship between the underlying indices, as shown by various tests conducted on the data. Indices based on Shariah are gaining popularity all over the world due to less risk and less volatility as compared to conventional indices.

. Cause-and-effect analysis of the indices did not show any significant relationships among the returns of indices. It is also crucial to note that GMM model revealed that only two variables, Nifty 500 Shariah and Nifty 500, were found to be significantly impacting one another as system equations.

<u>Hypothesis</u>	<u>Accepted/rejected</u>	<u>On the basis of results</u>
H01	Accepted	lower standard deviation in shariah
H02	Rejected	no cointegration
H03	Accepted	no cointegration
H04	Rejected	Nifty500 shariah is significantly influence while Nifty500
H05	Rejected	Nifty500 is significantly influence while Nifty500 shariah

Table 8. Hypothesis summary  
*Source: Authors' elaboration*

Sharia-based financial assets are gaining exceptional growth in the financial market. The study adds value to such market investments guiding optimal portfolio management consisting of sharia indices products. Results of the study are a guide to fund managers for strategically diversifying their portfolios while being compliant with the sharia law. Since the study The goal of diversification is also achieved because there is no short- or long-term causation. Furthermore, sharia indices can serve the purpose of offering optimum portfolio since they are relatively lesser risky.



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