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Understanding price-volume dynamics: An analysis of healthcare and consumer durables sectors of nifty 50 index

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Abstract
The present study aims to examine the interplay between trading volume and stock returns within the Indian stock market context. Over a span of ten years, from January 1, 2014, to December 31, 2023, daily closing prices and volume data were analyzed for two sectors of the Nifty 50 Index: Healthcare and Consumer Durables. Stationarity of the data was assessed using the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. Furthermore, the study employed Vector Auto regression (VAR) modeling and Granger Causality tests to delve into the contemporaneous relationship between stock returns and trading volume. The findings suggest a unidirectional causation from past stock returns to trading volume.

Keywords: Augmented dickey fuller test, granger causality test, stock return, trading volume, vector auto regression model

1. Introduction
The Indian stock market stands as one of the most vibrant and significant financial arenas globally, playing a pivotal role in stimulating economic growth and drawing both domestic and international investments. Investors, analysts, and policymakers continuously strive to decode the patterns and determinants that influence stock prices, aiming to optimize investment strategies and enhance market efficiency. The initial efforts to link price movements with trading volume were pioneered by Granger and Morgenstern (1963) [9], followed by an extension of their investigation by Godfrey, Granger, and Morgenstern (1964) [8]. Both studies concluded that there was minimal to no significant relationship between price and volume, with price changes seemingly following a random walk. In contrast, subsequent studies by Crouch (1970) [5], Clark (1973) [3], and Westerfield (1973) [20] using daily and hourly price changes for market indices and individual stocks, revealed a positive correlation between trading volume and the magnitude of returns. Rogalski (1978) [18], analyzing monthly stock and warrant data, observed a positive simultaneous correlation between volume and returns. Similarly, Epps (1975, 1977) corroborated this finding using transaction data. Karpoff' (1987) [12] seminal work underscored the significance of examining the relationship between price and volume in financial markets. While the relationship between stock returns and volume has garnered extensive attention from researchers and market participants worldwide, there remains a lack of substantial evidence on the connection between stock prices and volume.

The structure of this paper is as follows: the second section consolidates previous literature on the price-volume relationship. Section three outlines the data and research methodology employed in the study. Section four presents the analysis and interpretation of the findings. The final section concludes the paper.

2. Review of Literature
Lee and Rui (2000) [13] investigated the concurrent relationships between trading volume, stock returns, and volatility in the US, Hong Kong, Shanghai, and Shenzhen stock markets from 1990 to 1997. Using a six-variable model, they applied ADF and PP tests to ensure stationarity, and utilized GARCH (1, 1) models, VAR models, and Granger causality tests

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for their analysis. Results showed that US and Hong Kong trading volumes had minimal predictive value for Chinese market variables, though US stock returns could predict returns in Shanghai A and B shares. There were also feedback linkages between returns in Shenzhen B and Shanghai A, as well as Shanghai B and Shenzhen B equities. The study concluded that trading volume did not significantly impact stock market performance through Granger causality, and China's financial market operated relatively independently from the global market.

Pisedtasalasai and Gunasekarage (2007) [17] examined the relationships between trading volume, return volatility, and stock returns in the capital markets of Indonesia, Malaysia, the Philippines, Singapore, and Thailand from 1991 to 2004. Using EGARCH models and VAR techniques, with adjustments for the Monday effect and the 1997 Asian Financial Crisis, they found a significant dynamic link between trading volume and stock returns. The study noted asymmetry in these relationships and identified causal links in some markets, with the 1997 crisis notably impacting these dynamics.

Tripathy (2011) [19] analyzed the relationship between trading volume and stock returns in the Indian stock market from January 2005 to January 2010. Utilizing ADF, PP, KPSS, Granger Causality, VAR, Impulse Response Function, and Variance Decomposition tests, the study found a significant relationship between trading volume and return volatility. It also highlighted that return volatility was particularly influenced by trading volume during periods of bad news. The study concluded that trading volume is a critical factor in predicting stock price volatility and recommended using historical volume data to monitor market volatility.

McGowan and Muhammad (2012) [14] examined the correlation between stock prices and trading volume in the Russian trading system from September 1995 to June 2007. Using regression analysis, they analyzed the natural logarithm of trading volume and changes in the RTS Index. The study found a statistically significant positive correlation between trading volume and RTS Index fluctuations. Additionally, the study reported that positive (Or negative) returns on one day tended to be followed by positive (Or negative) returns on the next day, demonstrating the persistence of movements in the RTS Index.

Assan and Thomas (2013) [2] investigated how stock size affects the relationship between returns and trading volume in the Indian stock market across pre-crisis, crisis, and post-crisis periods from 1997 to 2012. Utilizing Granger Causality tests and the Vector Autoregressive (VAR) framework, study showed that the causal relationship between returns and volume was stronger for smaller stocks. However, this relationship weakened after the subprime crisis, indicating an increase in market efficiency.

Cook and Watson (2016) [4] examined the correlation between trading volume and returns in the London Stock Exchange, focusing on the impact of the financial crisis. Using daily high, low, open, and closing prices of the FTSE 100 index from 1991 to 2016, they employed various metrics and considered time variance to analyze the dynamics between volume and returns over the period. Their findings offered significant insights into how the financial crisis influenced the returns-volume relationship across different market conditions.

Naik, Gupta, and Padhi (2018) [15] explored the relationship between trading volume and stock market volatility on the Johannesburg Stock Exchange (JSE) from July 2006 to August 2016, a period following the financial crisis. Using EGARCH and Granger causality models, they reported that JSE volatility was more sensitive to bad news and exhibited a positive correlation with trading volume, supporting the MDH. The Granger causality tests indicated unidirectional causality across the entire sample and a feedback loop in the post-crisis subsample.

Nyakurukwa (2021) [16] re-evaluated the dynamic relationship between trading volume and stock returns on the Johannesburg Stock Exchange (JSE) from January 4, 2005, to February 26, 2021. The study aimed to analyze this relationship across stable periods, times of crisis, and the post-COVID era. Using regression analysis, Vector Autoregressive (VAR) models, Granger causality tests, and structural break analysis, the research found no tail dependence and varying causal links, with notable associations in intermediate quantiles during stable periods. However, the relationship between returns and volume weakened during pandemics and crises, indicating a shift in market dynamics. The study concluded that trading volume does not significantly influence JSE returns and that direct government intervention during crises may be ineffective. Additionally, the findings supported the notion of weak-form market efficiency on the JSE, implying that trading volume is not a reliable predictor of future profits.

Abukari and Assogbavi (2019) [1] examined the relationship between stock returns and trading volume for companies listed on the Johannesburg Stock Exchange (JSE) from 2011 to 2017. Utilizing Granger causality tests and vector autoregressive (VAR) models, they found strong contemporaneous connections between trading volume and stock returns, indicating the JSE's efficiency in informing investors. The study also identified short-lived bi-directional Granger causality between returns and volume, and an asymmetric negative relationship during market declines. These findings suggest that the JSE exhibits characteristics of mature stock markets, potentially attracting foreign investors.

Gueyie, Diallo, and Diallo (2022) [11] assessed the relationship between trading volume and stock returns in the West African stock market at the Bourse Régionale des Valeurs Mobilières (BRVM) from 2015 to 2022. Their study investigated whether there was a causal relationship between trading volume and stock returns, and if so, the direction of this relationship. Using linear techniques (GMM), they empirically analyzed the association between stock returns and trading volume at the BRVM index. The findings indicated no significant contemporaneous link between trading volume and stock returns at the BRVM. However, a one-way causal relationship was observed, suggesting that historical positive returns rather than large, unexpected transaction volumes primarily drove price fluctuations.

3. Data and Methodology
The study spans a decade, from January 1, 2014, to December 31, 2023, focusing on daily closing stock prices

and trading volume data from the CMIE database for two sectors-Healthcare and Consumer Durables-of the NSE Nifty 50 Index. This dataset encompasses seven companies listed within these sectors as part of the Nifty 50 Index.

To gauge stock performance, stock returns are calculated as the ratio of a stock's closing price today to its closing price the previous day. A positive value indicates a price increase, while a negative value indicates a price decrease. The stock returns are calculated using Natural logarithm return formula:

Stock Return = LN ((Today's Price)/ (Yesterday's Price))

Volume refers to the aggregate number of shares or units of a security traded within a single trading day, reflecting the overall buying and selling activity for a specific stock or security during a defined period. In this study, data from 2463 trading days were analyzed.

To assess the stationarity of the data, both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests were utilized. These tests help determine whether the data exhibit stable statistical properties over time.

Furthermore, the study employed the Vector Auto Regression (VAR) model and Granger Causality test to explore the dynamic link between stock returns and trading volume. These statistical tools allow for the examination of how changes in trading volume may impact stock returns, and vice versa, over the course of the study period.

4. Data Analysis and Interpretation

Table 1: Descriptive Statistics of Stock Returns and Trading Volume for the Companies under Healthcare & Consumer Durables Sector of Nifty 50 Index

Companies	Variables	Mean	Standard Deviation	Skewness	Kurtosis	Max.	Min.	JB statistic (Prob. Value)
Panel A: Healthcare Sector								
Apollo Hospitals Enterprise Ltd.	Stock Return	0.0720	2.0637	0.2674	8.9539	14.4052	-16.2395	3664.423 (0.0000)***
	Trading Volume	-0.0012	63.6699	0.4237	6.4511	449.7200	-351.4306	1294.990 (0.0000)***
Cipla Ltd.	Stock Return	0.0460	1.6715	0.4480	7.8281	12.2549	-9.2396	2472.661 (0.0000)***
	Trading Volume	0.0581	56.3529	0.2936	5.6379	296.9311	-318.8972	748.9149 (0.0000)***
Divi's Laboratories Ltd.	Stock Return	0.0751	2.0082	-1.2807	24.9287	14.9787	-25.1862	499829 (0.0000)***
	Trading Volume	0.0179	63.4169	0.5130	5.7689	429.4613	-291.8701	894.1525 (0.0000)***
Dr. Reddy's Laboratories Ltd.	Stock Return	0.0335	1.7198	-0.2679	11.1745	12.9870	-15.7366	6881.653 (0.0000)***
	Trading Volume	0.0953	58.4015	0.5437	6.1772	344.7478	-309.8114	1156.452 (0.0000)***
Sun Pharmaceutical Industries Ltd.	Stock Return	0.0320	1.8847	-0.4179	9.3322	10.4469	-16.3201	4183.280 (0.0000)***
	Trading Volume	0.0595	57.0594	0.5769	7.1236	450.352	-319.309	1880.168 (0.0000)***
Panel B: Consumer Durables Sector								
Asian Paints Ltd.	Stock Return	0.0779	1.6164	-0.2133	8.4520	8.4825	-15.1147	3066.735 (0.0000)***
	Trading Volume	-0.0450	51.9352	0.2714	4.7962	300.7763	-236.2108	361.0660 (0.0000)***
Titan Company Ltd.	Stock Return	0.1124	1.9324	0.4139	11.3771	17.2165	-13.0746	7266.380 (0.0000)***
	Trading Volume	0.0111	60.0142	0.3541	5.2992	381.5954	-287.9640	593.5141 (0.0000)***

Note: The JB test statistic serves to assess the non-normality of the distribution, with *** indicating a significant deviation at the 1% level.
Source: Extracted from CMIE Database.

Table 1 represents the descriptive statistics of Healthcare and Consumer Durables sector. Over a decade, from January 1, 2014, to December 31, 2023, daily trading volume and stock returns were analyzed for the Healthcare and Consumer Durables Sectors of the Nifty 50 index. Panel A details the five companies in the Healthcare sector, all displaying positive mean daily returns. APOLLOHOSP stands out with the highest variability in returns. Notably, most companies exhibit non-normal return distributions, indicating potential risk. In terms of trading volume, all companies, except APOLLOHOSP, show positive average daily volumes, with DRREDDY leading. However, APOLLOHOSP has the highest variability in volume. Overall, the data deviates from a normal distribution, suggesting market dynamics beyond typical patterns.

Panel B showcases ASIANPAINT and TITAN from the Consumer Durables sector of the Nifty 50 index. Both companies exhibit positive average gains, with TITAN having the highest standard deviation. ASIANPAINT's returns skew negatively, while TITAN's skew positively. Both companies display leptokurtic return distributions with potential outliers. Neither conforms to a normal distribution per the JB test at the 1% significance level. ASIANPAINT's average trading volume is negative, while TITAN's is positive. TITAN also demonstrates the highest volume standard deviation and positive skewness, indicating an uneven distribution. Positive kurtosis implies a leptokurtic distribution with potential outliers. The JB statistic rejects normal distribution conformity for both companies at the 1% significance level.

Table 2: Unit Root Test Results of Stock Return and Trading Volume for the Companies under Healthcare & Consumer Durables Sector of Nifty 50 Index

Companies	Variables	ADF Test Statistic			Prob. Value	Decision	PP Test Statistic			Prob. Value	Decision
		Intercept	Trend & Intercept	None			Intercept	Trend & Intercept	None		
Healthcare Sector											
Apollo Hospitals Enterprise Ltd.	Stock Return	-48.6243	-48.6265	-48.5734	0.0000***	H_0: Rejected	-48.6156	-48.6177	-48.5659	0.0001***	H_0: Rejected
	Trading Volume	-21.9612	-21.9598	-21.9648	0.0000***	H_0: Rejected	-413.421	-419.369	-411.544	0.0000***	H_0: Rejected

Cipla Ltd.	Stock Return	-51.7903	-51.7806	-51.7581	0.0001***	H₀: Rejected	-51.7475	-51.7382	-51.7230	0.0001***	H₀: Rejected
	Trading Volume	-24.1088	-24.1039	-24.1137	0.0000***	H₀: Rejected	-293.707	-295.603	-293.619	0.0000***	H₀: Rejected
Divi's Laboratories Ltd.	Stock Return	-46.5886	-46.5805	-46.5371	0.0001***	H₀: Rejected	-46.5218	-46.5133	-46.5071	0.0001***	H₀: Rejected
	Trading Volume	-26.1055	-26.1005	-26.1108	0.0000***	H₀: Rejected	-280.621	-281.251	-280.720	0.0000***	H₀: Rejected
Dr. Reddy's Laboratories Ltd.	Stock Return	-46.1445	-46.1389	-46.1373	0.0001***	H₀: Rejected	-46.1438	-46.1383	-46.1366	0.0000***	H₀: Rejected
	Trading Volume	-22.4025	-22.3988	-22.4071	0.0000***	H₀: Rejected	-264.010	-265.655	-263.888	0.0000***	H₀: Rejected
Sun Pharmaceutical Industries Ltd.	Stock Return	-49.3733	-49.3774	-49.3692	0.0001***	H₀: Rejected	-49.3737	-49.3780	-49.3698	0.0001***	H₀: Rejected
	Trading Volume	-25.0326	-25.0296	-25.0378	0.0001***	H₀: Rejected	-390.214	-428.954	-390.433	0.0001***	H₀: Rejected

Consumer Durables Sector

Asian Paints Ltd.	Stock Return	-51.2587	-51.2566	-51.1425	0.0000***	H₀: Rejected	-51.2568	-51.2592	-51.1415	0.0000***	H₀: Rejected
	Trading Volume	-21.8983	-21.8947	-21.9029	0.0000***	H₀: Rejected	-384.948	-387.749	-384.932	0.0000***	H₀: Rejected
Titan Company Ltd.	Stock Return	-53.0894	-53.0787	-52.9054	0.0000***	H₀: Rejected	-53.0007	-52.9904	-52.8005	0.0001***	H₀: Rejected
	Trading Volume	-22.0197	-22.0199	-22.0242	0.0001***	H₀: Rejected	-545.155	-595.585	-545.446	0.0001***	H₀: Rejected

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

Table 2 displays the unit root test results for stock returns and trading volume in the Healthcare and Consumer Durables sectors of the Nifty 50 index. Initially, both variables were found to be non-stationary at their original levels. However, after transforming the data into log percentage form, stationarity was confirmed at the level stage, with the null hypothesis rejected at a 1% significance level. These stationary data are crucial for accurate forecasting. Subsequently, the study proceeded to investigate the dynamic relationship between stock returns and trading volume using a Vector Autoregression (VAR) approach.

Table 3: Determination of Optimal Lag Length

Lag Length	LR	FPE	AIC	SC	HQ
0	NA	5358.954	14.26228	14.26701	14.26400
1	459.3460	4458.298	14.07828	14.09246	14.08343
2	169.1162	4174.630	14.01254	14.03618	14.02113
3	95.61199	4027.886	13.97675	14.00985	13.98878
4	39.19542	3976.815	13.96399	14.00654	13.97945
5	31.62263***	3938.521***	13.95431***	14.00633***	13.97321***

Note: *** indicates the optimal lag order selected by the criterion. LR: Likelihood Ratio, FPE: Final Prediction Error, AIC: Akaike Information Criterion, SC: Schwartz Information Criterion, HQ: Hannan- Quinn Information Criterion.

Selecting the appropriate lag length is critical in VAR analysis to ensure that the model accurately captures temporal dependencies in the data. Various criteria, including AIC, SIC, HQ, LR, and FPE, are used to determine the optimal lag. A model with too few lags may lack important dynamics, while an excessive number of lags can lead to overfitting and capturing noise instead of real patterns. By striking the right balance, the VAR model provides the best fit and effectively represents the data generation process.

Table 4 (a): VAR Estimation Model Results of Stock Return and Trading Volume for the Companies under Healthcare & Consumer Durables Sector of Nifty 50 Index

Panel A: Healthcare Sector

$$R_t = \alpha_1 + \sum_{j=1}^{5} \beta_j R_{t-1} + \sum_{j=1}^{5} \gamma_j V_{t-1} + u_{1t}$$

$$V_t = \alpha_2 + \sum_{j=1}^{5} \theta_j R_{t-1} + \sum_{j=1}^{5} \lambda_j V_{t-1} + u_{2t}$$

Companies	α_1	β_1	β_2	β_3	β_4	β_5	γ_1	γ_2	γ_3	γ_4	γ_5	α_2	θ_1	θ_2	θ_3	θ_4	θ_5	λ_1	λ_2	λ_3	λ_4	λ_5
Apollo Hospitals Enterprise Ltd.	0.07	0.01	-0.04**	-0.02	-0.00	0.03*	0.00	0.00*	-0.00	0.00	0.00	0.35	-0.50	-0.58	-0.42	-0.77	1.46***	-0.55***	-0.41***	-0.32***	-0.21***	-0.11***
Cipla Ltd.	0.04	-0.04**	0.00	0.02	0.00	0.03*	-0.00	0.00	0.00	0.00	0.00	0.23	-1.27**	-0.66	-1.10*	-1.16*	0.25	-0.51***	-0.40***	-0.27***	-0.17***	-0.11***
Divi's Laboratories ltd.	0.07	0.06***	-0.01	-0.00	-0.02	-0.03*	-0.01	-0.00	0.00	0.00	-0.00	0.21	-0.78	-0.29	-0.71	-0.51	0.34	-0.52***	-0.37***	-0.24***	-0.17***	-0.11***
Dr. Reddy's Laboratories Ltd.	0.03	0.06***	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	-1.13*	0.18	-0.63	-1.13	0.21*	-0.50***	-0.32***	-0.25***	-0.23***	-0.10***
Sun Pharmaceutical Industries Ltd.	0.02	0.00	0.01	-0.01	0.01	0.00	-0.00	-0.00	0.00	-0.00	-0.00	0.10	-0.70	-0.82	-0.80	-1.09**	-0.07	-0.52***	-0.39***	-0.26***	-0.16***	-0.09***
Panel B: Consumer Durables Sector																						
Asian Paints Ltd.	0.08	-0.03	0.00	0.00	-0.01	0.00	-0.00	0.00*	-0.00	0.00	0.00	0.28	-1.52***	-0.72	-0.96*	-0.08	-0.52	-0.53***	-0.40***	-0.28***	-0.19***	-0.13***
Titan Company Ltd.	0.11	-0.06***	0.03*	0.00	0.00	0.01	-0.00	-0.00	0.00	0.00	0.00	0.19	-0.50	-1.13**	-0.23	0.53	-0.42	-0.56***	-0.43***	-0.33***	-0.23***	-0.14***

Note: The coefficients β_j & γ_j represents the autoregressive coefficient of return and partial coefficient of return on past volume. Similarly, θ_j & λ_j represents the partial coefficient of volume on past returns and autoregressive coefficient of volume. The optimal lag selected by the AIC, SC, HQ are 5 lags for examining the relationship between stock return and trading volume. ***, **, *, represents the 1%, 5% and 10% significance levels respectively.

Table 4(a) Panels A and B display VAR model results for stock returns and trading volume in the Healthcare and Consumer Durables Sectors of the Nifty 50 index from January 1, 2014, to December 31, 2023. Most equities show significant relationships between volume and prior returns at certain lags, except DIVISLAB. In both sectors, a one-way directional relationship between trading volume and stock return is evident.

Table 4 (b): Pairwise Granger Causality Test Results of Stock Return and Trading Volume for the Companies under Healthcare & Consumer Durables Sector of Nifty 50 Index

Companies	Null Hypothesis	F-Statistics	Prob. Value	Decision
Panel A: Healthcare Sector				
Apollo Hospitals Enterprise Ltd.	Trading Volume does not granger cause Stock Return	1.60083	0.1565	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	2.29646	0.0429**	H_0: Rejected
Cipla Ltd.	Trading Volume does not granger cause Stock Return	0.54062	0.7456	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	2.56088	0.0255**	H_0: Rejected
Divi's Laboratories Ltd.	Trading Volume does not granger cause Stock Return	0.89460	0.4837	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	1.06164	0.3797	H_0: Failed to reject
Dr. Reddy's Laboratories Ltd.	Trading Volume does not granger cause Stock Return	0.61193	0.6908	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	1.71515	0.1277	H_0: Failed to reject
Sun Pharmaceutical Industries Ltd.	Trading Volume does not granger cause Stock Return	1.99033	0.0770*	H_0: Rejected
	Stock Return does not granger cause Trading Volume	2.13222	0.0589*	H_0: Rejected
Panel B: Consumer Durables Sector				
Asian Paints Ltd.	Trading Volume does not granger cause Stock Return	0.86950	0.5007	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	2.42188	0.0336**	H_0: Rejected
Titan Company Ltd.	Trading Volume does not granger cause Stock Return	0.58993	0.7077	H_0: Failed to reject
	Stock Return does not granger cause Trading Volume	1.31169	0.2560	H_0: Failed to reject

Note: ***, **, * highlights the 1%, 5% and 10% level of significance.

Table 4(b) displays the results of the Paired Granger Causality test for the Healthcare & Consumer Durables sectors, examining the dynamic relationship between variables. In the healthcare sector, three out of five equities indicate that past stock returns influence trading volume. However, none of the stocks show consistent correlation between trading volume and stock return. This implies a unidirectional causal relationship from stock return to trading volume, except for DIVISLAB and DRREDDY. Similarly, in the Consumer Durables sector, only one out of two stocks rejects the null hypothesis, suggesting volume is not affected by prior returns. This supports the hypothesis of unidirectional causation, where stock return variations precede changes in trading volume. These findings challenge theoretical models suggesting volume's information content influences future returns, indicating limited predictive capacity for future returns based on trading volume alone.

5. Conclusion
The analysis shows that the data series for stock return and trading volume across seven companies within the Healthcare and Consumer Durables sectors deviate from a normal distribution. Despite this non-normality, both stock return and trading volume data exhibit stationarity for all seven firms. VAR results reveal significant relationships between volume and past returns at specific lags for most equities, with the exception of DIVISLAB. Moreover, a unidirectional relationship from trading volume to stock return is evident in both sectors. Granger causality test results support these findings, confirming a one-way causal relationship from stock return to trading volume, except for DIVISLAB and DRREDDY within both sectors.

6. References
1. Abukari K, Assogbavi T. Dynamics of the price-volume relationship in an African context: the case of South Africa. African Journal of Accounting, Auditing and Finance. 2019;6(4):345-364. Available from: https://doi.org/10.1504/AJAAF.2019.105132
2. Assan A, Thomas S. Stock returns and trading volume: does the size matter? Investment Management and Financial Innovations. 2013;10(3):76-88.
3. Clark PK. A subordinated stochastic process model with finite variance for speculative prices. Econometrica. 1973;41(1):135-155. Available from: https://doi.org/10.2307/1913889
4. Cook S, Watson D. Revisiting the returns-volume relationship: Time variation, alternative measures and the financial crisis. Physica A. 2016;470(1):228-235. Available from: https://doi.org/10.1016/j.physa.2016.11.087
5. Crouch RL. The volume of transactions and price changes on the New York Stock Exchange. Financial Analysts Journal. 1970;26(4):104-109. Available from: https://www.jstor.org/stable/4470708
6. Epps TW. Security price changes and transaction volumes: Theory and evidence. American Economic Review. 1975;65(4):586-597. Available from: https://links.jstor.org/sici?sici=0002-8282%2819750.0%3B2-9&origin=repec
7. Epps TW. Security price changes and transaction volumes: Some additional evidence. Journal of Financial and Quantitative Analysis. 1977;12(1):141-146. Available from: https://doi.org/10.2307/2330293
8. Godfrey MD, Granger CWJ, Morgenstern O. The random walk hypothesis of stock market behaviour. Kyklos. 1964;17(1):1-30. Available from: https://doi.org/10.1111/j.1467-6435.1964.tb02458.x
9. Granger CWJ, Morgenstern O. Spectral analysis of New York stock market prices. Kyklos. 1963;16(1):1-27. Available from: https://doi.org/10.1111/j.1467-6435.1963.tb00270.x
10. Granger CWJ, Newbold P. Spurious regressions in

econometrics. Journal of Econometrics. 1974;2(2):11-120. Available from: https://doi.org/10.1016/0304-4076(74)90034-7

11. Gueyie JP, Diallo MS, Diallo MF. Relationship between stock returns and trading volume at the Bourse Régionale des Valeurs Mobilières, West Africa. International Journal of Financial Studies. 2022;10(4):1-16. Available from: https://doi.org/10.3390/ijfs10040113

12. Karpoff JM. The relation between price changes and trading volume: A survey. Journal of Financial and Quantitative Analysis. 1987;22(1):109-126. Available from: https://links.jsto.org/sici=00221090%28198703%2922%3A1%3C109%3ATRBPCA%3E2.0.CO%3B2-1

13. Lee CF, Rui OM. Does trading volume contain information to predict stock returns? Evidence from China's stock markets. Review of Quantitative Finance and Accounting. 2000;14(4):341-360. Available from: https://doi.org/10.1023/A:1008319826042

14. McGowan CB, Muhammad J. The relationship between price and volume for the Russian trading system. International Business & Economics Research Journal. 2012;11(9):963-970. Available from: https://doi.org/10.19030/iber.v11i9.7251

15. Naik PK, Gupta R, Padhi P. The relationship between stock market volatility and trading volume: evidence from South Africa. Journal of Developing Areas. 2018;52(1):99-114. Available from: https://doi.org/10.1353/jda.2018.0007

16. Nyakurukwa K. Revisiting the dynamic stock return–volume relationship in South Africa: A non-parametric causality in quantiles approach. Macroeconomics and Finance in Emerging Market Economies. 2021;17(1):136-152. Available from: https://doi.org/10.1080/17520843.2021.1953865

17. Pisedtasalasai A, Gunasekarage A. Causal and dynamic relationships among stock returns, return volatility and trading volume: evidence from emerging markets in South-East Asia. Asia-Pacific Financial Markets. 2007;14(4):277-297. Available from: https://doi.org/10.1007/s10690-008-9063-3

18. Rogalski RJ. The dependence of prices and volume. Review of Economics and Statistics. 1978;60(2):268-274. Available from: https://www.jstor.org/stable/1924980

19. Tripathy N. The relation between price changes and trading volume: A study in Indian stock market. Interdisciplinary Journal of Research in Business. 2011;1(7):81-95.

20. Westerfield R. The distribution of common stock price changes: An application of transactions time and subordinated stochastic models. Journal of Financial and Quantitative Analysis. 1973;12(5):743-765. Available from: https://doi.org/10.2307/2330254.