International Journal of Commerce and Management Research
www.managejournal.com
ISSN: 2455-1627
Received: 14-01-2024, Accepted: 29-01-2024, Published: 13-02-2024
Volume 10, Issue 1, 2024, Page No. 75-77

Investment prospects in ESG stocks- A study through arima model

Bidisha Sarkar Datta
Assistant Professor, Department of BBA, Asutosh College, West Bengal, India

Abstract
Environment accountability of companies is increasingly becoming a key parameter for investment decision. Companies with good ESG scores can been considered as the ones which are more accountable than others. So ESG stocks can be of much interest to the investors. However, the investor also expects good returns from their investments. This paper studies whether ESG index (considered in lieu of individual ESG stocks) are predictable, since predictability would ensure that investors would be able to make informed decisions and hence it will be a good investment option. Literature survey brought out few papers in the domain of ESG stocks that studies the same, but no papers in the Indian context. ARIMA model has been applied to find the predictability and out of sample data has been forecasted and compared with the actual values. The results indicate that the forecasted values closely resemble the actual values and hence ESG stocks are predictable.

Keywords: ARIMA, ESG, predictability

Introduction

Humans are finally waking up to the fact that just working for own profits completely ignoring interests of Earth, environment and society can only bring about disaster in the future. With evidence of glaring Covid 19 pandemic humans are already hearing the warning bell. Hence ESG (environmental, Social, Governance) investing is gaining even more popularity. It refers to environmental, social and governance considerations into investors' portfolio decisions (Matos, 2020) [13]. From about a decade sustainability has emerged as a very crucial aspect of investing. Responsible investing, sustainable investing, ESG are all terms looming large in the minds of investors, owing to the understanding that if the environment, and society is not prioritised, sustainability is at stake. So as a responsible citizen one should evaluate target companies not only based on financial parameters but also on the basis of non-financially parameters like environment empathy, social responsibility and good corporate governance. Even from a financial stand point, given the global consciousness about importance of saving nature and lives India can attract major investors and get sustained foreign direct investment and rise up its growth rate too (Economic Times, 2020). So, what started as simple value-based investing have travelled to become more mainstream with Thomson Reuters providing objective and comparable ratings of ESG performance (Blank, Sgambati, & Truelson, 2016) [8]. However, from an investor's view point financial returns on investments are as important as contribution to a heathier world. Whether an investor will be able to generate good returns on his investments is largely dependent on the predictability of the investment. so, in this paper we intend to study the predictability of ESG stocks. it they are found to be predictable, then investors have better reasons to invest in ESG stock which would help them contribute to better and sustainable environment alongside generation of financials returns for themselves. When we tried to inquire in this direction through survey of literature we found although studying predictability of stocks is very commonly researched, none have researched the predictability of ESG stocks, more so in the Indian markets. Hence, we identified a gap and the motivation to fill the gap led to the construction of this paper.

Literature Review

In the area of work on ESG stock/index we found a researcher concluded ESG investing though have social benefits but does not give higher returns (Cornell, 2020) [10]. Contradicting this finding another paper through new mathematical analysis demonstrated that companies that incorporate ESG factors show lower volatility in their stock performance than their peers in the same industry and ESG companies generate higher returns (Ashwin Kumar, *et al*., 2016) [1]. Yet another paper vehemently concludes against the prospects of ESG stocks studied during Covid and states that once industry affiliation, market-based measures of risk, and accounting-based measures of performance, financial position, and intangibles investments have been controlled for, ESG offers no such positive explanatory power for returns during the COVID crisis (Demers, Hendrikse, Joos, & Lev, 2021) [3]. While during the same period of study yet another paper uses a sample of 1204 European firms and investigates how more sustainable firms fare during the pandemic compared with other firms in terms of risk–return trade-off and stock market liquidity. Their findings contribute to the theoretical and empirical debate on the role of the sustainability as a source of corporate resilience to unexpected shocks (Cardillo, Torluccio, & Bendinelli, 2022) [9]. So our paper tries to add to the existing work by studying its predictability through Arima model. Its noteworthy we did not find any work that studies on ESG stocks using the ARIMA model.

As for the literature review regarding credibility of ARIMA for the purpose of predicting stock returns we found a paper that used the Amman Stock Exchange (ASE) general daily index, but the out of sample forecasting showed that the predication was inaccurate (Al-Shiab, 2006) [7]. However another study that investigated the return and volatility of S&P BSE Sensex and S&P BSE IT indices of the Bombay Stock Exchange deduced that ARIMA is capable of predicting medium- or long-term horizons using historical values since the forecasted values were almost equal to tehri

actual values. (Malepati, Challa, & Rao Kolusu, S&P BSE Sensex and S&P BSE IT return forecasting using ARIMA, 2020) [2] In their paper Spenassato *et al*. Mentions that ARIMA is a better predictive model for studying the future behaviour of Dow jones sustainability index (Spenassato, Trierweiller, Bornia, & Sanfelice Fraz, 2015) [15]. In a study of predicting medium- or long-term horizons using historical values of S&P BSE Sensex it was found that ARIMA was extremely capable in predicting (Challa, Malepati, & Kolusu, 2020) [2]. It was found that ARIMA was good predictor in case of stock prices of Helsinki stock exchange (inland) and the Stockholm stock exchange (Sweden) where the stock markets are seen to differ in complexity of time series models as well as in predictability of individual asset prices (Östermark, 1989) [14]. ARIMA model was proposed after rejecting the efficient market hypothesis or random walk hypothesis for modelling and forecasting stock returns on the Korea, Hongkong, Taiwan, Indonesia and Singapore indices. (Fatnassi & Abaoub, 2011) [12]. ARIMA model was found to be highly predictive for stock prices of five prominent banks of Bangladesh. The ARIMA model deduced accurately predicted the future pries and could be used for further decision making. (Hossain, Nandi, & Kamal Uddin, 2020) [4]. However after going through many papers though we could confirm upon the robustness of ARIMA as a predictive model we could not find any work that has studied the predictability of ARIMA in context to ESG index. And since as discussed previously ESG stocks are currently in demand due to the environmental concerns, we presumed it to be of immense value to understand if investing in ESG complaint companies can be financially rewarding too while being beneficial for the environment.

Objective of the Paper

Motivated by filling the gap as mentioned above the objective of the paper is to study the investment prospects of ESG stock. Instead of identifying individual companies that have a high ESG score we did the study of NIFTY ESG 100 that reflects performance of companies within NIFTY 100 based on their ESG score. This would give us a broadbased idea about the investability in ESG stocks as against individual stocks of companies with good ESG score.

Methodolgy

The predictability of the NIFTY ESG 100 has been checked though the age old and tested ARIMA model. We have taken data from 1st January 2015 to 12 April 2021(1555 observations) and checked the stationarity of the series through Augmented Dickey Fuller test. On making the series stationary through log differencing we identified the AR and MA order of the series and derived their PACF plot and ACF plot. Then we applied ARIMA and were able to build the model. Thereafter we checked the robustness of the model, by predicting the next five observations and therafter comparing them with the real values of the next five day. The entire work was done on R studio software.

Results and Discussions

As mentioned in the research methodology 1555 daily closing price observations were considered from the period January 2015 to 12 April 2021.

Hypothesis for ADF test is as follows:

H_0: the series is non-stationary

H_1: the series is stationary

The original price series was put through ADF tests where the results were as follow

Dickey-Fuller = -2.1352, Lag order = 12, p-value = 0.5211

The results show that p> .05 and hence the null hypothesis is accepted that the series is non-stationary.

Since forecasting methods cannot be applied on non-stationary series, the price series was log differenced and thereafter stationarity was checked again through ADF test the results was as follows

Dickey-Fuller = -11.493, Lag order = 12, p-value = 0.01

So the null hypothesis is rejected and the series was found to be stationary

Then the AR (Autoregressive) and MA (Moving average order were identified with ACF plot (chart 1) and PACF plots (chart 2) respectively

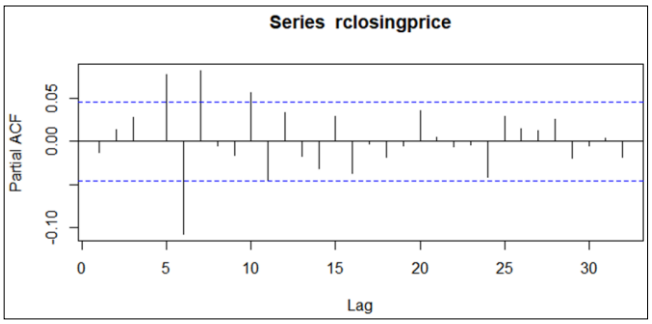


Chart 1: PACF PLOT for AR order

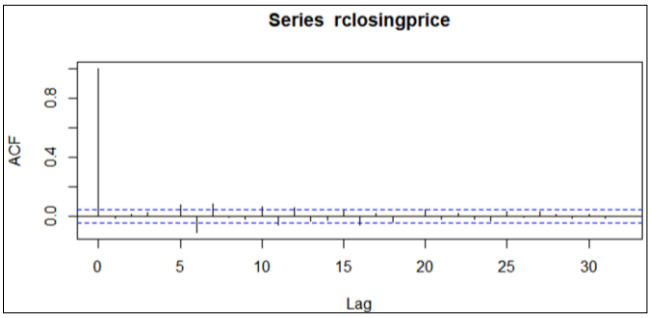


Chart 2: ACF PLOT for MA order

Thereafter the ARIMA model was applied and the following values were derived

ARIMA (2, 0, 3) with non-zero mean

Coefficients are shown in Table 1

Table 1

	ar1	ar2	ma1	ma2	ma3	mean
	-1.5712	-0.9171	1.5873	0.9899	0.0801	4e-04
s.e.	0.0273	0.0249	0.0355	0.0444	0.0256	3e-04

sigma^2 estimated as 0.0001203: log likelihood=5809.84

AIC=-11605.69 AICc=-11605.63 BIC=-11566.93

Equation of the ARIMA model thus deduced from the above vales uis as follows

Forecast of rclosing price (CLOSING PRICE OF NIFTY ESG 100) = $a\text{-}b_1ar_1\text{-}b_2ar_2+b_3e_{t-1}+b_4e_{t-2}+b_5e_{t-3}$ = 4e-04 -1.5712 $rclosingprice_{t-1}$ - 0.9171 $rcosingprice_{t-2}$ + 1.5873 rclosingprice e_{t-3} + 0.9899 rclosingprice e_{t-4} +0.0801 $rclosingprice_{t-5}$

Checking the Robustness if the Arima Test

The ARIMA model was built on 1555 observations. Thereafter the next 6 observations (Table 2) were predicted on the basis of previous 1555 observations.

Table 2

Observation	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
1556	-0.0005778037	-0.0146606038	0.013505031	-0.02211564	0.02096003
1557	0.0014988438	-0.0125849494	0.015582682	-0.02004053	0.02303822
1558	-0.0040207491	-0.0181058554	0.010064356	-0.02556206	0.01752056
1559	0.0066268715	-0.0074648005	0.020718548	-0.01492449	0.02817823
1560	-0.0041496782	-0.0182437001	0.009944345	-0.02570463	0.01740527

Then I see what are the last 5 actual log returns

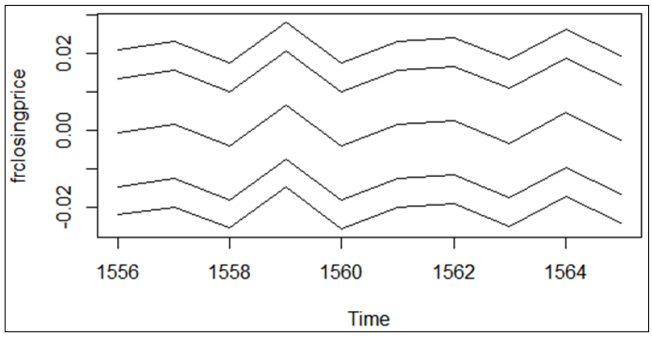
0.003208070

0.008055809

-0.018233370

-0.002842670

For better understanding we compare it through plot



The plot clearly suggests that the forecasted values are very near to the actual values. So the results conclude that the ESG nifty index is predictable and the forecasted values nearly match the actual values. An investor therefore can take informed decisions about timing the buy /sell of ESG stocks. So we can conclude by saying the investing in ESG index would help an investor to gain returns vis-a vis contributing towards a healthier tomorrow

Conclusion

The results and findings of the paper suggest that ESG Nifty 100 index is clearly predictable suggesting further that investor can take informed decisions if investing in such stocks. So ESG investing shall serve the dual objective of return generation as well as conscious involvement in Environment conscious companies.

References

1. Ashwin Kumar N, Smith C, Badis L, Wang N, Ambrosy P, Tavares R. ESG factors and risk-adjusted performance: a new quantitative model. *Journal of Sustainable Finance & Investment*, 2016.
2. Challa M, Malepati V, Kolusu S. S&P BSE Sensex and S&P BSE IT return forecasting using ARIMA. *Financial Innovation*, 2020. doi:https://doi.org/10.1186/s40854-020-00201-5
3. Demers E, Hendrikse J, Joos P, Lev B. ESG Didn't Immunize Stocks During the COVID-19 Crisis, But Investments in Intangible Assets Did. *Journal of Business Finance & Accounting*, 2021, 433-462.
4. Hossain M, Nandi D, Kamal Uddin K. Prediction of Banking Sectors Financial Data of Dhaka Stock Exchange Using Autoregressive Integrated Moving Average (ARIMA) Approach. *International Journal of Material and Mathematical Sciences*, 2020, 64-70.
5. Malepati V, Latha Challa M, Rao Kolusu S. S&P BSE Sensex and S&P BSE IT return forecasting using ARIMA. *Financial Innovation*, 2020.
6. Malepati V, Challa M, Rao Kolusu S. S&P BSE Sensex and S&P BSE IT return forecasting using ARIMA. *Financial Innovation*, 2020.
7. Al Shiab M. The Predictability of the Amman Stock Exchange using the Univariate Autoregressive Integrated Moving Average (ARIMA) Model. *Journal of Economic and Administrative Sciences*, 2006.
8. Blank H, Sgambati G, Truelson Z. Best Practices in ESG investing. *Journal of investing*, 2016, 103-112.
9. Cardillo G, Torluccio G, Bendinelli E. COVID-19, ESG investing, and the resilience of more sustainable stocks: Evidence from European firms. *Business startegy and teh environment*, 2022, 602-623.
10. Cornell B. ESG preferences, risk and return. *European Financial Management*, 2020, 12-19.
11. Economic Times. India, 2020.
12. Fatnassi L, Abaoub E. An analysis of the predictability of asset returns: A case of six emerging stock markets of Asia. *The IUP Journal of Applied finance*, 2011, 57-67.
13. Matos P. *ESG and Responsible Institutional Investing Around the World: A Critical Review*. CFA Institute research foundation, 2020.
14. Östermark R. Predictability of finnish and Swedish stock returns. *Omega*, 1989, 223-236.
15. Spenassato D, Trierweiller A, Bornia A, Sanfelice Fraz L. Dow Jones Sustainability Index: Use of forecasting models to assist decision making. *Espacios*, 2015, 21-28.