Trade Volume and Returns in Emerging Stock Markets An Empirical Study: The Egyptian Market

Dr. N. M. HABIB
University of Maryland Eastern Shore
Princess Anne, MD 21853
United States of America

Abstract

The Paper investigates the joint dynamics of stock returns and trading volume in a small emerging financial market, i.e., the Egyptian Securities Exchange (ESE). The researcher is interested in the power of stock trading volume in predicting future return volatility and autocorrelations. The main theme of the study is twofold: First; testing the contemporaneous relationship between volume and volatility, using OLS and GARCH models. Second; investigating the dynamic (causal) relationship between trading volume and stock returns, to determine whether information about trading volume is useful in improving forecasts of price changes (returns) and return volatility. There are two related types of theories that explain the volatility-volume relationship: information theories and dispersion of beliefs theories. The main idea of the paper contradicts the efficient market hypothesis (EMH), which implies that the volume should not have any predictive power.

The study is divided into five sections. Section one is an introduction that relates the study to the existing literature. The second section deals with the theoretical framework of the role of trading volume and its relationships with volatility. The third section is a review of the different approaches to the existing empirical work and a short summary of the empirical evidence. As to the fourth section, it presents the methodology used in the study: regression analysis using, first the ordinary least square (OLS) method, second using GARCH model to take care of any problems related to autocorrelation or heteroscedastisity. This section also introduces the relevant model used to test for causality relationship between volume and return, which is Granger causality. The last section contains the regression results and the conclusion.

The study documents empirical tests on the relationships between stock return and trading volume in a small emerging stock market (The Egyptian Stock Exchange) during the period 1998-2005. Its findings establish several regularities about the role of trading volume in predicting the volatility of return and return itself. The main conclusion is that the lagged stock trading volume has a little role to play in forecasting the future return volatility. The second finding relates to the predictability of returns. The analysis suggests that there is no relation between volume and first autocorrelation of stock return. Third, the Granger causality tests indicate a bidirectional causal relation between volume and volatility. Specifically, any change in return volatility leads to a change in trading volume and vice versa. However no such inference can be made about the causal relation between return and volume.

1. Introduction

For several years there has been a continuing controversy related to what extent can the past history of the common stock prices be used to reach a meaningful prediction concerning the future prices of common stocks? The extent of this effect can be approached either at the theoretical or technical levels. The theory of random walk indicates that successive price changes are independent and occur randomly. Most of the early work related to efficient capital markets was based on the random walk hypothesis. In its weak form, The *Efficient Market Hypothesis* is based on the notion that security prices adjust rapidly to the arrival of new information and, therefore, the current price of securities fully reflect all historical information. If the market is efficient, then it should not be possible to profit by trading on the information contained in the asset's price history. There are two formulations for tests the efficient of stock market: First; autocorrelation tests of independence which measure the significance of a positive or negative correlation in return over time. Those who believe in the efficiency of capital markets would expect insignificant correlations. Second; volatility tests, market efficiency implies restrictions on the volatility of stock prices so that the volatility of dividends constitutes an upper bound on volatility of stock prices. These tests are widely accepted as evidence against the efficient market hypothesis.

It has been widely documented that high frequency stock index returns are positively correlated. Moreover, LeRoy& porter (1981) & Shiller (1981) present considerable evidence that the variance bound is violated . These facts have led many researchers to belief that prices must be moved by waves of speculative optimism and pessimism beyond what is reasonably justified. The technical approach to investment is essentially a reflection of the idea that stock prices move in trends of hopes, fears, knowledge, and optimism, pessimism. The basic premise of technical analysis can be illustrated by figure No. (1)

Technicians' view of price adjustments to new information

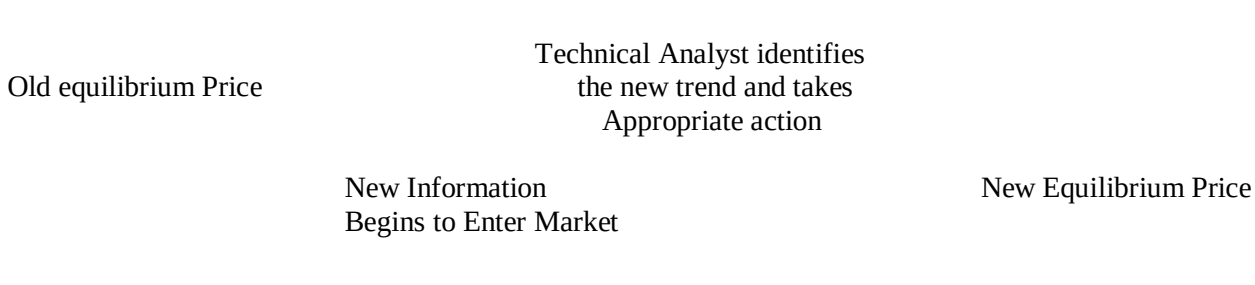

Figure No. (1)

The figure shows that stock prices move in trends that persist for long periods because information that affects supply and demand does not come to the market at one point in time, but rather enters the market over a period of time. Therefore, technicians expect a gradual price adjustment to reflect the gradual flow of information, which causes trends in stock price movements. This view is in sharp contrast to the efficient market hypothesis, which contends that past performance has no influence on future performance [Reily (2003)].

Since trends of investor confidence are responsible for price movements, this emotional aspect will be examined in the current study from two points of view, namely: *Price & Volume*. Changes in stock prices reflect changes in investor attitude, and "price" indicates the level of that change, while "volume" reflects the intensity of changes in investor attitudes, and "price" indicate the level of that change, While volume" reflects the intensity of changes in investor attitudes The current study aims to investigate the joint dynamics of stock returns and trading volume in a small emerging market (The Egyptian Securities Exchange). It is interested in the power of stock trading volume in predicting future return volatility and autocorrelations. The main theme is twofold: First testing the contemporaneous and lagged relationship between volume and volatility. Second investigating the relationship between volume and return autocorrelation, to determine whether information about trading volume is useful in improving forecasts of price changes (i.e., returns).

2. Theoretical Framework

There are three hypotheses provided by the theoretical work which explains the role of trading volume:

a) Strong Positive contemporaneous relationship between volume and volatility:

This relationship is understood through two main hypotheses which explain the information arrival process to the financial markets. First; the "Sequential Information Arrival hypothesis" in which new information flows into the market and is disseminated to investors one at a time. This pattern of information arrival produces a sequence of momentary equilibriums consisting of various stock price-volume combinations before a final equilibrium is achieved[1] . Second; the "Mixture of Distributions Hypothesis "(MDH) which implies that both variables should be positively correlated as a sequence of their joint dependence on a common underlying mixing variable that affects contemporaneous volatility, volume, and[2] the rate of information flow.

[1] Copeland 1976, Jennings and Barry1983

[2] Clark 1973, Epps & Epps 1976, and Tauchen and Pitts 1983. See Anderson1996 for some modification of this model.

Anderson develops a modification to the standard MDH, The main difference lies in the volume specification, due to an accommodation of noise component of trading as well as the Poisson, rather than normal, approximation to the underlying distribution that derives trading volume The contemporaneous relation is derived from a theoretical framework in which informational asymmetries and noise motivate trade in response to the arrival of new information. The dynamic features of the joint system are governed by a random mixed variable representing the rate of information flow.

b) Lagged relationship between volume and volatility:

The theory of "Dispersion of Beliefs" represents another strand of the literature, which argues that the current trading volume should dictate the intensity of future return volatility. This theory associates unusual and extremes of volatility to differences in trader's beliefs. This can arise either because traders simply interpret commonly known data differently, or because they have different private information. Such behavior is consistent with the noise literature, which is contrasted with the information literature. Clearly, noise-trading models contradict informational trading hypothesis, which implies that information about fundamentals is rapidly impounded in stock price. Thus, data of previous period has no value in predicting current prices[3].

a) Current trading volume should dictate the intensity and direction of future return autocorrelations:

Although there have been controversial findings regarding whether the relation between volume and return autocorrelations is positive or negative, it has been well documented that past trading volume interacts with past returns in the prediction of future stock returns.[4]Specifically, Campell et al. (1993) demonstrate that large trading volume induces negative return autocorrelations when the primary motive for trading is liquidity. Wang (1994) on the other hand shows that these autocorrelations will be positive if speculation is the main motive.

3. Empirical Evidence

There are two strands of empirical studies: One strand documents the positive relation between volatility of stock returns and trading volume. The other strand focuses on the relation between volume and the serial correlation of stock returns. The idea behind this work is to first identify periods of large (positive or negative) price movements accompanied by large trading volume, and then look at subsequent price movements.

A review of empirical work reveals the following:

- Some researchers focused on the relationship between stock returns and volume, others studied the relationship between volume and return autocorrelation. A strong positive relationship between volume and volatility has been well documented. On the other hand, there are controversial findings regarding the relation between market volume and the serial correlation in stock returns.
- The use of Granger causality test in the linear causal relationships, while GARCH model is used to study the nonlinear relationships.
- Different studies used different measurements and definitions of the variables. For example stock[5] index; number of transactions[6], the number of shares traded[7], and turnover are all have been used as a measure of volume. Volatility has been measured by absolute price change, variance of price change, squared of price change, square of return, standard deviation, and conditional variance based on GARCH[8].
- Different return definitions were used; some studies used composite index as well as individual stocks[9].

[3] See Harris & Raviv (1973).
[4]Campbell et al. (1993) documented negative autocorrelation if the motive for trading is liquidity. While Wang (1994) documented positive autocorrelation if the motive is speculation.
[5] See for example, Lee and Rui (2002)
[6] Conrad et al.(1994)
[7] Gervais et al.(2001)
[8] See Copland (1967), Tauchen and Pitts (1983), Epps and Epps (1976), and Lamoireux & Asrtapes (1990).
[9] See Brooks (1998) and Scott et al. (2003).

Most of the studies were concerned with developed markets especially US, and small number dealt with emerging markets[10]. The latter concluded that this set of emerging markets with different institutions and information flows, than the developed markets, do not always present similar relation to those studies employing US data. For this reason, it is important to investigate the joint dynamics of stock return-volume relationship for the Egyptian Securities Exchange as one of the emerging markets.

4. Methodology

This study will be confined of testing the three hypotheses stated previously by using regression analysis and causality tests. However it is important to distinguish between regression analysis and causality tests. The former is used to measure the strength of the relationship among variables, while the later examines whether lagged values in one variable help to explain current values of another variable.

4.1: Data used in the study:

The data set5 comprises daily closing prices and volume data for individual stocks in the Egyptian Securities Exchange (ESE). The sample consists only of the continuously heavily traded shares because the actively traded stocks are most likely to have sufficiently large number of information arrivals per day. Specifically, the sample data consists of the 26 most active stocks in terms of volume traded on the ESE over the period of the study, which is confined to seven years from January 1998 through January 2005.

Daily stock returns (rit) are determined as the logarithmic first difference of the stock price (rit) = (Log Pit - Log Pit-1), where (Pit) denotes the daily price of the stock at day t.

The daily trading volume (vit) use is the logarithmic turnover, which is defined as the logarithmic the ratio of the number of shares traded to the number of shares outstanding. The reasons for using turnover as a volume measure are 1) it isolates the effect of the firm size from trading volume, since raw trading volume and pound trading volume are highly correlated with firm size. 2) The use of turnover helps to reduce the low frequency variation in the series, since the number of shares outstanding and the number of shares traded have both grown steadily overtime.

Working with natural logarithms of prices and trading volume series, we examined if any of these two has a unit root. A fundamental problem might arise here is that one or both series might be non-stationary. The stationarity of the data is investigated first before testing any relationship to avoid spurious results associated with the use of non-stationary variables.

4.2: Regression Analysis:

First: Ordinary least Square (OLS)

a) Testing the contemporaneous and lagged relationship between trading volume and return volatility

The main issue here is to investigate the contemporaneous first hypothesis and the lagged relationship (second hypothesis) between trading volumes and return volatility using the following model:

$$\sigma^2_{it} = \beta_0 + \beta_1 V_{it} + \beta_2 V_{it-1} + \varepsilon_{it} \ldots\ldots (1)$$

This model shows that the daily return volatility (σ^2_{it}) measured by the variance, as a dependent variable is a function of the trading volume (V_{it}) in the same day and the previous day (V_{it-1}) as independent variables

b) Testing the relationship between trading volume and autocorrelation:
To investigate the relation between volume and the first autocorrelation of returns, the current stock return (rit) is regressed on lagged stock return (rit-1) interacted not only with lagged volume (vit-1) but also with the lagged volume squared (v^2_{it-1}) as follows:

$$r_{it} = \propto_0 + (\propto_1 V_{it-1} + \propto_2 V^2_{it-1})\, r_{it-1} + \varepsilon_{it} \ldots\ldots (2)$$

Second: GARCH model

[10] Arrif &Lee (1994)studied Singapore equity market, Al–laughan(2002) Studied Kuwait

The classical OLS method is based on, among others, on two main assumptions: First; the disturbances in the regression function are homoscedastic; that is, they all have the same variance, Second; there is no autocorrelation among the disturbances. In case of violating these assumptions, the usual OLS estimators, although still unbiased, are no longer minimum variance or efficient among all linear unbiased estimators. In short, they are no longer BLUE.

The common practice in such cases is to use the ARCH and GARCH models. (ARCH stands for Autoregressive Conditionally Hetroscedasticity, & GRACH is Generalized ATCH). In the ARCH model the conditional variance is a linear function of lagged squared residuals,. GARCH model allows the conditional variance to be dependent on the last period's conditional variance. To capture any serial correlation and hetroscedasticity of return volatility in the Egyptian market, GRACH model will be used here to reexamine the hypotheses of the study. For testing the contemporaneous and lagged relationship between trading volume and return volatility. The following GRACH model can be estimated

$r_{it} = \propto 0 + \propto 1 \mathcal{E}_{it-1} + \mathcal{E}_{it}$,
$\mathcal{E}_{it} / (\mathcal{E}_{it-1}, \mathcal{E}_{it-2} \ldots\ldots\ldots) \ldots \sim N(0, \sigma^2_{it})$
$\sigma^2_{it} = \beta_0 + \beta_1 \mathcal{E}^2_{it-1} + \beta_2 \sigma^2_{it-1} + \beta_3 V_{it} + \beta_4 V_{it-1} \ldots\ldots\ldots\ldots$ (3)

Where (σ^2_{it}) is a function of five terms:

Constant (β_0), ARCH term $(\mathcal{E}_{it-1})$, GARCH term (σ^2_{it-1}), Contemporaneous volume (V_{it}), and the Lagged volume (V_{it-1}). Only up to one lag is likely to have the largest effect upon the current value of volatility. To test the relationship between trading volume and return autocorrelation using a modification should be done to equation (3) which is excluding the contemporaneous and lagged variables from the volatility equation, and incorporating the lagged volume into the return equation. Specifically, the current stock return (r_{it}) is a function of lagged stock return (r_{it-1}) interacted with lagged stock volume (v_{it-1}) and lagged squared Volume (v^2_{it-1}) as follows:

$r_{it} = \propto 0 + (\propto 1 V_{it-1} + \propto 2 V^2_{it-1}) r_{it} + \propto 3 \mathcal{E}_{it-1} + \mathcal{E}_{it}$
$\mathcal{E}_{it} / (\mathcal{E}_{it-1}, \mathcal{E}_{it-2} \ldots) \sim N(0, \sigma^2_{it})$
$\sigma^2_{it} = \beta_0 + \beta_1 \mathcal{E}^2_{it-1} + \beta_2 \sigma^2_{it-1} \ldots.$ (4)

5. Causality Tests

The linear causal relationships between volume, return volatility and return itself will be investigated here by means of Granger causality as follows:

$$\sigma^2_{it} = \propto 0 + \sum_{i=1}^{i} \propto i \, \sigma^2_{it-1} + \sum_{j=1}^{j} \beta_j V_{t-j} + e_t \ldots\ldots\ldots (5)$$

$$V_{it} = \prec_0 + \sum_{i=1}^{1} \prec_i V_{t-1} + \sum_{j=1}^{j} \delta_j \sigma^2_{it-j} + e_t \ldots\ldots (6)$$

Where, (Q^2_{it}) is the return volatility for day t as measured simply by the variance day's return, and v_t is the trading volume in day t.

The test for causality is based on a standard F-statistic. If the F-test determines that the coefficients of lagged trading volume $(B_j{}^{'s})$ are jointly significant, then volume does cause volatility. Similarly, in the second equation, the null hypothesis that volatility doesn't cause volume is rejected when the coefficients of lagged volatility $(b_j{}^{'s})$ are jointly significant. If both $(b_j{}^{'s})$ and (B) are different from zero, there is feedback relation (i.e., bidirectional causality) between volume and volatility. As a result, the "Sequential Information Arrival Hypothesis " will be accepted and the " Mixture of Distributions Hypothesis "will be rejected, indicating that information arrival to investors tends to follow a sequential rather than simultaneous process. In order to test whether there is a lagged causal relationship running in either direction between volume and return itself, not volatility, granger causality test will be used again here with one modification which is introducing the return variable (r_{it}) instead of the volatility variable as follows:

$$r_{it} = \propto_0 + \sum_{j=1}^{j} \propto_i r^2_{it-1} + \sum_{j=1}^{j} \beta_j V_{t-j} + \varepsilon_t \ldots.(7)$$

$$V_{it} = \lambda_0 + \sum_{i=1}^{i} \lambda_{jt-1} + \sum_{j=1}^{j} \delta_j r_{t-j} + e_t \ldots\ldots (8)$$

5.1 Estimation results using OLS

a) The first hypothesis: The first hypothesis focuses on the contemporaneous relationship between volume and volatility. Table (1) in Appendix illustrates the results through equation (1) which shows that all of the coefficient values is almost negative in all stocks of the sample, which contradicts the implication of the hypothesis of information trading in addition to the empirical results of previous studies.

b) The second hypothesis: Here we examine to what extent it is possible to forecast the return volatility using historical data not only on volatility but also on trading volume. Proving this can be viewed again as a test against the informational efficiency for the Egyptian market, and consists with the dispersion of beliefs theory explained before. By looking again at the figures in Table (1), it is clear that the coefficient of regressing volatility on lagged volume is almost negative and insignificant in all the firms in the sample which contradicts the implications of the hypothesis of information trading.

c) The third hypothesis: This hypothesis concentrates on the power of volume data in predicting stock return itself in the future, not volatility. The results in table (2)reveal that the correlation between trading volume and return persistence in not always negative, as found in Campell et al. (1993) or always positive as found Morse et al. (1980) and Wang (1994).Furthermore, the coefficients of regressing current stock return on lagged return interacted with lagged volume and squared lagged volume are highly insignificant . In addition, the t-statistics of these coefficient s are small, which implies that the effect of trading volume on the autocorrelation of returns, if any, is extremely small.

5.2 Estimation results using GRACH:

a) The first hypothesis: When the trading volume is incorporated into the volatility equation, it has been found as shown in table (3) that the coefficient of regressing volatility on contemporaneous trading volume (B3) is almost positive and highly significant. Therefore, there exists a positive contemporaneous relationship between trading volume and return volatility. This phenomenon confirms the prediction of the mixture of distribution hypothesis and sequential information hypothesis. However all of these coefficients are extremely small so that which imply that the volatility of returns in not totally explained by volume.

b) The objective here is to examine the effects of using lagged volume as a predictor for volatility. The results show that lagged volume might contain prediction ability of tomorrow's stock return volatility. More precisely, all the parameter estimates on volume (B4) are positive and statistically significant. In spite of this, all values of these coefficients are again extremely small. The main conclusion from this observation is that lagged stock trading volume has a very minor role to play in predicting volatility. Volatility of returns is not totally explained by trading volume.

c) The third hypothesis: It is important now to make sure whether there is really no relation between volume and return as implied by estimating the OLS model equation (2) , or there is a problem in such estimation since the assumptions of autocorrelation and homoscedasticity are not satisfied. To this end the results of using GRACH model are reveal that the t-statistics are higher. However, the coefficients of regressing current return on lagged return interacted with lagged volume and lagged squared volume are once again highly insignificant. Thus it may be suitable to conclude now that these results support other studies which find no relation between volume and first autocorrelation of stock return.

5.2 Causality test results

a) The results of estimating the causal relation between volume and volatility. The direction of this causal relation through finding the values of F_1 and F_2. It is worthy to note that F_1represents a test of the null hypothesis which assumes that there is no causal relation from volume to volatility.

b) This hypothesis is rejected if the value of $F_1$is significant, meaning that volume causes volatility. Conversely, F_2 tests the null hypothesis which says that there is no causal relation from volatility to volume. Rejecting this hypothesis occurs if F_2 reaches a significant value, leading to a conclusion that the past (current) changes in the values of return volatility leads to current (future) changes in the values of trading volume. Table (6) shows the results of testing the causal relation between volume and volatility through Grange causality tests. These results show that F_1 is significant in 19 stocks, and the significance of F_2 in 13 stocks, which means that there is a bidirectional causal relation between volume and volatility. Specifically, any change in return volatility leads to changes in trading volume, and vice versa.

c) The results of estimating the causal relation between trading volume and return: This relation has been tested through estimating equations (7) & (8) and finding the values of F3 and F4. F3 tests the null hypothesis which assumes that there is no causal relation from volume to return, while F4 tests the null hypothesis which says that there is no causal relation from return to volume. Both hypotheses are rejected if the value of F3 and F4 are significant. The figures in table 7 document that all the values of F3 and F4 are insignificant. This means that the availability of historical trading volume data can't be used in the forecasting of future levels of return and vice versa. These results seem to be consistent with the results of the regression analysis using both OLS and GRACH, which lead us to conclude there is no relation between volume and return.

Conclusion

The study documented empirical tests on the relationships between stock return and trading volume in a small emerging financial market. Using data from The Egyptian Stock Exchange (ESE) during the period 1998 – 2005 we examined the previous relations. After testing the data for stationarity, our analysis established several regularities about the role of trading volume in predicting the volatility of stock return and return itself. The main conclusion is that lagged stock trading has little role to play in forecasting the future return volatility. The second finding of the paper relates to the predictability of returns. The analysis suggests that there is no relation between volume and first autocorrelation of stock return. Third the Granger causality tests indicate a bidirectional causal relation between volume and volatility. Specifically, any changes in return volatility leads to changes in trading volume, and vice versa. However, no such inference can be made for the case of the causal relation between return and volume.

References

Akgiray, V., "Conditional Hetreoskedasticity in Time Series of Stock returns: Evidence and Forecasts," Journal of Business, 62 (1989).

Al-Loughnai, N. " An Empirical Investigation of the Relationship between Return and Trading Volume in Palastine Securities Exchange" Working Paper (2002).

Arrif, M. and D.K.C. Lee "Share –Price-Changes-volume Relation on Singapore Equity Market." Applied Financial Economics, (1993)".

Anderson, T, G, "Return Volatility and Trading Volume: An Information Flow Interpretation of Stocastic Volatility." Journal of Finance (1996).

Bollerslev, T. "Generalized Autoregressive Conditional Hetreoskedasity." Journal of Econometrics, July (1972).

Brooks. C. "Predicting Stock Index Volatility: Can Market Volume Help?, Journal of Forecasting (1998).

Campell, J. Y.; A. W. Lo and A. C. Mackinaly: "The econometrics of Financial Markets" Princeton University Press.

Campell, J. Y. ; Grossman S. J. and Wang, J. " Trading Volume and Serial Correlation in Stock Returns." Quarterly Journal of Economics, (1993).

Clark,P. K. " A Subordinated Stocastic Process Model with Finite Variance for Speculative Prices." Economitrica (1973

Conrad. J. S.; A. Hameed, and C. Niden " Volume and Autocovariances in Short Horizon Individual Security Returns." Journal of Finance (1994).

Copeland, Y.E. " A m\Model of Asset Trading under the Assumption of Sequential Information Arrival." Journalm of Finance (1976).

Edwards, R.,; and Magee : Technical Analysis of Stock Trends." John Magee, Boston (1966).

Engle, R. "Autoregressive Conditional Hetreoskedasti ity with estimates of Variance of United Kingdom Inflation." Economitrica, (1982).

Epps, T. W. and Epps, M. L. "The Stocastic Dependence of Security Price Changes and Transaction Volumes: Theory and Evidence. American Economic Review 1975).

----------"The Stocastic Dependence of Security Price Changes and Transaction Volumes: Implication of Distributions Hypothesis" Econometrica (1976).

Hiemstra, C., and Jones, J. D. " Testing for Linear and Nonlinear Granger Causality in stock Price Volume Relation" Journal of Finance (1994).

Reily, F. K. "Investment Analysis and Portfolio Management." The Dryden Press, (2003)

Gervais, S.; R. Kaniel; and D. H. Mingelgrin "The High Volume Return Premium." Journal of Finance (2001).

Morse, D. "Price and Trading Volume Reaction Surrounding Earnings Announcements: Journal of Accounting Research (1981).

Jennings, R. H., and C. Barry "Information Dissemination and Portfolio Choice". Journal of Financial and Quantitative Analysis (1983).

Jennings; R. H. L. T. Starks; and J.C. Fellingham "An Equilibrium Model of Asset Trading with Sequential Information Arrival."Journal of Finance (1981).

Lee, C. M. C.; and B. Swaminathan "Price Momentum and Trading Volume."Journal of Finance (2000)

Lee, B.; and O. M. Rui " The Dynamic Relationship between Stock Returns and Trading Voume" Journal of Banking and Finance (2002).

Tauchen G.; and M. Pitts "The Price Variability-Volume relationship on Speculative Markets." Econometrica (1983).

Wang, J. "A Model of Competitive Stock Trading Volume." Journal of Political Economy. (1994).

Estimating the relation between stock trading volume and return volatility OLS. Table(1)

$\sigma^2_{it} = \beta_0 + \beta_1 V_{it} + \beta_2 V_{it-1} + \varepsilon_{it}$

Company Name	β0	t-	β_1	t-statistic	B_2	t-statistic
1 - Madinet Nasr Housing	0.00063	72.63*	-9.39E-06	1.62	-7.02E-06	- 1.21
2- El-Kahera Housing	0.00064	78.35*	-1.43E-05	-1.89	-576E-06	-0.76
3- Electrical Cables	0.00055	63.67*	-2.75-E05	-3.37*	-1.49-E05	-1.82
4-Orascom construction	0.00171	2.75*	-0.000677	-1.47	-.000185	-0.40
5-Misr Baniswf Cement	0.00057	61.68*	-45E06	-0.15	-1.89E06	-0.19
6- Misr Cement (Qena)	0.00042	58.99*	0.000127	0.35*	-0.000676	-1.86**
7-Torah Cement	0.00041	61.52*	-1.51E-05	-2.82**	-8.82E05	-1.64
8-Sues Cement	0.00042	58.99*	0.000127	0.35*	-0.000676	-1.86*
9-El Ezz Steel	0.00076	99.27*	-1.44E-05	-1.95	-1.03E05	-1.39
10-aic	0.00077	86.49*	-4.43E-05	-0.67	-1.13E-05	-1.72
11-Orascon Telecom	0.00078	71.03*	-3.31E-05	-2.44**	-1.78E-05	-1.31
12-Mobinil	0.00070	24.38*	-7.59E-05	-2.31**	-6.65E-05	-2.03**
13-Media Prod. City	0.00118	11.25*	-0.000224	-1.81	-7.32E-05	-0.59
14-Eastern Tobacco	0.00035	55.73*	-5.07E-06	-1.51	2.32E-06	-0.96
15-CIB	0.00724	16.45*	-0.000454	-0.95	-0.000231	-0.48
16-MiBank	0.00055	33.44*	-3.32E-05	-2.57*	-139E-05	-1.08
17-EAB	0.00053	70.01*	-1.44E-05	-2.72	-2.79E-06	-0.52
18-Olympic Group	0.00075	70.95*	-2.55E-06	-0.46	-6.31E-07	-0.11
19-NSGB	0.00047	67.85*	-5.82E-06	-1.43	-1.93E-06	-0.47
20-EFG-Hermes	0.000105	74.35*	-6.42E06	- 0.60	4.56E-07	0.04
21-EIPICO	0.00025	45.68*	-2.87E06	-0.91	4.66E-08	0.01
22-PACHIN	0.00048	52.41*	-2.11E-05	-2.76*	-1.12E-05	-1.46
23-Chemical Industries	0.00066	67.55*	-3.12E-05	-3.08*	-1.67E-05	-1.65
24-Abo Kir Fertilizers	09.00034	38.41*	5.41E-07	0.07	-3.84E-06	-0.55
25-Arab Polvara	0.00057	32.54*	-2.70E-05	1.17	-1.89E-05	0.82
26-Oriental Wavers	0.00053	62.49	4.76E-06	1.09	5.89E-06	1.35

Estimating the relationship between trading volume and return autocorrelation: OLS Table (2)

$r_{it} = \alpha_0 + (\alpha_1 \ v_{it-1} + \alpha_2 v^2_{it-1}) r_{it-1} + \varepsilon_{it}$

Company Name	α_0	t-statistic	α_1	t-statistic	α_2	t-statistic
Madinet Nasr Housing	0.00063	72.63*	-9.39E-06	-1.62	-7 02E-06	-1.21
El Kahera Housing	0.00064	79.35	-1.43E-05	-1.89**	-5.76E-06	-0.75
Electrical Cable	-0.00073	-1.30	-0.07483	-3.68*	0.03978	5.30*
Orascom Construction	0.00083	1.29	-0.00521	-0.43	0.00435	0.84
Misr Baniswef Cement	0.00085	1.27	-0.00530	- 0.25	0.02203	3.98
Misr Cement (Qena)	0.00084	1.40	0.01072	0.41	0.03134	3.23
Toura Cement	0.00067	1.34	-0.07545	-4.88	0.01067	2.89
Seuz Cement	-0.00072	-1.32	2.13272	3.15	15.74290	2.01
El Ezz Steel	0.00030	0.39	-0.05012	- 2.39	0.03708	6.17
aic	-0.00123	- 1.66	-0.07194	-4.82	0.01788	6.03
Orascom Telecom	0.00052	0.60	-0.03206	-0.96	0.03543	2.69
MobiNil	0.00078	1.15	-0.01572	-0.62	0.02663	2.63
Media Production City	-0.00148	-1.61	0.07389	3.64	0.09630	12.24
Eastern Tobacco	0.00029	0.63	0.01161	0.93	0.00902	3.03
CIB	-6.52E-05	-0.13	0.10221	4.29	0.04288	4.70
MiBank	-0.00022	-0.41	0.04979	2.70	0.00073	0.11
EAB	-1.6E-05	-0.02	0.01325	1.01	0.02377	6.90
Olympic Group	0.00051	0.70	-0.00800	-0.68	0.00846	3.61
NSGB	0.00065	1.21	0.00079	0.059	-0.00151	-0.42
EFC-Hermes	-0.00065	-0.62	-0.01449	-0.71	0.02420	4.66
EIPICO	4.41E-05	0.11	0.01522	1.16	-0.00124	-0.38
PACHIN	-0.00018	-0.35	0.03751	2.10	0.01443	2.51
Chemical Industries	0.00020	0.33	-0.08427	-3.90	0.03269	4.31
Abou Kir Fertilizers	2.22E-06	0.01	0.00974	0.68	0.00703	1.72
Arab Polvara	0.00156	1.69	-0.03282	-0.92	0.06141	5.44
Oriental Weavers	0.00088	1.49	0.04188	3.59	-0.00099	-0.34

Estimates of GRACH Model with Contemporaneous and Lagged Volume Table (3)

$\sigma^2_{it} = \beta_0 + \beta_1 \varepsilon^2_{it-1} + \beta_2 \sigma^2_{it-1} + \beta_3 V_{it} + \beta_4 V_{it-1}$

Company	β_1	z-value	B_2	z-value	β_3	z-value	B_4	z-value
Madenit Nasr	0.178	9.52	0.668	400.7	1.71E05	2.56	4.34E-05	4.83
El-Kahra housing	0.218	5,21	0.655	11.73	4.08E05	2.79	1.69E06	0.096
Electrical Cables	0.238	8.58	0.693	23.45	0.000158	9.56	0.000125	5.52
Orascom Const,	0.126	3.89	0.541	4.92	0.000100	7.37	8.19E05	3.08
M.B. Cement	0.286	6.44	0.420	8.42	5.13E05	6.41	0.000112	9.28
M. Cement	0.075	2.66	0.457	4.65	8.32E-05	20.50	4.83E-05	2.87
Torah Cement	0.095	4.70	0.456	4.09	4.97E-05	19.87	3.33E-05	3.29
Suez Cement	0.195	8.53	0.746	39.02	1.03E-05	4.87	-1.41E05	-3.90
El-Ezz Steel	0.095	4.70	0.456	4.09	4.97E-05	19.87	3.33E-05	3.29
aie	0.207	4.86	0.739	16.11	2.58E-05	5.14	-0.00027	-0.71
Orascom Telc.	0.098	6.31	0.515	9.82	0.000181	15.64	0.000133	9.82
MobiNil	0.20	0.79	0.427	3.30	9.55E-05	6.70	5.35E-05	1.56
Media Pro. City	0.238	8.58	0.693	23.45	0.000158	9.58	0.000125	5.52
Eastern Tobacco	0.119	5.10	0.492	6.06	3.65E-05	15.82	2.73E-05	4.85
CIB	0.226	10.41	0.570	16.08	3.86E-05	14.48	4.83E-05	17.54
MIBank	0.196	11.95	0.687	29.61	4.67E-05	16.13	4.76E-05	11.20
EAB	0.154	7.09	0.456	12.47	7.09E-05	21.15	5.54E-05	20.56
Olympic Group	0.161	5.95	0.774	25.02	3.65E-05	5.91	1.27E-05	1.89
NSGB	0.211	9.28	0.642	33.43	3.79E-05	8.79	-5.46E05	-.51
EFG-Herms	0.051	4.71	0.946	92.42	0.000148	7.28	2.73E050	0.92
EIPICO	0.146	12.30	0.794	90.88	1.66E-05	20.08	-907E-07	-0.81
PACHIN	0.233	7.35	0.630	13.37	3.09E05	18.19	2.35E-05	8.24
Chemical Ind.	0.275	5.94	0.624	12.47	4.91E-05	11.77	4.01E-05	4.23
Abou K. Fertilizers	0.325	11.36	0.508	16.25	-7.13E-06	-3.70	-1.27E-05	-6.70
Arab Polvara	0.174	4,97	0.766	20.27	5.75E-05	7.73	5.09E-05	3.32
Oriental Weavers	0.153	8.95	0.823	50.35	-2.68E-07	--0.08	-7.14E-06	-1.65

Trading Volume and the First Autocorrelation of Returns: GRACH. Table (4)

$r_{it} = \alpha_0 + (\alpha_1 v_{it-1} + \alpha_2 v^2_{it-1}) r_{it-1} + \alpha_3 \varepsilon_{it-1} + \varepsilon_{it}$ $\sigma_{it}^2 = \beta_0 + \beta_1 \varepsilon^2_{it-1} + \beta_2 \sigma^2_{it-1}$

Company name		t-statistic		t-statistic		t-statistic
Medinet Nasr	-0.0013	-2.41	0.015	1.04	-0.009	-1.64
El-Kahera Housing	-0.0009	-0.0009	-0.023	-1.34	0.012	2.04
Electrical Cables	-0.0009	-1.850	-0.049	-2.23	-0.004	-0.35[88]
Orascom Telecom	0.0005	0.86	0.005	0.30	-0.003	-0.53
Misr Benisuef Cement	-0.0001	-0.19	0.008	0.33	0.002	0.17
Misr Cement (Qena)	0.0003	0.81	0.003	0.08	0.005	0.34
Toura Cement	0.0002	0.49	-0.003	-2.09**	-0.003	-0.56
Suez Cement	-7.74E-05	-0.172	0.016	1.20	-15.777	-0.62
El-Ezz Steel	-8.82E-05	-0.10	-0.035	-1.63	0.012	1.67
aic	-0.0011	-1.42	-0.050	3.41*	0.003	0.79
Orascom Lelecom	0.0007	0.79	-0.041	-1.23	-0.001	-0.06
MobiNil	0.0013	1.92	-0.033	-1.22	-0.011	-1.24
Media Prod. City	-0.0015	-1.70	-0.002	-0.07	0.030	2.67*
Eastern Tobacco	-0.0001	-0.26	0.022	1.46	-0.001	-0.21
CIB	-0,0004	-0.82	0.096	3.24*	-0.002	-0.16
MIBank	-0.0015	-3.83	0.057	2.38*	-0.019	-1.81
EAB	-0.0002	-0.39	0.015	0.98	0.007	1.32
Olympic Group	7.17E-05	0.10	-0.003	-0.25	-0.000	-0.04
NSGB	6.17E-05	0.13	0.009	0.63	-0.002	-0.40
EFG-Herms	-0.0002	-0.26	-0.008	-0.45	0.007	1.23
EIPICO	-3.96E-06	-0.01	0.03	1.78	-0.002	-0.48
PACHIN	-0.0001	-0.27	0.033	1.63	-0.008	-1.21
Chemical Industries	-0.0004	-0.78	-0.044	-1.75	0.001	0.054
Abou – Kir Industries	-0.0003	-0.85	0.017	09.72	-0.007	-0.71
Arab Polvara	-0.0001	-0.12	-0,014	-0.29*	0.042	2.105
Oriental Weavers	o.0004	0.93	0.029	2.40	-0.003	-0.780

*Significant at 1% level

** Significant at 5% level- relationship between stock trading volume and return volatility: Granger Causality. Table (5)

Company Name	V $\longrightarrow$ σ^2		σ^2 $\longrightarrow$ V	
	F_1	Significant	F_2	Significant
Madinet Nasr Housing	4.236**	0.01462	3.719**	0.02446
El Kahera Housing	17.835*	2.2E-08	6.026*	0.00246
Electrical Cables	33.105*	7.8E-15	12.2982*	5.0E-06
Orascom Construction	0.822	0.4443971	1.02806	0.35797
Misr Bwnsisued Cement	1.801	0.16554	0.41523	0.66027
Misr Cement(Qena)	24.624*	3.4E-11	5.64532*	0.00364
Toeah Cement	17.888*	2.0E-08	5.6563*	0.00525
Sues Cement	3.391*	0.03389	1.74890	0.17428
El-Ezz-Steel	6.915*	0.00103	4.96763	0.00709
aie	13.272*	1.9E-06	0.96240	0.38221
Orascom Telecom	18.760*	9.7E-09	7.22035*	0.00077
MobiNil	1.879	0.15297	3.26287**	0.03854
Media Production City	10.799*	2.2E-05	6.94782*	0.00100
Eastern Tobacco	9.981*	4.9E-05	5.18068*	0.00572
CIB	1.260	0.28364	2.15880	0.11578
MIBank	8.444*	0.00022	2.34416	0.09624
EAB	10.613*	2.6E-05	4.77494*	0.00855
Olympic Group	1.834	0.25070	1.23526	0.29107
NSGB	7.741*	0.00045	2.73599	0.06513
EFG-Herms	6.631*	0.00138	0.66275	0.51566
EIPICO	6.071*	0.00236	0.26980	0.76356
PACHIN	11.827*	7.9E-06	5.58913*	0.00381
Chemical Industries	28.272*	8.3E-13	5.14599*	0.00591
Abou Kir Fertilizers	1.430	0.23940	0.48129	0.61807
Arab Polvera	2.136	0.11883	1.98800	0.13777
Oriental Weavera	0.698	0.49759	1.87697	0.15342

*Significant at 1% level
** Significant at 5% level

Casual Relationship between Stock Volume and return Volatility: Granger Causality: Table (6)

Company Name	V → r		r → V	
	F_1	Significant Level	F_2	Significant Level
Madinet Naser Housing	0.21793	0.80420	1.38523	0.25056
El Kahera Housing	2.04475	0.12973	7.68671*	0.00051
Electrical Cables	0.25758	13.9042*	13.9042*	1.0E-06
Orascom Comunication	1.41483	0.24331	1.38268	0.25124
Misr Benisuef Cement	2.48625	0.08361	7.00610*	0.00094
Misr Cement (Qena)	1.93931	0.14429	5.54453*	0.00402
Tourah Cement	5.99767*	0.00254	0.89885	0.40723
Suez Cement	3.62091**	0.02697	5.7769*	0.00341
El-Ezz Steel	3.04657**	0.04785	1.58784	0.20474
aie	3.92351**	0.01997	1.10442	0.33167
Orascom Telecom	1.37733	0.25269	0.17241	0.84166
MobiNil	4.65955*	0.00960	2.73766	0.06502
Media Production City	0.04725	0.95385	3.88005**	0.02089
Eastern Tobacco	3.36133**	0.03493	0.98586	0.37334
CIB	0.35643	0.70022	1.09158	0.33592
MIBank	4.13092**	0.01623	0.61201	0.54189
EAB	5.51829**	0.00408	4.30991**	0.01358
Olympic Group	0.30192	0.73943	0.81394	0.44332
NSGB	3.55897**	0.02869	0.80422	0.44761
EFG-Herms	2.22134	0.10900	0.82602	0.43809
EIPICO	2.08427	0.12474	0.76226	0.46678
PACHIN	2.16116	0.11550	3.46282**	0.00381
Chemical Industries	2.39624	0.09137	3.23894 **	0.03945
Abou Kir Fertilizers	0.47918	0.61937	0.74589	0.47447
Arab Polvara	0.86920	0.419975	0.37216	0.68938
Oriental Weavers	2.66518	0.06992	1.41683	0.2428181

* Significant at 1% level
** Significant at 5% level