The Effect of Information Technology on Stock Market Trade Volume and Volatility: Case for Dhaka Stock Exchange in Bangladesh

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Abstract

In this study, the effect of the Internet on the stock market trade volume and volatility has been enquired in the case of Dhaka Stock Exchange in Bangladesh. The results show that the “Net” has a significant impact on these two parameters of volume and volatility of Dhaka stock market.

Keywords: Communication process, information delivery system, stock market, financial sector, trade volume, volatility.

Introduction

The information network of business relationships is perhaps the central element of the production technology of the 21st-century stock investment.

Technology is a stock of specie, which tosses into head-tail outcomes. Irrespective of its win-loss situation that makes current investment obsolete, proponents view technology as a giant catalyst that irrevocably lowers costs. Many firms have saved money on staff and paperwork through electronic order processing, billing and e-mail (Strauss et al. 2003). In such a way, increasing number of companies is marketing their investment products over the Internet, which provides a competitive advantage in the upwardly challenging financial industry. Thus, when online brokerage accounts were introduced, this new form of investment revolutionized the stock market trading in both dimensions of volume and volatility.

Yet, individual in Bangladesh cannot have free access to stock market trading other than by going through the brokerage stations, but substantially lower fees and commissions have opened up increased opportunity for every potential investor. Now, an individual can browse the Internet and go for the stock market information available on the webpage in order to have an instant informed decision about the investment, i.e., either to buy or sell the shares of a particular firm or industry. These factors dramatically nudged up the overall volume and volatility of stock exchange market during the near past. Online (Wide Area Network) brokerage account was introduced in 2004 in the Dhaka Stock Exchange (DSE) (Anon. 2007b). Be that as it may, the expectation was that this new form of investment would revolutionize the way people handled their stock transactions, by which investors, by and large, may find themselves vulnerable (Perkins and Perkins 2001). The prime intention of this paper is, thus, to investigate the impact of the “Net” on the stock market in terms of volume and volatility in the case of DSE in Bangladesh.

Dhaka Stock Exchange in Brief

The history of the DSE is not so long. This is the prime bourse of Bangladesh. The legacy of it goes back to 28 April 1954. However, its formal trading began in 1956 as East Pakistan Stock Exchange Association Ltd. The name of the stock exchange was once again changed to DSE Ltd. in 1964. The service was uninterrupted upend till 1971. The trading was suspended during the liberation war and resumed in 1976 with the change in economic and financial policy of the government (Anon. 2007b). Since then the bourse did not look
back and continued its journey contributing to the development activities of the nation.

Nowadays, the DSE is the prime bourse of the country. Through its nonstop highly fault-tolerant screen based automated trading system, the exchange can offer facilities for transparent and highly efficient mechanism provisions for secondary market activities of shares, debentures and wide varieties of other securities. The overall operation of the exchange is run by a team of qualified executives. The bourse at present offers trading facilities for 305 securities worth Tk. 281.42 billion (US$ 4.14 billion), which accounts for 6% of GDP of the country. By and large, the DSE espouses shared vision of Bangladeshi businesses all over.

On 10 August 1998 the DSE introduced screen-based state-of-the-art automated real-time trading through Local Area Network and Wide Area Network on 24 January 2004. Later the DSE upgraded its automated trading system on 21 August 2005. Meanwhile, Central Depository System operated by Central Depository Bangladesh Ltd. (CDBL) for electronic settlement for share trading made a debut in the DSE on 24 January 2004, which was incorporated on the 20 August 2000 sponsored by the country’s Nationalized Commercial Banks, Investment Corporation of Bangladesh, Private Commercial Banks, Foreign Banks, Merchant Banks, Publicly listed companies, insurance companies and Dhaka and Chittagong Stock Exchanges with the collaboration of the Asian Development Bank (ADB).

The core services of CDBL cover the efficient delivery, settlement and transfer of secretaries through “NET” system namely recording and maintaining securities accounts and registering transfer of securities, changing the ownership without any physical movement or endorsement of certificates and execution of transfer instruments. The Central Depository System operated by CDBL has proved to a conveniently reliable, transparent and efficient means to settle securities transaction. The investors have been freed from the hassles of physical handling of certificates, errors in paper work and the risks associated with damage, lost and forged certificates (CDBL Annual Report 2006).

The DSE became a full depository participant of CDBL to facilitate the trading of its non-depository participant members. In its 50-year journey the stock exchange has made significant contribution to the economy of Bangladesh providing the unique venue to raise investment from the members of the public. Over the years, the bourse has earned confidence of the investors. Soon the DSE will have its own building for which the foundation stone has already been laid at Uttara in Dhaka on 24 February 2007 (Anon. 2007c).

The DSE has 230 members who are also the shareholders of the exchange. The members are licensed by the Securities and Exchange Commission (SEC) for conducting trading as stock dealer or broker. All brokerage houses have been corporatized in 2006. The number of listed securities including mutual funds, debentures and bonds in the DSE are 298 as in April 2006. Apart from 256 listed companies including 140-A category, 35-B category, 1-G category and 92-Z category companies, there are 13-Mutual Funds, 8-Debentures and 22-Bonds in the stock exchange. The listed companies are divided into 18 sectors. One hundred companies having a market capitalization of Tk 170,189.76 million accounting for 83.46% of total market capitalization are being traded under aforementioned Central Depository System till June 2006. All IPO shares are issued in dematerialized condition (Anon. 2007b).

**Literature Review**

The evolution of the Internet and other forms of information technology are changing dramatically the way the brokerage industry does business (Jud *et al.* 2002). Interestingly, online technology influenced primarily the banking industry, which enjoyed the lion share of the stake of this windfall. Lots of studies exemplified this fact. Hutzschenreuter (2001) shows how the structure of the bank is changed fundamentally. This development is affected by a variety of trends such as customer loyalty is dropping; banking is becoming a commodity.
and as a whole technology dominates the business. With these trends, the bank industry is evidencing typical features of the financial sector whose structure is involved in a process of change. In addition, completely new forms of financial services are coming into being. Wilhelm (1999) offers both historical and economic perspective on technological innovations in investment banking along with the discussion of advances of information technology particularly Internet and its impact on financial markets. Colvin (2000) unfolds some striking facts of the “Net”-corporate how they hide profits with the accounting math. If new-companies could apply the same common sense to their accounting that old-economy firms do, they would see some surprisingly healthy profits. Fact is many of these companies reporting losses actually make money in lots of cases. This study, in fact, shows the paramount importance of Internet business (E-commerce) having emphasized the opportunity of profit margin. Kurz et al. (2003) shows the dynamics of diverse rational beliefs is the primary propagation mechanism of volatility in asset market. The model also predicts and explains the presence of stochastic volatility in equilibrium asset prices and returns. Coward (1997) puts forward that the growth of online trading has exploded in the past few years with a surge in the number of start-ups. As business has grown online, so have the number of traditional brokers who have jumped on the bandwagon.

**Hypotheses to be Tested**

The primary objectives of the paper are, as mentioned earlier, to find out the impacts of the Internet on the stock market trade volume and volatility. In order to attain those objectives, the present study postulates two hypotheses. One of them is the null hypothesis that two mean values of trade volume for the two time periods are the same which can be expressed in the following mathematical notation:

\[ H_0: \mu_1 - \mu_2 = 0, \]

where \( \mu_1 \) is the mean of trade volume in the period of January 2004 to October 2005 and \( \mu_2 \) is the mean of the same in the period of November 2005 to June 2007 in the data.

In tests of two means of the two periods the alternative hypothesis is set as:

\[ H_1: \mu_1 - \mu_2 < 0. \]

In order to test the volatility of the stock market trade volume, the study puts forward the following hypothesis for the standard deviation that of the form

\[ H_0: \sigma_1 - \sigma_2 = 0, \]

against the following alternative:

\[ H_1: \sigma_1 - \sigma_2 < 0, \]

where \( \sigma_1 \) is the standard deviation of the trade volume for the period of January 2004 to October 2005 and \( \sigma_2 \) is that of the period November 2005 to June 2007.

**Methodology**

Given the nature of the study, different data sources are taken into consideration. Out of all references, Central Depository Bangladesh Limited provides the most useful and precise data base that was mostly used for this study. Monthly Review of the DSE also provided additional support of database, which was indispensable for this study to carry on. Purposively, the monthly data were used from January 2004 to June 2007. To get a sophisticated output, the SPSS was used for the data analysis. In order to show the change over time, the data were divided into two parts - from January 2004 to October 2005 and from November 2005 to June 2007. By analyzing two sets of data - each set consists of 21 months of data (altogether 42 months data), the investigation was done in order to detect and compare the change in trade volatility and volume of the DSE. At the beginning of introducing “NET” in the stock market, numbers of accounts were small and gradually it got to upsurge that makes a huge difference between two breaks. This is the rationale for breaking the whole “Net” period into two parts. Nevertheless, if the periods before and after introducing Internet could be used, that could be better strategic methodology, but due to data limitations that strategy could not be followed. Conceptually, this study considers the monthly
closing volume of total turnovers (in Tk) as the dependent variables.

Although there have been several statistical methods for measuring the volatility, the standard deviation is one of the most widely used statistics (Vakil and Lu 2005). Another measure of variation and volatility is range that is very easy to compute and interpret (Vakil and Lu 2005, McClave 2005). For the analysis, the following regression model has been used:

\[ Y = \alpha + \beta X + \epsilon, \]

where:

- \( Y \): Monthly trade volume (turnovers in Taka);
- \( X \): Number of accounts or stocks with the brokers that are enlisted in CDBL;
- \( \alpha, \beta \): Parameters to be estimated;
- \( \epsilon \): The disturbance term.

**Results and Discussions**

Arguably, it is plausible that if the volatility of the market has not been changed, the statistical test must confirm the fact by concluding that the standard deviations for the two periods are equal. Otherwise, if there has been a significant change in the standard deviations in the January 2004 – October 2005 period compared to November 2005 – June 2007 period, then the conclusion could be drawn that the market is volatile. Here, the mean values for the two periods are also recorded.

The summary statistics for the change in the monthly DSE turnovers closing (in Tk) is provided in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Summary statistics for DSE.</th>
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<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>S.D.</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>No. of observations</td>
</tr>
<tr>
<td>t-test</td>
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<td>F-test</td>
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The \( t\)-test for equality of two means and the \( F\)-test to investigate the equality of standard deviations for two periods have been performed. Observed \( t\)-test and \( F\)-test support the hypotheses that there are significant increases in the mean and standard deviation during the two compared periods. Consequently, it can be concluded that the average of the trade volume and its volatility has significantly increased. The same conclusion is applicable to the statistics of range, which supports the earlier evidences of vulnerable trade volume and volatility of DSE market.

An examination of the data indicates that there might be some correlation between the number of share accounts and the volatility of the DSE trade volume. To further analyze the relationship between the volatility and the number share accounts a regression model is run. The result is provided in Table 2. The result shows that the slope of the trade volume line is positive, which intuitively supports the hypothesis that trade volume is increasing.

<table>
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<th>Table 2. Regression results.</th>
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<tr>
<td><strong>Coefficient</strong></td>
</tr>
<tr>
<td>Intercept</td>
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<tr>
<td>No. of account</td>
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***\( p < .001 \), **\( p < .01 \)

Based on the result, it concludes that the explanatory variable contributed significantly to predicting the volatility of the DSE trade volume. The conclusion supports the thought that the number of accounts has statistically contribute significantly to the upsurge in volatility of the DSE. Based on the statistical tests, it can be concluded that the volatility of the market trade volume has increased during the pre-specified 2004-2005 period compared to the 2005-2007 period.

Since the test statistic for analysis of variance (ANOVA) is distributed as Fisher’s \( F \), it should not be surprising that analysis of variance and the \( t \) test for two population means are also closely related. An analysis of variance performed on observations from two groups will yield exactly the same \( p \)-value as a
non-directional $t$ test performed on the same data. Thus, the strategy underlying analysis of variance is based on the notion that all of the variability among the sample scores obtained from the population is attributable to two sources: variability that is associated with systematic differences among populations (treatment) and all other sources of variability (error), which are assumed to operate randomly throughout the population and therefore to contribute variability in equal measure to the population (Frank and Althoen 1994). The ANOVA result of this study is provided in Table 3. The $F$ value is found to be significant and it can be concluded that two populations of stock market trade volumes from which the samples are drawn do not have identical mean. This simply implies to support the null hypothesis to be rejected.

Furthermore, all these statistical tests support the hypothesis that the number of shareholder accounts influenced significantly the volatility of the stock market trade volume during the period of introducing Internet of about four years.

Table 3. ANOVA.

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
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<tbody>
<tr>
<td>Reg.</td>
<td>1</td>
<td>1.002E+18</td>
<td>1.002E+18</td>
<td>8.30**</td>
</tr>
<tr>
<td>Res.</td>
<td>40</td>
<td>4.833E+18</td>
<td>1.208E+17</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>5.835E+18</td>
<td></td>
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**p<.01

In Figs. 1 and 2, the trends in the monthly trade volume and the monthly volume of accounts with the brokers enlisted with the CDBL are depicted, respectively. Two trend lines show a consistent analogy with the results brought forth by the econometric analysis. It also shows the level of fluctuation of the trade volume with the upsurge of the volume of month-based account numbers of stock exchange. In Fig. 2, it is evident that the number of accounts lurched down throughout the period from March 2006 to April 2007 except only the month of March 2007. This downward syndrome of the monthly volume of the account numbers could be interpreted as the consequence of the political unrest emerged in the country. However, in the month of June 2007 the number of accounts is again found to be rising.

**Conclusion**

Intuitively, the result of the study has multiple facets in terms of ultimate effects. By and large, volatility of any phenomenon is bad particularly for the economic business cycle. Volatility of trade volume influences attitude of the investors in negative way that aggravates the aggregate investment levels. This is undesirable for the stock market capitalization, but somebody could be in highly advantageous situation by reason of good luck if s/he could hunt the pick time chance. If not, it could incur her or him high loss. Thus, informed clients could be in advantageous situation than uninformed investors in averting risk. Overall, volatility is not desirable for any market as a whole. In that sense, the outcome of the paper possesses profound insights that influence the investment and finally the overall GDP of the country as a whole.
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