Review MECAS V°20 / N°1 / June 2024

The relationship between trading volume, stock returns and volatility during the Covid-19 period for the shanghai stock exchange

Benkhedda zineb[1]
MIFMA Laboratory, Faculty of Economics and Management, University
zineb.benkhedda@univ-tlemcen.dz

Benbouziane mohamed
MIFMA Laboratory, Faculty of Economics and Management, University of Tlemcen, Algeria
mbenbouziane@yahoo.fr

Received date : 30-03-2024 , Accepted date : 05-05-2024, Publication date:02-06-2024

Abstract :
The financial markets have experienced notable fluctuations in stock prices and volume of trading, attributed to the spread of COVID-19, which affected the financial market worldwide. This research delves into the dynamics of the contemporaneous nexus between volume of trading, return, and volatility of the Shanghai Composite Index during COVID-19. The results reveal that Granger demonstrated that returns have a significant causal effect on volume of trading. The GARCH model shows positive and statistically significant parameters; however the effect of today's shock remains in the forecast of variance for many periods in the future. Additionally, Johansen cointegration shows that there is a presence of cointegration between the series, which is a long-run correlation between the variables.

Keywords: volume of trading, stock return,information hypothesis, Garch Model, Granger causality
Jel Classification Codes: E2,E29

Introduction :

The financial landscape has been witness to numerous notable fluctuations in stock prices and volume of trading. These occurrences can be attributed to the widespread effect due to the COVID-19 virus,which has had a profound impact on global financial markets. Numerous studies have explored the intricate connection

[1] Corresponding Author.

between information and fluctuations in the financial market, where information has emerged as an invaluable asset in this realm, garnering attention from researchers analyzing the efficiency of the market. Further, the (EMH) or the market hypothesis of efficiency was introduced by **(Fama, 1970)**, attesting that an effective market incorporates available information. The relationship between volume of trading and stock return is an indicator of how swiftly new information influences stock prices. Given the frequent fluctuation of stock returns, it is critical to examine the dynamics between stock returns and volume of trading to gain a comprehensive understanding of the stock market micro-structure. Various theories have arisen within the framework of information hypotheses to explain the association between volume of trading and stock returns. **(Karpoff, 1987)** emphasized the importance of investigating the correlation between these factors, providing insights into different hypotheses regarding market structure, information dissemination, and the influence of information on market prices and size.

Moreover, studying this relationship is crucial for conducting specialized case studies that employ price data and volume of trading to reach conclusion. If the variables stock prices and volume of trading move in harmony, it strengthens the validity of these tests. In certain examinations, price changes are regarded as the market's assessment of newfound information, while volume of trading reflects investors' divergent interpretations of this information. The accuracy of inferences relies on the distribution of price fluctuations and volume of trading, rendering them useful for exploring the experimental distribution of speculative prices.

According to **Shie & Lin (2015)**, effective investment decisions can be made by interpreting the price-volume relationship, in addition to understanding the behavior of investors as well as changes in market structure and market price mechanisms. Determine the optimal investment method for achieving arbitrage and risk avoidance. Investor expectations of market changes are reflected in trade prices.

Ranging from Copeland's 1976 research on the Sequential Information Arrival Hypothesis (SIAH) to Tauchen and Pitts' 1983 study, as well as Grammatikos and Saunders' investigations in 1986, it is suggested that the positive correlation between volume of trading and returns is the sequential delivery of information. This impliesa bidirectional causal connection between the stock return and volume of trading, along with a lag relationship between the two variables according to this model.

In actuality, the return can be predicted using the volume of trading data from the prior period, which reflects the shift in the volume of trading's access to the new information. Thus, the seeming permanence of the return and the trade volume are caused by this successive arrival of information.

Spanning from Clark **(1973) research on** The mixture distribution hypothesis (MDH) model, **to Epps and Epps (1976)** and **Campbell et al. (1993)**, asserting that stock return and the volume of trading are interacted contemporaneously whilst volume of trading is causally related to the return only in one direction. Additionally, the simultaneous access of new information to the market of stocks that reaches the traders all at once has an effect on volume of trading and returns. Consequently, the prices quickly changed to bring the market into balance, and there was no chance to use the return information to forecast volume of trading or vice versa.

Nevertheless, the model makes use of the volume of trading to be a proxy variable to reflect the level of agreement or disagreement on the interpretation of market information. The MDH model has been studied using volume of trading as a proxy variable that reflects the information rate flow to the market.

The reminder of the paper is organized as follows: the literature review section related to literature review is provided with some empirical studies.

The methodology and data section introduces the principle of the Garch model applied in this study and describes the data used for illustrating market characteristics. Furthermore, the empirical outcomes section presents a thorough examination of the research results. Finally, a section presents a conclusion that concludes the paper.

1. Literature Review :

Samman and Al-Jafari (2015) examined the connection between volume of trading and stock return volatility for 17 companies listed on the Muscat Securities Market. The VAR model revealed a significant positive correlation between volume of trading and stock returns. The Granger causality test revealed that volume of trading influences stock returns. The study also found that return volatility has a significant impact on volume of trading. These findings are consistent with prior investigations by Sabri (2008), Mubarik and Javid (2009), Tripathy (2011), Pathirawasam (2011), and Al-Jafari and Tliti (2013).

Wang et al. (2005) investigated the dynamic interplay between stock return volatility and volume of trading for stocks of individual listed on the Chinese stock exchange, as well as market portfolios. The GARCH specification's inclusion of volume of trading, which acts as a proxy for information arrival, significantly reduces conditional variance persistence. In each case involving individual stocks, the positive volume effect is statistically significant.

Al-Jafari and Tliti (2013) study looks at the dynamic relationship betweenreturn of stock and volume of trading within the Amman Stock Exchange's banking sector. The empirical findings indicate that there is no significant relationship between volume of trading and returns at the sub-index level. However, they do show a significant correlation between trade volumes and volatility of return. Furthermore, Johansen's cointegration research shows that stock returns and volume of trading are cointegrated, implying a long-term equilibrium relationship. Furthermore, VECM shows evidence of a long-term relationship between returns and volume of trading.

The paired Granger causality test demonstrates that historical stock return values can accurately predict ASE trade volume.

Hussain, S. (2014).A study of the association between stock returns, trade volume, and volatility in Pakistan's banking sector. Sector from January 2012 to June 2014. The results reveal that previous-day volume has a considerable effect on the current stock return, demonstrating that both The return and volume from the previous day have the potential to influence current returns.The causal relationship illustrates that stock returns have a bigger impact on volume than volume has on returns. The results of the ARCH-GARCH Model show a significant link between volume and volatility. These findings are supported by Mustafa and Nishat's (2006) and Mubarik and Y. Javed's (2009) earlier research on the Stock Exchange of Karachi Pakistan.

2. Data and methodology

2.1. Description of data

The datasets includes daily data on the Shanghai Stock Exchange's composite index from March 1st, 2020 to December 29th, 2021, during the COVID-19 pandemic.

2.2.Research variables:

In this study, the stock return will be calculated as follow:

$$\text{Return} = \ln\left(\frac{\text{cl}_t}{\text{cl}_{t-1}}\right) \times 100$$

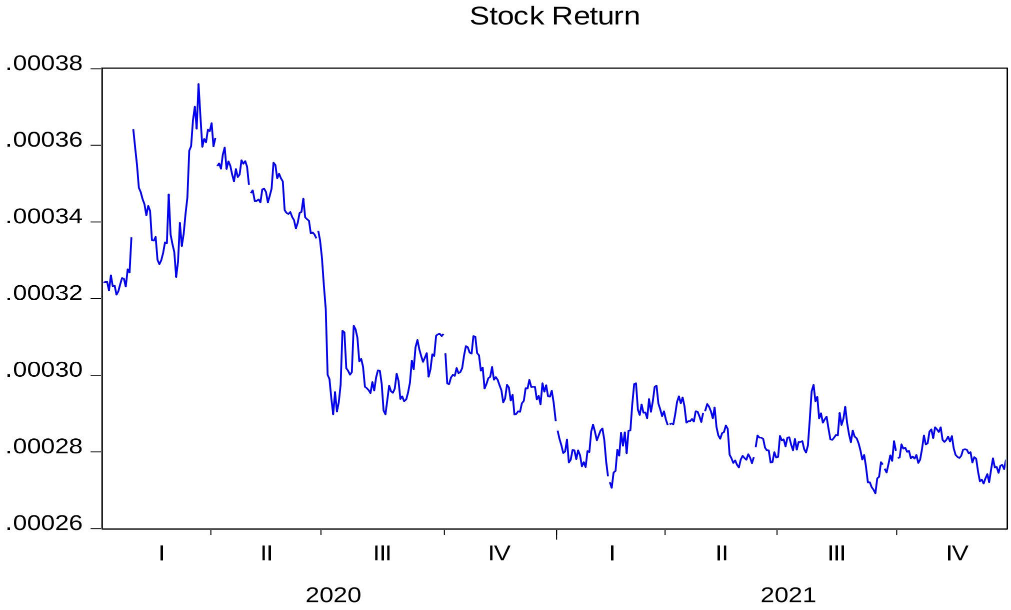
The calculation of the volume of trading, according to Choi, Kang, and Yoon (2013), was as follows:

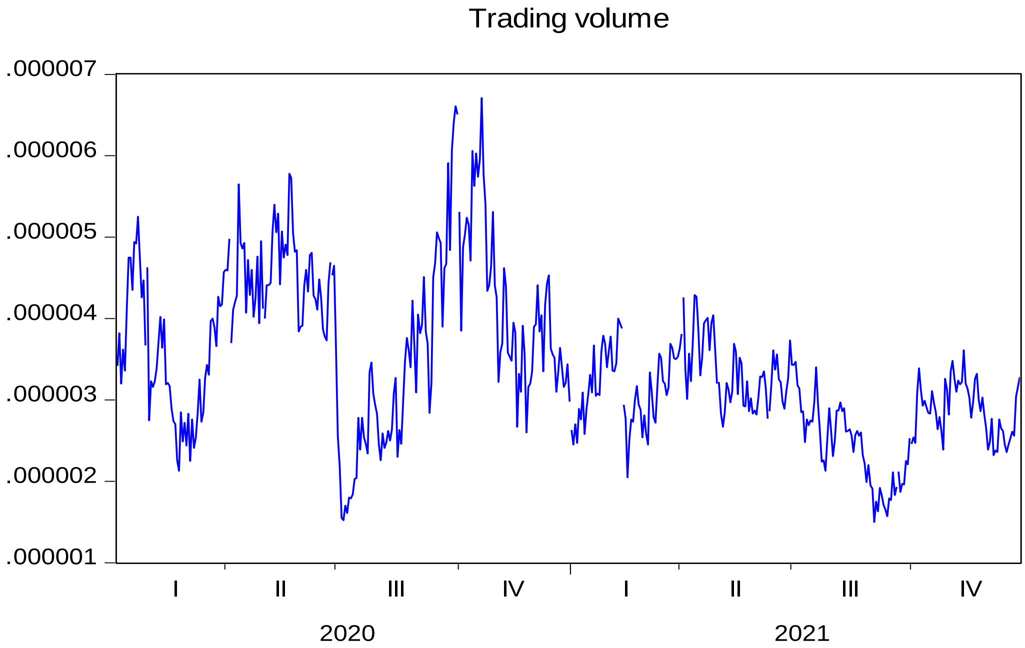
$$\text{volume} = \ln\left(\frac{v_t}{v_{t-1}}\right) \times 100$$

2.3.Model:

According to **(Engle)**the ARCH and GARCH models serve as vital for assessing time series data in financial applications, particularly for predicting volatility. This model implies homoskedasticity, which means that the anticipated value of all error terms squared is roughly the same at any given location. In contrast, heteroskedasticity occurs when mistakes have disparate variances across data points or ranges. ARCH and GARCH models consider heteroskedasticity as a variable that can be modeled, rather than a problem to be solved. However, we In this study, the GARCH and GJR-GARCH models were used to undestand the interplay betweeen the variables series.

3. Findings and discussion





3.1.Descriptive statistics

	CLOSE (-1)	STOCK RETURN	volume of trading	VOLUME (-1)
Mean	3331.817	0.000302	3.41E-06	317424.8
Median	3412.702	0.000293	3.23E-06	309599.0
Maximum	3714.370	0.000376	6.71E-06	667299.0
Minimum	2659.170	0.000269	1.50E-06	149099.0
Std. Dev.	268.5827	2.63E-05	9.59E-07	91998.60

Skewness	-0.839471	1.018281	0.692815	0.981555
Kurtosis	2.427106	2.745893	3.426597	4.448359

Source:Author's computation using EViews software

The descriptive statistics table shows that the average of the first level difference of the closing stock is about 3332 with a variability of about 269, the average stock return is 0.000302 with a variability of about 0.0000263, the average volume of trading is about 0.00000341 with a variability of about 0.000000959, and the average of the first level difference of the volume of the stock is about 317425 with a variability of about 91999. The skewness of all the variables approaches zero except for the stock return, with positive skewness at the leptokurtic level indicating the presence of volatility in the stock return during the period under study, which is a COVID-19 period where all business activities were practically crippled and hence contributed to volatility. Investors are cautioned not to invest during this period owing to the lack of safety.

3.2.Unit root test

Null Hypothesis: D(STOCK_RETURN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-21.36250	0.0000
Test critical values:	1% level	-3.443691	
	5% level	-2.867317	
	10% level	-2.569909	

Source:Author's computation using EViews software

This implies that the stock return becomes stationary after the first difference, or we can say it is integrated of order 1, as the P-value is less than 0.05 after the first difference of the series of the stock return.

Null Hypothesis: D(TRADING_VOLUME) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=17)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.68505	0.0000
Test critical values:	1% level	-3.443776	
	5% level	-2.867354	
	10% level	-2.569929	

Source:Author's computation using EViews software

Review MECAS V°20 / N°1 / June 2024

This implies that the volume of trading becomes stationary after the first difference, or we can say it is integrated of order 1, as the P-value is less than 0.05 after the first difference of the volume of trading.

3.3.GARCH Model

Dependent Variable: STOCK_RETURN
Method: ML ARCH - Normal distribution (Marquardt / EViews legacy)
Date: 01/12/24 Time: 12:10
Sample (adjusted): 1/03/2020 12/29/2021
Included observations: 483 after adjustments
Convergence achieved after 6 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.49E-06	1.71E-06	1.456483	0.1453
STOCK_RETURN(-1)	0.991149	0.005607	176.7616	0.0000
Variance Equation				
C	2.46E-12	4.64E-13	5.307905	0.0000
RESID(-1)^2	0.150000	0.013262	11.31057	0.0000
GARCH(-1)	0.600000	0.044413	13.50941	0.0000

R-squared	0.982065	Mean dependent var	0.000302
Adjusted R-squared	0.982027	S.D. dependent var	2.63E-05
S.E. of regression	3.53E-06	Akaike info criterion	-22.43780
Sum squared resid	6.00E-09	Schwarz criterion	-22.39453
Log likelihood	5423.728	Hannan-Quinn criter.	-22.42079
Durbin-Watson stat	1.939608		

Source:Author's computation using EViews software

3.4.**Gjr-GARCH**

Dependent Variable: STOCK_RETURN
Method: ML ARCH - Normal distribution (Marquardt / EViews legacy)
Date: 01/12/24 Time: 13:42
Sample (adjusted): 1/06/2020 12/29/2021
Included observations: 482 after adjustments
Convergence achieved after 6 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	2.50E-06	1.72E-06	1.449534	0.1472
STOCK_RETURN(-1)	0.991123	0.005646	175.5306	0.0000
AR(1)	0.005000	0.053183	0.094014	0.9251
Variance Equation				
C	2.47E-12	4.70E-13	5.248225	0.0000
RESID(-1)^2	0.150000	0.015888	9.441336	0.0000
GARCH(-1)	0.600000	0.045587	13.16151	0.0000

R-squared	0.982043	Mean dependent var	0.000302
Adjusted R-squared	0.981968	S.D. dependent var	2.63E-05
S.E. of regression	3.54E-06	Akaike info criterion	-22.43030
Sum squared resid	5.99E-09	Schwarz criterion	-22.37829
Log likelihood	5411.702	Hannan-Quinn criter.	-22.40986
Durbin-Watson stat	1.949916		

Source:Author's computation using EViews software

The GARCH Model results reveals the mean equation with the average stock return of 0.00000249 and its past value of the stock return, which significantly predicts the current value of stock by 0.9911. The variance equation shows that the coefficients of the constant variance term, the ARCH, and the GARCH parameters are positive and statistically significant. The GARCH time varies with a constant of 0.0000000000246 and a past value of 0.6 with a residual error of 0.15. This clearly establishes the time-varying conditional volatility of the stock return, and the result also suggests that the presence of volatility stocks as represented by ARCH and GARCH parameters is large, which means that the effect of today's shock remains in the forecast of variance for many periods in the future. This can be attributed to the cases of the COVID-19 pandemic, where there is a total lockdown in the country and all business activities are practically crippled, indicating that investors are not advised to invest at that time to avoid losses due to the presence of volatility caused by the COVID-19 pandemic era.

3.5.Granger Causality test

Pairwise Granger Causality Tests
Date: 01/12/24 Time: 12:12
Sample: 1/02/2020 12/29/2021
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
TRADING_VOLUME does not Granger Cause STOCK_RETURN	482	0.12925	0.8788
STOCK_RETURN does not Granger Cause TRADING_VOLUME		11.6904	1.E-05

Source:Author's computation using EViews software

The greater causality demonstrated here is that stock results have a major effect on volume of trading. This implies that stock returns have a strong causal effect on volume of trading

3.6.Johansen Cointegration test

Date: 01/12/24 Time: 13:43
Sample (adjusted): 1/06/2020 12/29/2021
Included observations: 482 after adjustments
Trend assumption: Linear deterministic trend
Series: STOCK_RETURN
TRADING_VOLUME
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.042477	23.12893	15.49471	0.0029
At most 1	0.004570	2.207680	3.841466	0.1373

Source:Author's computation using EViews software

The Johansen cointegration shows that one of the cointegrating equations (None*) is statistically significant at the 1% level, implying that there is a presence of cointegration among the series, suggesting that between volume of trading and stock return there is a long-run relationship.

Conclusion:

The study includes daily data during the pandemic of COVID-19 on the composite index of the Shanghai stock exchange (SSE) from March 1, 2020, to March 29, 2021. Based on the data analyzed and the findings of the study, the researchers deduced the following conclusions:

1. According to the positive skewness at the leptokurtic level, indicating the presence of volatility in the stock return during the period under study,
2. The unit root results imply that the stock return and volume of trading become stationary after the first difference, or we can say it is integrated of order 1, as the P-value is less than 0.05 after the first difference of the stock return series.
3. The GARCH Model results reveal that the GARCH parameters are positive and statistically significant. The GARCH time varies with a constant, which clearly establishes the time-varying conditional volatility of the stock return. The result also suggests that the presence of volatile stocks as represented by ARCH and GARCH parameters is large, which means that the effect of today's shock remains in the forecast of variance for many periods in the future. This can be attributed to the cases of the COVID-19 pandemic, where there is a total lockdown in the country and all business activities were practically crippled, indicating that investors are not advised to invest at that time to avoid losses due to the presence of volatility caused by the COVID-19 pandemic era.
4. The greater causality demonstrated here that stock returns have an extensive effect on volume of trading. This signifies that stock returns have a strong causal effect on volume of trading. In other words, the return provides information on the predictive strength of potential volume of trading in the Shanghai stock market.
5. The Johansen cointegration shows that there is a presence of cointegration in the series, suggesting that there is a long-run relationship between the stock return and the volume of trading.

Investors In this circumstance,should not to rush and to carefully consider the relationship between the stock return and volume of trading when making investment decisions in the Shanghai market in order to avoid losses attributed by crisis.

References :

Al-Jafari, M. K., & Tliti, A. (2013). An Empirical Investigation of the Relationship between Stock Return and Trading Volume: Evidence from the Jordanian Banking Sector. Journal of Applied Finance & Banking, 3(3), 1–4.

Campbell, John Y., Sanford J. Grossman, and Jiang Wang. 1993. Trading volume and serial correlation in stock returns. Quarterly Journal of Economics 108, no. 4: 905-939.

Choi, K.-H., Kang, S. H., & Yoon, S.-M. (2013). Relationship between Stock Returns and Trading Volume: Domestic and Cross-Country Evidence in Asian Stock Markets. International Conference on Economics and Business Administration (pp. 33-39). BUSAN: the National Research Foundation of Korea Grant funded by the Korean.

Clark, P., 1973, A subordinated stochastic process model with finite variances for speculative prices, Econometrica 41, 135–155.

Engle, R. GARCH 101: An Introduction to the Use of ARCH/GARCH models in Applied. New York, Stern School of business , America.

Epps, T., and M. Epps, 1976, The stochastic dependence of security price changes and transaction volumes: Implications for the mixture of distributions hypothesis, Econometrica 44, 305–321.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. Journal of Finance, 25(2), 383-417.

Grammatikos, T., Saunders, A., & Swary, I. (1986). Returns and risks of US bank foreign currency activities. The Journal of Finance, 41(3), 671-682.

Harris, L. (1986). A transaction data study of weekly and intradaily patterns in stock returns. Journal of financial economics, 16(1), 99-117.

Hussain, S. (2014). Analysis of Relationship between Stock Return, Trade Volume and Volatility: Evidences from the Banking Sector of Pakistani Market. European Journal of Business and Management, 6, 57-61.

Karpoff, J. M. (1987). The Relation between Price Changes and Trading Volume: A survey. Journal of Financial and Quantitative analysis , 22 (1), 109- 126.

Samman, H. A., & Al-Jafari, M. K. (2015). Trading Volume and Stock Returns Volatility: Evidence from Industrial Firms of Oman. Asian Social Science, 11(24).

Shie, Fu Shuen; Lin, Jun Cheng. International Research Journal of Applied Finance; Hyderabad Vol. 6, Iss. 4, (2015): 366-393

Tauchen, G.E. and Pitts, M. (1983) The Price Variability-Volume Relationship on Speculative Markets. Econometrica, 51, 485-505.

Wang, P., Wang, P., & Liu, A. (2005). Stock return volatility and trading volume: evidence from the chinese stock market. Journal of Chinese Economic and Business Studies, 3(1), 39–54.