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The Relationship between Stock Return Volatility and Public Disclosure: The Case of Istanbul Stock Exchange Online Public Disclosure Platform

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The study assumed that stock price volatility was a measure of uncertainty and uncertainty could be reduced by more, faster and costless information dissemination. With these assumptions, it examined the relationship between stock return volatility of ISE-30 index constituents and public disclosure via electronic public disclosure platform (PDP), which was introduced by Istanbul Stock Exchange (ISE) in 2009. From the perspective of informational asymmetries and efficient market hypothesis, it was expected that faster and costless information would reduce informational asymmetries and newly disseminated news would be reflected in stock prices instantaneously. Moreover, it was expected that old news would not be persistent on stock return volatility as they would have already been reflected in stock prices. So, the expected outcome after the introduction of PDP was a lower stock return volatility. The study employed a GARCH (1,1) methodology in order to test the impact of faster public disclosure by issuers via PDP on the volatility of the constituents of ISE-30 index. It was found that old news were persistent in subsequent periods and volatility did not decline ex-post as opposed to expectations.

Keywords: *Public disclosure, volatility, GARCH, Istanbul Stock Exchange, asymmetric information, efficient markets*

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1. Introduction

Transparency and disclosure of financial information to investors have been essential for efficient price formation in financial markets. As such, a number of initiatives have been taken to ensure more transparency and faster and more efficient dissemination of information to public. Among these initiatives, introduction of new regulations, facilitating corporate governance and introduction of new technologies allowing faster public disclosure of information have been prominent. For example, Istanbul Stock Exchange (ISE) introduced an

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electronic public disclosure platform (PDP) which enables trading companies disclose their material information to public faster and costless.

From the perspective of efficient markets hypothesis, disclosure of information by issuers and efficient formation of share prices are considered to be closely related. The hypothesis assumes that prices reflect the information available to the investors. This implies that more transparency and faster dissemination of information allow investors to make use of the information available to them in their investment decisions. Moreover, efficient dissemination of information about issuers reduces uncertainty about investment decisions thereby allowing share prices move towards their fundamental values. Thus, the process of price formation becomes more efficient in an environment where more information is available to investors fast and costless than in an environment where such information is non-existent, costly or becomes available to investors at a slower pace.

In this respect, if stock price volatility is a measure of uncertainty and if uncertainty can be reduced by more information (Baumann & Nier, 2004) and its faster and free disclosure then it is essential to examine the relationship between stock price volatility and disclosure of information. The present paper examines the effect of disclosure of information after the introduction of PDP on stock return volatility of the constituents of ISE-30 index. The paper is structured as follows: The first section includes the conceptual framework and literature review. The second section gives information about online public disclosure platform, which was introduced by Istanbul Stock Exchange for more transparency and online dissemination of material events. The third section introduces the methodology with a reference to GARCH models specified for the purpose of the present study. The last section presents the empirical results and conclusion.

2. Theoretical Background and Literature Review

There are at least two theoretical explanations to expect a relationship between costless, faster public disclosure by issuers and share price volatility. One explanation is from the perspective of asymmetric information. Asymmetric information affects the decisions of market players and the way it affects markets result in deviations of stock prices from their fundamental values. Asymmetric information is the differences in information available to different parties in a financial contract where borrowers have an informational advantage over lenders because borrowers know more about the investment projects they want to undertake (Mishkin, 1991). By the same token, in a publicly owned company, issuers, top executives or other insiders may have an informational advantage over third parties, investors and share owners. This informational advantage may lead to some informational problems such as adverse selection, adverse incentive, agency-principle and “lemon” problems, all of which may partly contribute to a market failure in terms of efficient price discovery (Akerlof, 1970, Stiglitz & Weiss, 1981, 1990). Transparency and more and faster disclosure of information to market players may help reduce information asymmetries in the market thereby partly eliminating these problems. Thus, prices in general and stock prices in particular may become more efficient (Baumannn & Nier, 2004; Diamond & Verrecchia, 1991). By reducing the information asymmetries, trading volume increases, bid-ask spreads and stock-return volatility decreases (Leuz and Verrecchia, 2000).

Another explanation regarding possible effects of public disclosure on stock return volatility is from the perspective of efficient markets hypothesis. The hypothesis assumes rational expectations. That is to say, investors update their expectations whenever new relevant information is disclosed. Therefore, prices reflect all publicly available information and markets are informationally efficient. There are three common forms of the hypothesis; "weak-form efficiency", "semi-strong for efficiency" and "strong-form efficiency".

In the weak form, the hypothesis claims that asset prices already reflect all old publicly available information. So, according to this view, one can expect that old news is not persistent on stock return volatility as investors already updated their expectations accordingly. In semi-strong form, the hypothesis asserts that new publicly disclosed information is reflected in stock prices very rapidly. Therefore, the influence of new information on stock return volatility is expected to be instantaneous and non-persistent. The strong form efficiency states that share prices reflect all public and private information including insider information. In this form of efficiency, no excess return is possible. Regarding the three forms of the efficient market hypothesis there has been mixed empirical evidence, which generally has not supported the strong form (Nicholson, 1968; Basu, 1977; Rosenberg, Reid and Lanstein, 1985; Fama and French, 1992; Chan, Benton and Pan, 2003).

However, in terms of less stock return volatility and uncertainty, the most desired form is the strong form. So, if more transparency and faster dissemination of information help markets move towards strong-form of efficiency, then one can expect that faster and more information disclosure to public reduce stock price volatility. This is a natural result of the presence of informed investors because they act as rational arbitrageurs who trade with uninformed or irrational investors and by doing so they help prices move towards their fundamental values (Friedman, 1953). Moreover, irrational or uninformed investors would disappear from the market in the long run as they would lose money to arbitrageurs.

3. Istanbul Stock Exchange Electronic Public Disclosure Platform

Istanbul Stock Exchange Public Disclosure Platform (PDP) is the official disclosure platform for the companies whose shares are traded on ISE markets. PDP was launched by ISE on June 1st, 2009. It provides the issuers to disclose relevant information and material events to public electronically and without an extra cost. Moreover, it provides quick access to past public disclosure and, by doing so, contributes to market transparency. Before the introduction of PDP, there was a paper based system, which was more costly and time-consuming. In the paper-based system, information was disclosed to public with a time-delay in contrast to PDP, which allows an instant disclosure of information electronically. The time-delay in the old paper-based system was caused by several manually handled procedures, which were required to disclose the relevant information to public. First, issuers were required to send the relevant information to Istanbul Stock Exchange through fax. Then, the fax message sent by the issuer was delivered to the related departments at ISE where the fax message was re-typed into the ISE system for disclosure. As this type of manual handling is subject to typing errors, the typing was controlled and proofread by a controller in order to avoid from typing errors. After the approval of the controller, the information was disclosed to public in coordination with the trading floor via telephone. At the end of the trading day, all information sent to ISE was published in a paper-based daily bulletin. So, information in the old paper-based system can only be disclosed to public with a time-delay. On the other hand, after the introduction of new electronic PDP all the above mentioned manual procedures were eliminated. Moreover, differently from the old system, newly launched PDP allowed investors to make an inquiry through the official web site of the platform for past information. Thus, any investor can reach previously disclosed information easily in PDP whereas such an inquiry through paper-based daily bulletins was extremely difficult and time-consuming. To sum up, newly launched PDP enables issuers to disclose public disclosure to public online, costless and faster than the old paper-based disclosure system.

Additionally, it enables investors to make an inquiry for past material events thereby contributing to market transparency.

4. Methodology

4.1. Purpose

The purpose of the present study is to examine the impact that faster and free dissemination of information by issuers through electronic PDP has on the volatility of the stock returns of ISE-30 index constituents

4.2. Sample

The sample of the study includes the constituents of ISE-30 index as of 01.08.2011. The constituents of the index are shown in Table 1 (Istanbul Stock Exchange, 2011).

Table 1. Shares Included in ISE-30 index as of 10.08.2011

Share Code	Share
AKENR	Ak Enerji
AKBNK	Akbank
ARCLK	Arçelik
ASYAB	Asya Katılım Bankası
BIZIM	Bizim Mağazaları
DOHOL	Doğan Holding
DYHOL	Doğan Yayın Hol.
ENKAI	Enka İnşaat
EREGL	Ereğli Demir Çelik
GARAN	Garanti Bankası
IHLAS	İhlas Holding
ISCTR	İş Bankası (C)
KRDMD	Kardemir (D)
KCHOL	Koç Holding
KOZAL	Koza Altın
KOZAA	Koza Madencilik
MGROS	Migros Ticaret
PETKM	Petkim
SAHOL	Sabancı Holding
SISE	Şişe Cam
HALKB	T. Halk Bankası
TKFEN	Tekfen Holding
TCELL	Turkcell
TUPRS	Tüpraş
THYAO	Türk Hava Yolları
TTKOM	Türk Telekom
VAKBN	Vakıflar Bankası
YKBNK	Yapı ve Kredi Bank.
EKGYO	Emlak Konut GMYO
SNGYO	SinpaşGMYO

4. 3. Data Collection and Analysis

Average daily share prices of ISE-30 constituents were collected from Istanbul Stock Exchange for the period after the introduction of electronic PDP. The research period covered from the introduction of the system on 01.06.2009 to 01.08.2011. Due to the periodic update in the constituents of the index, data were unavailable for 3 shares. These shares included BIZIM, KOZAL, EKGYO, which were excluded from the sample. Moreover, due to the presence of corporate actions such as stock splits and capital increase, some of the share prices were corrected. These shares included AKENR, AKBNK, DYHOL, ENKAI, EREGL, IHLAS, ISCTR, KRDMD, KCHOL, PETKIM, SISE, TKFEN, THYAO, SNGYO.

The study employed a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model with a dummy variable.

4.3.1. Autoregressive Conditional Heteroskedasticity (GARCH)
A GARCH model, provides a volatility measure for heteroskedastic time series. Heteroskedasticity refers to time varying variance of error terms. As the purpose of the present study is to examine the change in the volatility of the stock returns, a GARCH model fits well for the purpose of the study.

A GARCH model has two components, an ARCH term and a GARCH term. ARCH stands for Autoregressive Conditional Heteroskedasticity in which the term "conditional" refers to dependence on the observations of the immediate past and the term "autoregressive" implies a feedback mechanism that incorporates past observations into present (De Beer, 2009). Engle (1982) introduced ARCH model process for forecasting and determine conditional variance of times series as an extension to the more general AR(p) model (Jacobsen, 2010, p.39). Bollerselv (1986) and Taylor (1986) extend the ARCH model to a Generalized process (GARCH) independently to a model where the conditional variance is a linear function of its own lags. (Jacobsen, 2010, p.39).

The GARCH(p, q) model (where p is the order of the GARCH terms σ^2 and q is the order of the ARCH terms ϵ^2) is given by

$$\sigma_t^2 = a_0 + a_1\epsilon_{t-1}^2 + \cdots + a_q\epsilon_{t-q}^2 + ß_1\sigma_{t-1}^2 + ß_p\sigma_{t-p}^2 = a_0 + \sum_{i=1}^{q} a_i\epsilon_{t-i}^2 + \sum_{i=1}^{p} ß_i\sigma_{t-i}^2$$

One of the most widely used and robust specification of GARCH (p, q model)is the GARCH(1,1) (Berument & Yuksel, 2006; Gahlot, Datta & Kabil, 2010). Therefore the study used the GARCH (1,1) model for statistical analysis. The model is introduced by Bollerslev (1986) as a generalization of Engle (1982). So, for the purpose of the present study, the mean equation and conditional variance equation for GARCH (1,1) model is specified as follows:

Conditional mean equation

$$y_t = c + by_{t-1} + \varepsilon_t; \quad \varepsilon_t \qquad N(0, \sigma_t^2)$$

Conditional Variance

$$\sigma_t^2 = \alpha_0 + \alpha\epsilon_{t-1}^2 + ß\sigma_{t-1}^2; \alpha_0 > 0; \alpha > 0; ß > 0$$

Unconditional variance of the error term is specified as

$$Var(\varepsilon_t) = \frac{\alpha_0}{1-(\alpha+\beta)}$$ where

y_t: Dependent variable (Stock return)
c: Constant
b: Autoregressive coefficient
y_{t-1}: lagged explanatory variable
ε_t: error term
σ_t^2: Conditional variance in period t
α_0: Constant

α: New news (ARCH(1)) coefficient
ϵ_{t-1}^2: ARCH(1) term
β: Old news -GARCH (1) coeeficient (Persistence)
σ_{t-1}^2: GARCH (1) term

Moreover, in order to scrutinize the impact of information disclosure to public through electronic PDP on stock volatility after the launch of PDP a dummy variable is added into the GARCH (1,1) equation. Thus the final GARCH (1,1) with a dummy variable model takes the following form.

Conditional Variance with Dummy

$$\sigma_t^2 = \alpha_0 + \alpha\epsilon_{t-1}^2 + ß\sigma_{t-1}^2 + \delta Dummy; \alpha_0 > 0; \alpha > 0; ß > 0$$

The dummy is given the value of “1” whenever information is disclosed to public via PDP. It takes the value “0” if a disclosure is absent. A significant and positive “δ” implies a rise in the stock volatility due to electronic public disclosure. On the other hand, a significant and negative δ implies that volatility is lower.

A statistically significant α or β implies that the impact of a shock on the dependent variable is likely to persist for several subsequent periods. A high α implies that the new news is disseminated faster with an apparent impact on the dependent variable while a high β implies a prolonged effect of old news on the dependent variable. The sum of α and β i indicates the possible persistence to the shocks. Closer the sum of α and β to unity, higher the persistence.

4.3.2. Unit Root

Before the GARCH analysis, stationarity of times series; - the presence of unit root- is tested by applying Augmented Dickey Fuller (ADF) test. Following models are estimated for ADF test.

Model 1: $\Delta Y_t = \rho Y_{t-1} + \sum_{j=1} \varphi_j \, \Delta Y_{t-j} + u_t$

Model 2: $\Delta Y_t = \alpha + \rho Y_{t-1} + \sum_{j=1}^{p} \varphi_j \, \Delta Y_{t-j} + u_t$

Model 3: $\Delta Y_t = \alpha + \delta_t + \rho Y_{t-1} + \sum_{j=1}^{p} \varphi_j \, \Delta Y_{t-j} + u_t$

Yt is a time series, α is a constant; t is the time trend; ut is residuals; ΔY_{t-1} = (Y_{t-1}-Y_{t-2}), ΔY_{t-2} = (Y_{t-2}-Y_{t-3}), etc.. Lag lengths (ρ) were selected based on Schwarz information criterion. p-values using the Dickey-Fuller t- distributions for the corresponding ADF t-test statistics were computed. In each case, the null hypothesis is that $\rho = 0$; that is, there is a unit root—the time series is nonstationary. The alternative hypothesis is that ρ is less than zero; that is, the time series is stationary.

5. Results

Daily average share prices were collected over the post-PDP period of 01.06.2009-01.08.2011. Before testing the specified model, unit root tests were applied as stationarity of time series is a necessary condition for model testing. Based on ADF tests, the null hypothesis of unit root was not rejected for the data regarding return on stocks. Thus, the data was found to be stationary. The results are indicated in Table 2.

Table 2. Results of ADF test for Stock Returns

Share Code	ADF	Lag Length	Prob.
AKENR	-21.8965	0	0.0000
AKBNK	-19.9394	0	0.0000
ARCLK	-20.1407	0	0.0000
ASYAB	-19.4212	0	0.0000
DOHOL	-24.5299	0	0.0000
DYHOL	-21.0029	0	0.0000
ENKAI	-20.2053	0	0.0000
EREGL	-16.3848	1	0.0000
GARAN	-20.3087	0	0.0000
IHLAS	-18.7689	0	0.0000
ISCTR	-21.1022	0	0.0000
KRDMD	-23.149	0	0.0000
KCHOL	-21.0976	0	0.0000
KOZAA	-19.5464	0	0.0000
MGROS	-24.8214	0	0.0000
PETKM	-20.9365	0	0.0000
SAHOL	-20.8271	0	0.0000
SISE	-16.8832	1	0.0000
HALKB	-17.058	1	0.0000
TKFEN	-19.8913	0	0.0000
TCELL	-20.8016	2	0.0000
TUPRS	-19.5304	0	0.0000
THYAO	-19.2864	0	0.0000
TTKOM	-21.3634	0	0.0000
VAKBN	-19.1224	0	0.0000
YKBNK	-20.4773	0	0.0000
SNGYO	-18.5977	0	0.0000
AKENR	-21.8965	0	0.0000
AKBNK	-19.9394	0	0.0000
ARCLK	-20.1407	0	0.0000

Then, previously specified the GARCH (1,1) model with a dummy variable was tested. The results of model testing are shown in Table 3. The results showed that stock returns of 5 shares, namely IHLAS, GARAN, KCHOL, MGROS, TCELL and TUPRS did not fit the model well and therefore these shares were excluded from the analysis. As a result, the model fit well for 21 stock in total.

Based on the data analysis of these 21 shares, it was seen that there were significant ARCH and GARCH effects. It was also seen that there were high GARCH effects with the exception of one share, namely DYHOL. This result was also evidenced by the presence of high $\alpha + \beta$, which was close to unity. To be more specific, 14 of 21 shares have an $\alpha + \beta$ larger than 0.90. 3 of them have an $\alpha + \beta$ larger than 0.88 and the remaining 4 shares have an $\alpha + \beta$ larger than 0.76 with the exception of one share. Only DYHOL has a low $\alpha + \beta$, that is 0.37.

As for the impact of public disclosure through electronic PDP, it was seen that the dummy coefficients were insignificant for 11 stocks in total. This implied that for 11 shares, public disclosure through PDP did not have significant influence on their stock return volatility. On the other hand, the dummy coefficients were positive and statistically significant for 10 shares. This implied that public disclosure via PDP increased the volatility of these stocks.

Table 3. Results of the GARCH Analysis

Share	α RESID(-1)^2	Prob.	β GARCH(-1)	Prob.	News AKBNKKAP	Prob.	α + β	Unconditional variance c/1-(α + β)
AKENR	0.211787	0.000000	0.581057	0.000000	0.001345	0.001400	0.792844	0.003051
AKBNK	0.094028	0.023200	0.677777	0.000000	0.002239	0.155500	0.771805	0.014632
ARCLK	0.084852	0.000000	0.880389	0.000000	-0.000656	0.381600	0.965241	0.025346
ASYAB	0.079958	0.000000	0.862349	0.000000	0.000561	0.002700	0.942307	0.000066
DOHOL	0.191376	0.000000	0.738326	0.000000	0.000325	0.000000	0.929702	0.000262
DYHOL	0.227697	0.000000	0.144616	0.038400	0.000467	0.000000	0.372313	0.000320
ENKAI	0.116320	0.000100	0.792641	0.000000	0.000632	0.121600	0.908961	0.006635
EREGL	0.113940	0.001300	0.793865	0.000000	0.000371	0.004100	0.907805	0.000876
GARAN	-0.007654	0.000000	1.000486	0.000000	-0.000917	0.000000	0.992832	0.080078
IHLAS	0.091797	0.000000	0.908916	0.000000	-0.000009	0.006300	1.000713	-0.005806
ISCTR	0.103700	0.000700	0.779522	0.000000	0.000752	0.081900	0.883222	0.004847
KRDMD	0.062946	0.000000	0.858867	0.000000	0.000014	0.010000	0.921813	0.000126
KCHOL	0.099224	0.000000	0.874656	0.000000	0.001096	0.000000	0.973880	-0.001604
KOZAA	0.397942	0.064349	0.501269	0.000000	0.002525	0.003500	0.899211	0.009426
MGROS	0.531876	0.047089	0.579082	0.000000	0.071471	0.000000	1.110958	-0.136511
PETKM	0.048171	0.015547	0.903518	0.000000	0.000058	0.055100	0.951689	0.000631
SAHOL	0.096905	0.029807	0.670961	0.000000	0.004311	0.000700	0.767866	0.010033
SISE	0.152751	0.033753	0.846182	0.000000	0.000061	0.295300	0.998933	0.022493
HALKB	0.086202	0.004000	0.806874	0.000000	0.003576	0.125600	0.893076	0.044349
TKFEN	0.100228	0.004900	0.867187	0.000000	-0.000703	0.264200	0.967415	0.015713
TCELL	0.149769	0.009500	-0.001490	0.125900	-0.535971	0.000000	0.148279	0.651671
TUPRS	-0.011267	0.000000	1.006953	0.000000	0.006099	0.000000	0.995686	0.139314
THYAO	0.193272	0.000000	0.749248	0.000000	0.000370	0.041400	0.942520	0.004697
TTKOM	0.133183	0.000100	0.821817	0.000000	0.001886	0.000000	0.955000	0.002356
VAKBN	0.099459	0.000800	0.808000	0.000000	-0.000454	0.132700	0.907459	0.007499
YKBNK	0.120257	0.000400	0.797033	0.000000	0.000248	0.465400	0.917290	0.005102
SNGYO	0.181172	0.000000	0.720780	0.000000	-0.000009	0.901600	0.901952	0.001968

6. Discussion and Conclusion

The present study assumes that stock price volatility is a measure of uncertainty and uncertainty can be reduced by more, faster and costless information dissemination. With these assumptions, it examined the relationship between stock return volatility of ISE-30 index constituents and public disclosure made via PDP by these companies. From the perspective of informational asymmetries and efficient market hypothesis, the expected outcome was a lower stock return volatility as faster and costless information would reduce informational asymmetries and newly disseminated news would be reflected in the price instantaneously. Moreover, it was expected that old news would have no effect on the volatility as they would already be reflected in stock prices.

The results of the study implied persistent effect of old news on stock volatility in subsequent periods as opposed to expectations. Moreover, it was found that public disclosure through PDP did not have significant influence on volatility of stock returns in the case of 11 shares. As for the other 10 stocks in the sample, the impact that public disclosure through PDP had on volatility was positive. In other words, volatility of these stocks increased ex-post. Based on these findings, it can be inferred that the expectations of lower uncertainty and volatility on ISE markets were not realised after the introduction of PDP.

Yet, the study is limited with the methodology and research period. During the research period of 2009-2011, financial markets were distressed in many countries due to prolonged effects of 2008 global financial crisis. The global crisis led to sharp decreases in asset prices. It also caused higher volatilities in many markets. So, the study was limited as it did not endogenize the factors such as destabilising speculation that was highly likely to be related with the onset of global financial crisis. A further study endogenizing the crisis related factors with a longer post-crisis period could shed more light on the impact that faster public disclosure through PDP had on stock volatility.

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