Impact of Trading Activity on Price Volatility: Case of Tunisian Stock Market

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Abstract

This paper aims at examining how trading activity impacts price volatility. We propose first to estimate the return volatility following Jones, Kaul and Lipson (1994) and Chan and Fong (2000). Second, we will attempt to detect the best measure of the trading activity that better explains the price volatility.

For this reason, we use a sample of 48 listed firms in the Tunisian Stock Exchange "the BVMT" during the period from 02/01/2015 to 29/05/2015.

Results show the significance of the size of trades beyond that of the number of trades and traded capitals. We rank the stocks into three trade size categories based on their market capitalization in order to examine whether daily price volatility increases more with the number of shares traded in a particular size category than with other size categories. We found a negative relation between trading activity and price volatility for large and medium size firms and a positive relation for the smallest stocks.

Keywords: number of transactions, traded capitals, share volume, price volatility, Tunisian stock market

1. Introduction

All over the world, the financial markets have undergone huge changes accompanied by rapid growth of quantities and order frequencies issued from different market participants. Considerable advances in high-speed telecommunications and computers were required in order to deal with the substantial increase in order volume for financial assets.

The growing development of trading activity on financial markets has received attention in the literature developing the efficient markets theory (Fama, 1965; French & Roll, 1986; Hasbrouck, 1991; Koski & Michealy, 2000).

The relationship between share volume and stock price volatility is analysed by several studies using a variety of methods. However, the literature provides mixed evidence concerning this relation.

This study investigates the relationship between trading activity and stock price volatility. It also detects the role of trade size in the volatility volume relation.

The paper is structured as follows. The next section provides a short literature review.

Section 3 contains a description of the data and the estimation procedures used in this study. In section 4, we present and analyse the empirical evidence. The conclusion is provided in section 5.

2. Literature review

The theoretical and empirical literature on the relation between price volatility and trading volume is large. Various theoretical models have focused on the relation price volatility and volume, such as Mixture of Distributions Models (Epps & Epps, 1976; Tauchen & Pitts, 1983; Harris, 1986), Asymmetric Information Models (Kyle, 1985; Admati & Pfleiderer, 1988) and Differences in Opinion Models (Varian, 1985, 1989; Harris & Raviv, 1993).

On the other hand, many empirical studies have been conducted to examine the volatility – volume relation. However, this relation remains a controversial topic.

Jones, Kaul, and Lipson (1994) analysed the impact of daily number of trades and average trade size on daily price volatility. Using a number of Nasdaq stocks over the 1986-1991 period, they showed that the positive volatility – volume relation simply reflects the positive relation between volatility and number of transactions. So, they argued that the size of trades has no incremental information content. Any information in the trading behaviour of agents is almost entirely contained in the frequency of trades. Their results suggest that it is the occurrence of transactions and not their size that generates volatility. Trade size has no information beyond that contained in the frequency of transactions.

Al-Suhaibani and Kryzanowski (2000) highlighted the results of the asymmetric information models. They employed a new specification of an existing vector autoregressive (VAR) model to assess the information content of a newly submitted order. Using order data for the Saoudi stock market, they showed that larger orders are more informative and that private information is the more important determinant of the frequency of transactions.

Chan and Fong (2000) explored the role of the size of trades beyond that of the number of trades in the volatility-volume relation. They ranked the transactions into different trade size categories and regressed the daily absolute return on the numbers of trades of different sizes in order to investigate the impact of the number of trades on daily price volatility in these different trade size categories.

Then, they compared the volatility impacts of small-sized, medium sized and large sized trades. Given the differences in market microstructure between the NYSE and NASDAQ, Chan and Fong examined the volatility-trade size relation for both these two markets. They found that daily absolute return increases more with the numbers of trades of medium size categories than with other size categories for both the NYSE and NASDAQ samples. Therefore, both the number of trades and size of trades play significant roles in the volatility-volume relation. They also suggested that order imbalance plays a role in the volatility-volume relation.

Saji and Chandrasekhar (2001), who used a sample of Nasdaq stocks, found that trades of large firms are related to the proxies of market wide and firm specific information. For large firms, an increase of the number of trades seems to have a beneficial effect on liquidity. However, for small and medium firms, trades are associated with firm specific information and are not related to market wide information.

Huang and Masulis (2002) studied the price volatility of stocks in the Financial Times Stock Exchange (FTSE) 100 index, the major stock index in London. They found that price volatility on the London stock exchange is directly related to trade frequency and more weakly but positively related to trade size. Their finding is consistent with the empirical evidence of Jones, Kaul and Lipson. They classified trading activity measures by trade size categories to better detect the effects of traders who act strategically by breaking up large blocks into a number of small trades. They found that both trade frequency and average trade size impact price volatility for small trades. For large trades, only trade frequency affects price volatility.

Downing and Zhang (2002) in their research based on the Municipal Bond Market, showed a positive relation between a bond's price volatility and the number of transactions. They also argued that there is a negative relationship between price volatility and average deal size.

Ting, Galagedera, Treepongkaruna and Brooks (2010) contributed to existing literature by analysing the relation between trading volume and realized volatility for the top 50 Australian stocks over the period January 1996 to April 2010. They showed that realized volatility is positively correlated with trading volume, number of trades and average trade size.

Duong and Kalev (2014) used a sample of stocks traded on the Australian Securities Exchange (ASX) in order to study the impact of the number of trades and average trade size on price volatility. They found a positive relation between trading volume and volatility and documented that the number of trades affects more the price volatility than average trade size.

Boonvorachote and Lakmas (2016) studied the relationship between trading activity and price volatility in Asian futures exchanges during the 2006-2012 period. They reported that volume has a positive relationship with expected and unexpected volatility. Furthermore, they produced evidence that the speculative activities are likely to increase the futures volatility while the hedging activities tend to stabilize the markets.

3. Data Description and Empirical Specification

The aim of this section is to analyse the trading activity by estimating its impact on price volatility. In order to better understand the strategy adopted by Tunisian investors as well as their risk aversion degrees, we will suppose that if insiders are risk averse and prefer the camouflage strategy, then volatility would be better

explained by trade frequency than by trade size.

3.1 The Sample

The data compiled for this study are taken from the Tunisian stock exchange "BVMT" database which is available on line. We consider the most liquid stocks traded in continuous on the BVMT for 48 listed firms from 02/01/2105 to 29/05/2015.

For each stock, we use the following variables: daily closing prices, daily number of transactions, share volume (number of shares traded), traded capitals (value of shares traded) on the BVMT and market capitalization.

3.2 Statistical Methodology

In order to examine the impact of volume on volatility, we use a two-step procedure. We propose first to estimate the return volatility following Schwert (1990), Jones and al (1994) and Chan and Fong (2000).

Daily price volatility for each stock is estimated from the absolute residuals of the following model:

$$R_{it} = \sum \alpha_{ik} D_{kt} + \sum \beta_{ij} R_{it\text{-}j} + \xi_{it} \tag{1}$$

where R_{it}: is the return of stock (i) on day (t) which is calculated by:

$$R_{it} = [\text{closing price (t) - closing price (t-1)}] / \text{closing price (t-1)}$$

D_{kt}: are the five -day of the week dummy variables.

ξ_{it}: the residual of the model.

The lagged returns are used to control for any serial dependence in daily returns since returns are explained by their latest past values.

Second, we define three measures for trading activity: traded capitals, share volume and number of transactions. We, then estimate the following 3 sets of regressions for each stock:

$$Vol_{it} = a_{io} + a_{il}L + \sum a_{ij}vol_{it\text{-}j} + b_i K_{it} + \eta_{it} \tag{2}$$

$$Vol_{it} = a_{io} + a_{il}L + \sum a_{ij}vol_{it\text{-}j} + c_i Q_{it} + \mu_{it} \tag{3}$$

$$Vol_{it} = a_{i\,o} + a_{il}L + \sum a_{ij}vol_{it\text{-}j} + d_i N_{it} + v_{it} \tag{4}$$

with $Vol_{it} = \left| \xi_{it} \right|$: the absolute residual obtained from Eq(1).

L: a dummy variable that is equal to 1 for Mondays and 0 otherwise,

K_{it}: traded capitals (value of shares traded)for stock (i) on day (t),

Q_{it}: share volume (number of shares traded) for stock (i) on day (t),

N_{it} : number of transactions for stock (i) on day (t),

η_{it}, μ_{it}, v_{it}: the residuals of the equations (2),(3) and (4),

The lagged values of volatility are introduced in these equations in order to control for the persistence in volatility for a relatively short period.

In this test, 2 represents the mean number of lags which minimize Shwartz and Akaike criteria for equations (1), (2), (3) et (4) for the majority of our sample.

After we estimate Eq(1) using ordinary least squares, we extract the absolute residuals $\left| \xi_{it} \right|$ and use them as the dependant variables in Eqs (2), (3) and (4).

Eqs (2), (3) and (4) are also estimated using ordinary least squares which provides consistent estimators of the parameters.

4. Results

All the variables used are stationary so that we use them as regressors in our model of stock price volatility. In addition, the estimation conditions by ordinary least squares method are satisfied.

Our sample contains 48 listed firms in the Tunisian Stock Exchange "BVMT". After excluding those stocks that have non significant results, we obtain 17 firms for equation (2), 18 for equation (3) and 32 for equation (4).

Table 1. Percentage of firms with non significant results

	Sample	Firms with significant results	Firms with non significant results	Percentage of firms having non significant results
Eq (2)	48	17	31	64,5%
Eq (3)	48	18	30	62,5%
Eq (4)	48	32	16	33,3%

These results show that 64,5% of our sample following the equation (2), 62,5% following the equation (3) and 33,33% following the equation (4) have a transaction activity with no significant effect on volatility.

For these firms, we can confirm that variables measuring the transaction activity (number of transactions, share volume and traded capitals) have no significant multiplier effect on price volatility.

These stocks may provide opportunities for insiders who can profit from their information content with no impact on prices. In fact, information can affect prices only by the mean of trading activity. However, our results don't let show the significant effect of the information on price volatility. As a consequence, it will be difficult to show the impact of the information on prices.

The non significance of the coefficients of equations (2), (3) and (4) for a large part of our sample, provide us a justification for the weakness of the role of private information in explaining the prices volatility.

In what follows, we will eliminate firms with no significant estimations and consider for each equation the means of the coefficient estimates b, c and d of the variables: traded capitals, share volume and number of transactions as well as the mean R squared across all stocks in the sample.

The following table presents the results of estimating Eqs (2), (3) and (4). Each regression is separately run for each stock.

Table 2. Means of the coefficient estimates for firms with significant results

	Coefficients (b,c d)	ABS (t-Statistic)	Prob (t-statistic)	R-squared	F-statistic	Prob (F-statistic)
Eq (2)	-0,3763198	3,018	0,01	0,103648765	3,521989706	0,04925858
Eq (3)	-112,54522	2,97	0,08	0,162266444	3,33889E+31	0,05276611
Eq (4)	-108892,78	2,52	0,07	0,082700313	2,871629938	0,15515184

where: (b) is the mean of the coefficient estimates for traded capital in equation (2),

(c) is the mean of the coefficient estimates for share volume in equation (3),

(d) is the mean of the coefficient estimates for number of transactions in equation (4).

On an average, trading activity measured by traded capitals, share volume and number of trades, has a significantly negative effect on price volatility after eliminating the effect of the persistence in volatility.

In fact, daily traded capital, share volume and number of trades are found to have a negative effect on daily volatility with error probabilities of 1%, 8% and 7%, respectively.

This result could explain the specific behaviour of the Tunisian investor who wants to increase the trades of the least volatile assets.

Such behaviour proves the risk aversion of the Tunisian investor.

This finding does not support the general conclusion of Jones, Kaul, and Lipson (1994) who find a positive relation between volatility and number of transactions.

The following table shows a negative relation for more than 83% of the firms of our sample.

Table 3. Percentage of firms with negative effect on volatility

	Total	Positive effect on volatility	Negative effect on volatility	Percentage of firms with negative effect
Eq (2)	17	1	16	94%
Eq (3)	18	3	15	83%
Eq (4)	32	4	28	87%

Nevertheless, these negative coefficients for most of the companies, do not allow for comparison and classification of these effects. We propose then to detect the best measure of the trading activity which provides a better understanding of the volatility.

For this reason, we will compare the R^2 of the 3 equations to see whether share volume, traded capitals or number of trades better explains the price volatility.

Table 4. Means of R-squared

	R-squared
Eq (2)	0,10364876
Eq (3)	0,16226644
Eq (4)	0,08270031

According to this table, we can note the significance of the size of trades beyond that of the number of trades and the capital traded. The R squared of Eq (3) is higher than those of Eqs (2) and (4). This result confirm that insiders are speculators who make big size trades without covering up their private informations by increasing the number of trades.

In the following, we will consider the equation (3) which studies the impact of trade size on volatility.

To detect the role of trade size in the volatility volume relation, we propose to rank the stocks into three trade size categories based on their market capitalization. This allows us to examine whether daily price volatility increases more with the number of shares traded in a particular size category than with other size categories.

Table 5 reports the results of estimating the equation (3).

Table 5. Role of size in the volatility-volume relation

Size of the firm	Coefficient	ABS [t student]	Market capitalization
Large	-318,150485	3,14426917	851036,333
Medium	-118	3	161 660
Small	98,0576367	3,23210283	32182,1667

As shown in this table, there is a negative relation between trading activity and price volatility for large and medium size firms while it is positive for the smallest stocks.

This finding is consistent with the results of Chang and Fong (2000) who found a decreasing relation between the size and its impact on price volatility.

The share volume increase lead to a decrease of volatility for large and medium size firms and an increase of this price volatility for the small size ones.

Based on these findings, we can advance that risk averse investors would like to buy the stocks of large and medium size firms which are supposed to be more controlled and have, therefore, a weak informational asymmetry and a volatility decreasing with trades. On the other hand, small firms with less control would have a relatively high informational asymmetry. Consequently, they would be the most risky and most demanded by speculators.

5. Conclusion

The objective of this paper was to examine the impact of trading activity on stock price volatility for the Tunisian Stock market. We explored the relation between different trade size categories and daily price volatility. Contrary to Jones, Kaul and Lipson's findings, we found a negative relation between trading activity and price volatility. Our results suggest that price volatility increases more with small sized trades. Furthermore, we found that for both large and medium size trades, price volatility decreases as trade size increases. This negative relation between the size and its impact on stock price volatility is consistent with Chan and Fong's results.

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