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ORIGINAL PAPER

Market reaction to regulatory policy changes in financial statements filings: evidence from Turkey

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Abstract

Financial reporting has a vital impact on investors for acquiring and integrating value-relevant information in making or revising investment decisions. This article investigates how changes in regulatory disclosure policy for financial reporting influence market reaction for the companies listed on Borsa Istanbul over the period 2003–2017. We elaborate our findings in the context of investor attention and trading opportunities, resulting in three distinct policies. The results reveal that small-cap firms are more exposed to abnormalities than large-cap firms for positive news before and after the public disclosure platform (PDP). Further, the number of financial statements filings made on the same day affects the abnormal returns before the PDP (from 2003 to June 2009) and, after the PDP (from 2009 to 2013), where the companies are allowed to release them intra-day. Additionally, the response of investors to financial statements filings on Friday is quite different than other days of the week before the PDP and after the PDP (from 2013 to 2017), where the companies are required to make their release only after the market closure. Finally, as a search-facilitating technology, the adaptation of eXtensible Business Reporting Language (XBRL) does not translate into an improvement on market reaction. These findings support the validation of limited investor attention and post-announcement drift in the Turkish capital market.

Keywords Disclosure policy · Financial reporting · Investor distraction · Post-earnings announcement drift · Turkey

1 Introduction

Financial statements provide a yardstick to market participants to assess the health of a company and to forecast its future performance. Their content is a primary source of information for investors, creditors and other stakeholders to

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make rational decisions and offers an important ingredient of efficient and transparent corporate practice. Further, it may influence the behavior of investors to choose a stock or portfolio in trading. Thus, regulators and accounting standard-setters put efforts into improving the quality of financial statements to increase the transparency in the market.

Financial reporting mainly conveys two types of information to the market: financial and non-financial. The former includes figures from a company's operations and financial transactions; non-financial information, on the other hand, is difficult to measure in monetary terms and includes social responsibility, corporate governance and environmental matters. Thus, the quarterly or annual performance of a firm has great value to investors since it has a direct impact on returns. Upon the release of financial statements, an efficient market should immediately absorb the information and adjust stock prices accordingly. Otherwise, if the market overreacts or underreacts to new price-sensitive information, this may offer an opportunity for investors to systematically beat the market and get abnormal returns. Perhaps just at that point, regulation becomes much more important since it plays a central role in solving the information and agency problems in capital markets through dictating a time span within which companies should release their financial statements to the market. Thus, a change in the regulatory policy may influence the market reaction.

This study aims to identify the market reaction to the release of quarterly financial statements in the Turkish stock market at three time periods where there were regulatory changes in disclosure policy. It investigates whether the quarterly financial statements filings by the companies listed on the Borsa Istanbul (BIST) 100 Index, over the period 2003–2017, creates any signalling effects on stock prices, leading to pre- or post-announcement drift in three sub-periods. These periods are: (1) 2003–June 2009, where there is no Public Disclosure Platform (PDP), (2) June 2009–March 2013, where there is PDP and the companies may only release their financial reports intra-day, and (3) June 2013–March 2017, where the companies are only allowed to file their financial statements after closing session. Finally, the study examines whether the search-facilitating technology, XBRL, translates into an improvement on price formation in the market.

The study focuses on quarterly financial statement filings because they are one of the most anticipated pieces of firm-level information associated with market price inefficiency, which is often attributed to the limited attention of investors (Martineau 2019). Our paper contributes to the literature from three angles. First, it brings together a framework of three distinct regulations on financial statements disclosure and elaborates the impact of regulatory policy changes on the investors' use of information for pricing the stocks in an emerging market. Second, it offers new insights into how the timing of financial statements filings impact information processing of investors across firms. Finally, our findings can contribute to evidence-based policy making as suggested by Leuz (2018), since understanding the behavior of investors is critical to designing disclosure policies. The results indicate that regulatory changes designed to increase investors' awareness in the Turkish capital markets are unlikely to help most of them and lead to different investor responses, creating differential market imperfections, i.e.

informational inefficiency through time, although the aim of policy changes is to ensure the reverse of it. The findings also show that there is limited investor attention and post-announcement drift in the Turkish market, both before and after the PDP.

The rest of this article is organized as follows. Section 2 briefly reviews the literature, Sect. 3 describes the data and methodology Sect. 4 presents the empirical findings and finally, Sect. 5 concludes.

2 Literature review and research hypotheses

2.1 Literature review

The disclosure literature on stock market reaction to accounting data announcements has gained much importance in finance research since there has been a gradual shift in the timing of financial statement release over time. This issue has even become more critical in recent years as changes in information technology and capital markets interact to affect the ways that information is generated, disseminated and processed (Miller and Skinner 2015). While this is the case, the studies that have measured market reaction to financial statements releases yield mix results. Although most of the studies held for developed markets have reported evidence which is largely consistent with the efficient market hypothesis (EMH), the validity of this hypothesis has been questioned since several recent studies have reported evidence of significant abnormal returns (ARs) generated on financial information, especially after the release date, called “post-earnings announcement drift” (PEAD).

Ball and Brown (1968) were the first to find ARs in firms that had announced positive results; these returns continued to drift upward after the earnings announcements. On the other hand, the opposite was true for firms with negative results. Easton and Zmijewski (1989) and Kross and Schroeder (1984) found that stock prices responded positively to announcements of an increase in earnings and negatively to announcements of a decrease in earnings for the US firms. Beaver (1968), Brown and Kennelly (1972), Foster (1977) and Joy, Litzenberger and McEnally (1977) examined the information content of earnings announcements and claimed that when firms disclose new information, trading volume becomes larger and price changes reflect the market’s expectations. Similarly, Watts (1978), Rendleman, Jones and Latane (1982) and Foster, Olsen and Shevlin (1984) found statistically significant ARs after the quarterly earnings announcements, while Ball and Kothari (1991) found significant excess returns just on the day of the announcement.

Ball and Shivakumar (2008) examined quarterly earnings announcements of firms from 1972 to 2006 and concluded that they provide a modest amount of incremental information to the market. Alegria, McKenzie and Wolfe (2009) investigated the abnormal return dispersion when mid-to-large UK firms announced their interim or final earnings over the period of 1984–2005 and found strong empirical evidence supporting an abnormal dispersion of returns on announcement dates. Patton and Verardo (2009) investigated constituent stocks of the S&P 500 index from 1996 to 2006 and found that the betas of stocks increase significantly on the days of quarterly earnings announcements and revert to their mean two to five days later.

Cready and Gurun (2010) examined quarterly earnings announcements in the US from 1973 to 2006 and identified a negative relationship between the announcement data and aggregate market returns. They also found some evidence that the negative relationship between earnings announcements and market returns persists beyond the announcement period. A similar study conducted by Savor and Wilson (2016) to analyze the quarterly earnings announcements of NYSE, NASDAQ and AMEX stocks from 1974 to 2012 found that firms scheduled to report earnings earn an annualized abnormal return of 9.9% and that early (late) announcers earn higher (lower) returns. From a different perspective, Berkman and Truong (2009) analyzed earnings announcements of stocks in the Russell 300 Index for the period 2000–2004 and found that daily returns, volume and volatility around event day 0 are significantly biased if the event dates are not adjusted for after-hours announcements.

Ammann and Kessler (2004) focused on processing information in the Swiss market and pointed out the existence of drift when adapting to new information. They reported significant ARs as soon as four days after the earnings data publication. Prakash (2013) explored the speed and accuracy of incorporating corporate earnings and action into the stock prices from 2008 to 2010 for 15 companies listed in the S&P CNXY Nifty and showed that the market captures the information quickly and leaves no scope for investors to generate abnormal returns. Easton, Gao and Gao (2010) investigated evidence of a predictable drift in stock prices before the earnings announcements of firms that announce their earnings later than other firms in their industry. They concluded that pre-earnings announcement drift, similar to PEAD exists.

Patell and Wolfson (1982) suggest that earnings released outside of regular trading hours receive less attention because traders are less likely to be at work. Thus, the farther the earnings announcement is from regular trading hours, the more likely it is that investors are not at work and are therefore distracted by other activities. DeHann et al. (2015) examined the differential response to earnings announcements released after versus during regular trading hours and find a lower reaction to earnings announcements released after market close relative to earnings announcements released during trading hours and attribute the muted reaction to investor inattention. This is consistent with a stream of literature that suggests that investors may underreact to information (Hong and Stein 1999) because of inattention to, or distraction from, the information (Hirshleifer and Teoh 2003). They also claimed that an immediate but far-reaching consequence of limited attention is that informationally equivalent disclosures may have different effects on investor perceptions, depending on the form of presentation. DellaVigna and Pollet (2009), on the other hand, find a delayed reaction to earnings announcements released on Fridays which supports Investor Inattention Hypothesis.

Odabası (1998) investigated market reaction to earnings announcements on the Istanbul Stock Exchange (ISE) from 1992 to 1995 and found that the mean squared excess return on the announcement day is significantly larger than the average during the non-event period. Saleem and Yalaman (2017) measured the company-level informational shocks based on the jump dynamics of stock prices around earnings announcements on the Turkish stock market for 30 firms listed on the BIST 30 Index from 2005 to 2013 by using high frequency data. They found that there is a discrete jump in the stock price around the announcement days and supported the validation of the PEAD anomaly. They also stated that the cumulative abnormal returns respond significantly to negative earnings data during the event window. Eyupoglu and Bulut (2016) analyzed the effects of different categories of company-specific news on the stock prices of ISE 30 companies from 2003 to 2012 by classifying 2143 announcements into five categories: corporate governance, financial, legal, operational and restructuring. Their findings suggest that investors largely react to operational, financial and restructuring announcements respectively.

Su (2003) examined stock price reactions to changes in earnings per share in the Chinese stock markets and found that domestic A-share investors do not correctly anticipate changes in earnings and fail to adjust to new earnings data quickly enough; however, international B-share investors can predict earnings changes better than A-share investors. Goh and Jeon (2017) examined the presence of PEAD in the Korean stock market over the period 2000–2012 and found that PEAD is both economically and statistically significant, and the drift is larger and more persistent for positive earnings surprise than negative earnings surprise.

Recent studies on other emerging markets also support the PEAD. Iqbal and Mallikarjunappa (2007, 2008, 2010) and Hawaldar (2014) conducted studies on the Indian stock market and found that the market does not immediately react to quarterly earnings announcements, and so provides investors an opportunity to earn ARs. Iqbal and Farooqi (2011) conducted a study on the Karachi Stock Exchange and examined market reaction to earnings announcements by non-financial listed firms from January 2004 to August 2008. They identified that there was no AR post-earnings announcement, but there was evidence that market reaction to bad news was stronger than to good news. Sehgal and Bijoy (2015) examined market reaction around earnings announcements in India from 2002 to 2011 and found significant pre-event and post-event ARs. Dsouza and Mallikarjunappa (2016) examined the significance of quarterly earnings announcements for Bombay Stock Exchange-500 firms by event study and showed that the Indian stock market fails to absorb publically available information and the investors can forecast future returns based on new information. Another study conducted by Harshita et al. (2018) on the Indian market over the period 2002–2017, showed statistically significant PEAD. Their findings were also robust to sub-period analysis.

Similar results are observed for GCC (Gulf Cooperation Council) countries. Hawaldar (2016) analyzed the market reaction to the financial results announcements in 2014 on 30 firms listed in Bahrain Bourse by event study and found significant cumulative average abnormal returns for 30 days prior to and 31 days after the announcement. This finding is also supported by Joseph et al. (2017), who examined annual earnings announcements and market efficiency in Bahrain Bourse for 32 listed firms. They looked at the behavior of average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) 30 days before and 31 days after the event and detected ARs after the announcement. Syed and Bajwa (2018) investigated the market reaction to the quarterly earnings announcements in Saudi

Stock Exchange (Tadawul) from 2009 to 2014 by exploiting event study and found that the market does not bear a semi-strong form of EMH and provided evidence of significant ARs and PEAD around earning announcements. Alhassan et al. (2019) analyzed market reaction to the information content of quarterly earnings announcements for a sample of 145 publicly traded companies in Tadawul over the period 2007–2017 and found that the market reaction for earnings announcements increases over time due to changes in regulatory and technological environment. Sabej and Alshammari (2018) examined the effects of earnings surprises on stock prices in the Kuwait stock market for the years 2010–2013 and confirmed a statistically significant AR around the earnings announcements, further illustrating that the majority of the ARs occur just after the actual announcement itself. Their results also indicated a significant negative AR in the case of negative earnings surprise announcements.

Besides these findings, which are mostly associated with random-walk earnings surprises, there are also some studies that examine whether and how analyst quality influences the magnitude of the PEAD (Ayers et al. 2011; Cheng et al. 2009; Doyle, Lundholm and Soliman 2006; Lerman et al. 2007; Livnat and Mendenhall 2006; Zhang 2008). These studies mainly argue that desirable analyst quality can assist investors in efficiently processing earnings information and mitigate underreaction to earnings surprises, and therefore reduce the magnitude of the PEAD. Then, a trading strategy that longs stocks in the highest quintile of earnings surprises and shorts stocks in the lowest quintile of earnings surprises within the lowest quintiles of these desirable analyst attributes may yield hedge portfolio returns superior to those based on earnings surprises alone. Although this may be an important attribute worth to consider, we did not use analysts' forecasts as a predictor of the expected earnings due to there being a limited number of analysts' forecasts available for BIST companies other than BIST 30, and we did not document a drift associated with analyst-forecast-based earnings surprises, which may be stated as a limitation for that study.

2.2 Research hypotheses

Stock prices are ultimately formed by the convergence of the expectations of investors and their behavior. They consider financial filings of companies and are likely to underreact (overreact) to bad (good) news. As a result, pre- or post-earnings announcement drift may occur on negative or positive unexpected earnings. Kothari (2001) claims that the PEAD appears to be incremental to a long list of anomalies that are inconsistent with the joint hypothesis of market efficiency and an equilibrium asset-pricing model. It may exist because of information uncertainty, real-world frictions and the market's failure to revise its expectations of future earnings from current earnings surprises. Thus, it may lead to the formation of a profitable trading strategy. This phenomenon can be explained with a number of hypotheses, but two competing hypotheses and explanations dominate the debate. The first is the rational explanation and the second comes from the behavioral approach which suggests that investors are irrational. Advocates for the rational and efficient market claim that PEAD can be explained by the inaccuracy of the tools used by researchers to detect the price drift, an inaccuracy which may stem from returns mismeasurement, risk mismeasurement or methodological biases in general. They also attribute importance to such causes for the drift as the rational risk premium and transaction cost. This rational explanation views the price drift anomaly as a compensation for risk associated with shocks in the earnings news, valuation bias or information asymmetry (Dyckman and Morse 1986; Foster et al. 1984; Garfinkel and Sokobin 2006; Tutuncu 2018, 2019).

In fact, the main theoretical perspectives that have affected the development of stock price responses to earnings announcements are: the random walk theory, efficient market hypothesis (EMH) and signaling theory. We assume that if the market is efficient, AARs and CAARs should be close to zero. To mention briefly, EMH is based on the theory that the security prices in the financial markets reflect all available information. In this sense, the efficient market prices always remain "correct" and the real cash flow and the real risk can only affect the market price. Another argument supporting market efficiency is that the stock prices follow a "random walk". The random walk theory is used to explain the movements that cannot be predicted. Thus, the changes in the stock prices are unpredictable. Finally, signaling theory claims that strong form EMH does not hold if insiders in a firm have information that the market and other investors do not have. It assumes that information is not equally available to all parties at the same time and thus, there exists information asymmetry. For this research, the main motivation of financial statements filings for companies is signaling and to discover the effect of earnings announcements on the stock returns. This is so simply because the financial decisions of the corporations are signals that are sent by managers to investors. Thus, when a company announces quarterly financial statements it creates a signal in the market.

Combining the theoretical expositions and previous literature, it is possible to infer that an under or overreaction bias may be present in the Turkish stock market. Thus, stock prices of the companies listed on Borsa Istanbul may show consistent or temporary abnormal returns surrounding financial filings dates depending on the impact of regulatory changes on disclosure policy. Thus, we propose the following hypotheses for the research question:

Hypothesis 1: The average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) are equal to zero.
Hypothesis 2: There is randomness in AARs and CAARs.

Hypothesis 3: No significant difference exists between positive and negative AARs and CAARs.

3 Background on financial statements filings, data and methodology

3.1 Financial statements disclosure in Borsa Istanbul (BIST)

The BIST is a self-regulatory entity in the form of a joint stock company that covers all the exchanges operating in Turkey. A wide variety of instruments are traded on the BIST, including stocks, ETFs, government bonds, treasury bills, corporate bonds, sukuk, derivative instruments, foreign securities (eurobonds issued by the Turkish Treasury) and precious metals. As of December 31, 2017, 414 companies are listed on the BIST and the market capitalization is USD 250 billion.

This section provides consecutive regulations designed by the Capital Market Board (CMB) of Turkey to aid investors in getting timely financial information and reducing information awareness costs. According to the Turkish regulations, publicly listed companies must prepare their interim financial statements every quarter, semi-annually and every nine months in accordance with the Turkish Accounting Standards and the CMB. Yearly and semi-annual financial statements must be approved by independent auditing firms. The firms should file their interim financial statements electronically to the public via the Public Disclosure Platform (PDP) within either:

- 30 days following the end of the relevant interim period when they are not required to prepare consolidated financial statements.
- 40 days following the end of the relevant interim period when they are required to prepare consolidated financial statements.

The CMB has mandated the use of the PDP since June 2009. The main aim is to facilitate the processing of financial information, and any other material events for investors. PDP covers over 749 companies, and 773 funds. Investors can access the disclosures of companies online. Before the PDP, companies disseminated their financial statements to the BIST at the end of market closure and the BIST provided this information to the public through its daily bulletin or trading screens on the next day. After the PDP, the companies were initially allowed to release their financial statements intra-day, from June 2009 to March 2013, and then, they were only allowed to file their financial statements at the end of closing session.

3.2 Data and methodology

We use corporate financial statements releases to investigate the interaction of financial reporting and market reaction. The sample consists of the BIST 100 companies. However, we included 90 firms in the cross-sectional analysis to work with balanced panel data. We excluded ten firms because of missing data. Table 11 in "Appendix" gives total assets, equity and market capitalization of companies. The total market capitalization of the firms is USD 152 billion as of March 31, 2017. While 61 of these companies operate in non-financial industries, 29 of them are in the financial industry. According to the market capitalization, 23 of the companies are small size, 44 of them are medium-size and 23 of them are large-size.

We analyzed data for each quarter from 2003 to 2017. We obtained the daily price data for abnormal return calculations from the BIST and detailed filing time data from the PDP. We calculated the daily return for the BIST 100 and equity prices as the logarithmic change in the value of the index or equity compared with the previous day's closing value.

$$R_{it} = ln\left(\frac{P_{it}}{P_{it-1}}\right) \tag{1}$$

Different from the previous studies in the literature, we mainly focused on policy changes and its effects on PEAD. We constructed two groups of portfolios. The first group was created according to time period and the second one was created according to the positive or negative earnings surprises within each sub-period.

Further, we divide the data set into three sub-periods to examine the impact of the regulatory policy changes about the disclosure timing and way of release of quarterly financial statements on the stock prices. The three time slots are summarized below:

1. 2003/06–2009/03, where the companies were disseminating their financial statements to BIST and BIST, which disclosed them to the public through its daily bulletin and trading screens.
2. 2009/06–2013/03, where the companies were allowed to release their financial statements intra-day through the PDP.
3. 2013/06–2017/03, where the companies are required to release their financial statements through the PDP only at the end of the closing session.

Before the PDP, filings submitted were stored overnight and became available to the market simultaneously the next day at the opening session. Thus, there was a certain time lag for financial statements to be ready for publication into the bulletin and through the market screen. This created a decrease of information flow throughout the night and an information overload in the morning, decreasing the attention of investors per filing. After the PDP, companies directly disseminate these filings to the market without the intervention of BIST.

To conduct the analysis, we used an event study; this is a standard approach employed to estimate the effect of new information on the market value of a security. The event under examination is the quarterly financial statement releases by listed companies. The data consists of 4981 quarterly filings. To calculate abnormal returns (ARs), we use three different methods, namely mean-adjusted model, market-adjusted model and market model. Across alternative methods, both the bias and precision of the expected return measure can differ, and this may affect the properties of abnormal return measures. When we use daily data, the estimation sample period typically changes between 100 and 250 trading days. For our case, we define an estimation period of 80 days to prevent overlapping of quarterly financial statements filings.

In the first method, we measure excess daily returns by the mean-adjusted approach. The date of the event is $t=0$, the mean-adjusted returns model is estimated over 80 days, from $t=-90$ (T_2) to $t=-10$ (T_1) relative to the event date.[1] The event period is not itself included in the estimation period to prevent the event from influencing the parameter estimates. The main event under investigation is the event date itself ($t=0$); the time subscript refers to event-time rather than calendar-time. We take the event window of 11 trading days (including day zero as the event day), 10 trading days prior to the filing date, i.e., days − 10 to − 1, 10 trading days after the filing date i.e., days + 1 to + 10. t represents the time, i represents the firm.

$$AR_{it} = R_{it} - \overline{R} \tag{2}$$

$$\overline{R} = \frac{1}{(T_2 - T_1 + 1)} \sum_{t=T1}^{T2} R_t \tag{3}$$

In the second method, we measure excess daily returns by the market-adjusted model. In this model, we calculate the abnormal return as the difference between stock return and market return (R_{mt}). R_{mt} is the return on the BIST100 index for day t.

$$AR_{it} = R_{it} - R_{mt} \tag{4}$$

Finally, the market model assumes a linear relationship between the return of any security to the return of the market portfolio. In the market model, the α_i, and β_i of each stock was estimated over 80 days, from $t=-90$ to $t=-10$ relative to the event date. With the estimates of α_i, and β_i, one can predict a "normal" return during the days covered by the event window. The difference between the actual return and the predicted normal return, referred to as the abnormal return, is then calculated as:

$$AR_{it} = R_{it} - \left(\alpha_i + \beta_i R_{mt}\right) \tag{5}$$

To measure the statistical significance of the event period, we compute ARs by using the test statistics described by Brown and Warner (1985). We used a standardized abnormal return (SAR), where the abnormal return of each security was normalized by its estimation period standard deviation for the mean-adjusted model and market-adjusted model.

$$SAR_{it} = \frac{AR_{it}}{SD(AR_{it})} \tag{6}$$

The standard deviation, $SD(AR_t)$, of each abnormal return was then calculated as:

[1] The decision on the size of the event window is subjective and changes from one study to another. In this study, we define it according to the frequency of data: quarterly.

$$\sigma(AR_{it}) = \sqrt{\frac{1}{T_2 - T_1} \sum_{t=T_1}^{T_2} AR_{it}^2} \tag{7}$$

In addition to the mean-adjusted and market-adjusted models, we also used the standard error of the regression of the market model to compute the t statistic for each abnormal return. We have N firms and we define average abnormal returns across firms for each separate day *t* during the event window as:

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} \tag{8}$$

We then calculated the test statistics as:

$$t_{stat} = \frac{AAR_t}{(\sigma_{AR})/\sqrt{N}} \tag{9}$$

In order to determine the magnitude of ARs over the entire event window, we also calculate firm-specific cumulative abnormal returns (CARs), and overall cumulative average abnormal returns (CAARs), which are defined as follows:

$$CAR_t = CAR_{t-1} + AR_t \tag{10}$$

$$CAAR_t = CAAR_{t-1} + AAR_t \tag{11}$$

where CAR_t = cumulative abnormal return at time t; CAR_{t-1} = cumulative abnormal return at time t−1; AR_t = abnormal return at time t; $CAAR_t$ = cumulative average abnormal return at time t; $CAAR_{t-1}$ = cumulative average abnormal return at time t−1; AAR_t = average abnormal return at time t.

The significance of these overall cumulative abnormal t statistic calculations is defined as follows:

$$t_{stat} = \frac{CAAR_t}{(\sigma_{CAR})/\sqrt{N}} \tag{12}$$

The specific null hypothesis to be tested is whether the AAR_t and $CAAR_t$ at time *t* is equal to zero. The null hypothesis is rejected if the test statistic exceeds a critical value ± 1.96. Rejecting the null hypothesis would indicate that there is a non-zero abnormal return associated with the event.

In addition to parametric tests, we also run non-parametric tests to test the hypothesis. We tested the randomness in the behavior of AARs and CAARs by using runs test. The runs test, developed by Levene (1952), is an approach to determine whether successive price changes are independent. The null hypothesis for the runs test is that the observed series for AARs and CAARs is a random series. We calculated the runs test by the following formula:

$$\mu_r = \left(\frac{2n_1 n_2}{n_1 + n_2}\right) + 1 \tag{13}$$

$$\sigma_r = \sqrt{\frac{2n_1 n_2(2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}} \tag{14}$$

$$t_{runs} = \frac{r - \mu_r}{\sigma_r} \tag{15}$$

where μ_r is the mean number of runs, n_1 = number of positive AARs or CAARs, n_2 = number of negative AARs or CAARs, r = number of runs (actual sequence of counts).

To analyze the market reaction to the filings, we also run a sign test. Under the null hypothesis in the sign test, it is equally probable that the AARs or CAARs will be positive or negative. If the null hypothesis is that there is a positive AR associated with a given event, the null hypothesis is H_0: $p \leq 0.5$ and the alternative is H_a: $p > 0.5$ where $p = pr$ [AAR or CAAR ≥ 0.0]. To calculate the test statistic, we need the number of cases where the abnormal return is positive, N^+, and the total number of cases, N (MacKinlay 1997).

$$t_{sign} = \left[\frac{N^+}{N} - 0.5\right]\frac{\sqrt{N}}{0.5} \sim N(0, 1) \tag{16}$$

4 Empirical findings

In the empirical analysis, we focus on investigating the difference in ARs for filing of financial statements when there was no PDP and, when there is PDP for intra-day versus after market closure. We initially test whether releasing before and after the PDP are significantly associated with ARs. Then, we examine each sub-period separately to discover the differential market reactions in response to regulatory policy changes.

4.1 Descriptive statistics

When we run the analysis in the market model, we observe significant AR and CAR on the event day and after the release date. The results in Table 1 show that there are significant ARs and CARs throughout the days surrounding financial statements filings. This result rejects Hypothesis 1. In parallel to PEAD, ARs shift downwards in the days following the releases (the large part occurring within the first 4 days), followed by reversal corrections. However, when we compare these results with those of the other two models, namely mean-adjusted and market-adjusted models, we

Table 1 Descriptive statistics for ARs and CARs for (2003/06–2017/03)

Days	Market model			
	AR	t stat	CAR	t stat
Day-10	0.0000	0.0845	0.0011	0.5885
Day-9	0.0002	0.3176	0.0011	0.6028
Day-8	– 0.0004	0.6817	0.0009	0.5688
Day-7	– 0.0001	– 0.1693	0.0013	0.9705
Day-6	– 0.0002	– 0.4395	0.0014	1.0461
Day-5	– 0.0001	– 0.2305	0.0016	1.3110
Day-4	0.0000	0.1205	0.0017	1.5386
Day-3	0.0008	2.0450	0.0017	1.6809
Day-2	0.0005	0.9991	0.0009	1.0389
Day-1	– 0.0004	– 0.9499	0.0004	0.6569
Day-0	0.0008	2.0500*	0.0008	2.0500*
Day 1	– 0.0020	– 3.5465*	– 0.0012	– 1.5888
Day 2	– 0.0019	– 4.7262*	– 0.0031	– 3.4201*
Day 3	– 0.0013	– 2.5670*	– 0.0044	– 3.9681*
Day 4	– 0.0009	– 2.1324*	– 0.0053	– 3.9214*
Day 5	0.0001	0.1832	– 0.0052	– 3.6433*
Day 6	0.0005	1.3213	– 0.0047	– 3.1060*
Day 7	0.0003	0.7394	– 0.0045	– 2.6435*
Day 8	– 0.0002	– 0.4994	– 0.0046	– 2.5047*
Day 9	– 0.0003	– 0.7034	– 0.0049	– 2.3897*
Day 10	0.0006	1.4127	– 0.0043	– 1.9476

*Significance at 5% level

observe certain differences.[2] The results are in line with other studies conducted in emerging markets (Mlonzi et al. 2011; Saleem and Yalaman 2017). It seems that the policy makers should improve the market environment to increase efficiency since it is currently possible to get significant ARs and CARs both on the event day and after the release date.

These findings could be attributable to different factors, as suggested in different studies held by Timmermann (1993), Bartov (1992) and Ball and Bartov (1996). Investors tend to underreact to news when they are not sure whether the news is a result of a structural shift. Similarly, Bartov et al. (2000) and Narayanamoorthy (2006) pointed out that the inefficient use of information because of poor disclosure readability, accounting conservatism or simply unsophisticated investors may lead to PEAD or similar anomalies.

To make a robustness check, we constructed portfolios for the BIST 30 and BIST 70 (100-30) companies separately to see whether the anomalies only exist in less actively traded companies within the BIST 100 or in all BIST 100 companies. The

[2] The results are not reported in the tables, but will be given upon request.

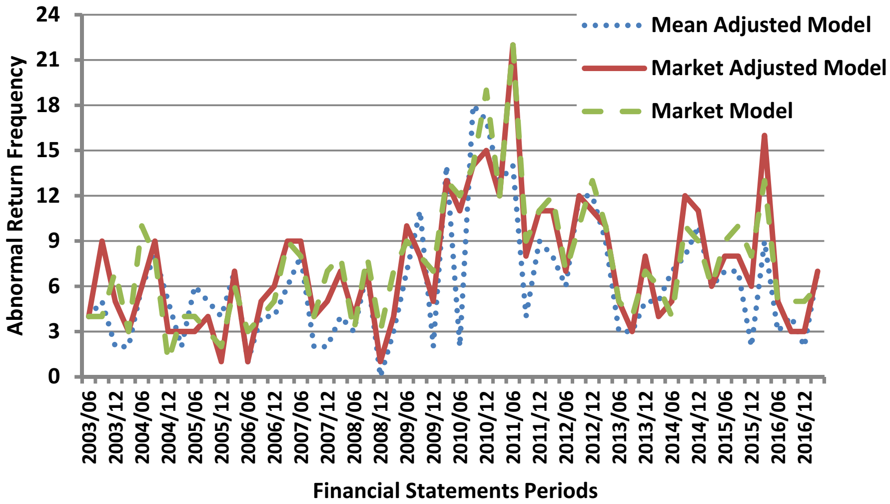

Fig. 1 Frequency of quarterly ARs in mean-adjusted, market-adjusted and market models

results[3] show that there is no differentiation among these two groups and, almost all of the BIST 30 companies, more or less, witnessed similar anomalies in different periods under study. This outcome is interesting since one may expect to observe anomalies more in non-BIST 30 stocks. It may also suggest that market inefficiency is not a result of the relative liquidity of stocks, but of the tendency to buy the rumor and sell the news.

4.2 Impact of regulatory policy changes on the timing of release

When we run the same analysis by dividing the sample into three sub-periods based on regulatory policy changes for financial statements filings, we obtain different results. Our first observation is that the frequency of ARs changes throughout the sample period in terms of number of companies, most notably increasing from 2010 to 2012. After 2013, we still notice peaks and troughs in some periods, such as in September 2014, December 2014 and March 2016, but to a lesser extent. Figure 1 denotes the frequency of quarterly ARs on the event day from 2003 to 2017. The first and most likely explanation for the upward trend in the frequency from 2009 to June 2013 may be the launching of the PDP; during this period, the firms were allowed to file their financial statements intra-day electronically through PDP, which may have offered advantages for some market players, i.e. institutional investors. On June 13, 2013, a policy change took place by a new Communiqué issued by the CMB (2013) and it obliged the BIST companies to release their financial statements after the market closure. This policy change provided an expanded opportunity for

[3] The results are not reported in the tables, but will be given upon request.

Table 2 Descriptive statistics for cumulative abnormal returns

Days	2003/06–2009/03				2009/06–2013/03				2013/06–2017/03			
	AR	t-stat	CAR	t-stat	AR	t stat	CAR	t stat	AR	t stat	CAR	t stat
Day-10	0.0010	1.6696	0.0031	1.0162	− 0.0011	− 1.5084	− 0.0011	− 0.4082	− 0.0003	− 0.4903	0.0001	0.0564
Day-9	0.0010	1.2273	0.0022	0.7760	− 0.0005	− 0.4245	− 0.0001	− 0.0408	− 0.0005	− 0.7191	0.0004	0.1661
Day-8	− 0.0003	− 0.2332	0.0014	0.5285	− 0.0001	− 0.0605	0.0003	0.1309	− 0.0009	− 1.8633	0.0009	0.4215
Day-7	0.0003	0.4081	0.0015	0.7962	0.0005	1.0667	0.0003	0.1342	− 0.0012	− 2.1694*	0.0018	0.8474
Day-6	− 0.0010	− 1.1038	0.0011	0.6392	0.0018	2.3957*	− 0.0002	− 0.0723	− 0.0010	− 1.6188	0.0030	1.4573
Day-5	− 0.0004	− 0.6608	0.0020	1.2204	− 0.0003	− 0.5407	− 0.0018	− 0.9199	0.0007	0.9956	0.0040	2.1018*
Day-4	0.0000	0.0361	0.0024	1.5654	− 0.0006	− 0.7732	− 0.0015	− 0.9614	0.0007	1.2824	0.0033	1.7237
Day-3	0.0012	1.8586	0.0023	1.6234	0.0003	0.5060	− 0.0010	− 0.8587	0.0006	0.8608	0.0026	1.5314
Day-2	0.0008	0.9958	0.0013	1.0707	0.0002	0.3279	− 0.0012	− 1.3022	0.0001	0.1632	0.0021	1.4478
Day-1	− 0.0007	− 0.8703	0.0006	0.6081	− 0.0011	− 1.6359	− 0.0014	− 2.2761*	0.0007	1.0750	0.0020	2.0363*
Day-0	0.0014	1.9956*	0.0014	1.9956*	− 0.0005	− 0.6901	− 0.0005	− 0.6901	0.0013	2.1250*	0.0013	2.1250*
Day 1	− 0.0002	− 0.2122	0.0010	0.9844	− 0.0032	− 3.7297*	− 0.0034	− 3.0246*	− 0.0036	− 4.8947*	− 0.0022	− 2.0156*
Day 2	− 0.0020	− 2.6618*	− 0.0006	− 0.4488	− 0.0019	− 2.5995*	− 0.0051	− 4.3243*	− 0.0019	− 3.2899*	− 0.0040	− 3.4403*
Day 3	− 0.0013	− 1.3835	− 0.0017	− 1.0259	− 0.0018	− 2.1585*	− 0.0067	− 4.8398*	− 0.0007	− 1.1211	− 0.0048	− 2.8440*
Day 4	− 0.0010	− 1.2656	− 0.0025	− 1.2009	− 0.0011	− 1.5235	− 0.0077	− 4.4619*	− 0.0005	− 1.0573	− 0.0052	− 2.7597*
Day 5	0.0000	− 0.0486	− 0.0025	− 1.2069	0.0005	0.5895	− 0.0072	− 3.3947*	− 0.0002	− 0.2866	− 0.0055	− 2.4270*
Day 6	0.0010	1.6611	− 0.0017	− 0.7599	0.0004	0.6190	− 0.0069	− 2.9479*	− 0.0002	− 0.4060	− 0.0057	− 2.4764*
Day 7	0.0008	1.2635	− 0.0010	− 0.4246	− 0.0004	− 0.4576	− 0.0072	− 2.6055*	0.0002	0.3284	− 0.0055	− 2.2719*
Day 8	− 0.0006	− 1.1356	− 0.0014	− 0.5420	0.0001	0.1692	− 0.0071	− 2.4445*	0.0002	0.4039	− 0.0053	− 1.9917*
Day 9	− 0.0002	− 0.3178	− 0.0016	− 0.5236	− 0.0007	− 1.0613	− 0.0077	− 2.4653*	0.0001	0.1390	− 0.0052	− 1.7782
Day 10	0.0012	1.5439	− 0.0006	− 0.1890	− 0.0005	− 1.1126	− 0.0082	− 2.5719*	0.0007	1.3310	− 0.0046	− 1.4890

*Significance at 5% level

market participants to evaluate the disclosed financial statements over a relatively longer time span.

Our second striking observation is that while there is no significant ARs and CARs either before or after the filing date during the period, where there is no PDP (supporting Hypothesis 1), we observe significant AR on the release date (0.0014, t stat 1.9956 in Table 2, rejecting Hypothesis 1). The stock market seems to react informationally efficiently before the introduction of PDP, while the efficiency is somehow distracted in the following periods, where there is PDP. One may explain the results derived for the first period by the limited investor attention hypothesis, which states that investors pay less attention to individual filings when many of them are released simultaneously on the same day (Cuñat and Groen-Zu 2017). The investors' performance suffers since they try to process multiple sources of information simultaneously (Hirshleifer et al. 2009). Event-occurrence during non-trading hours may be another reason. Finally, in many emerging markets, investors still prefer and feel comfortable analyzing the information in written form rather than through the websites. This may stem from a lack of technological literacy among investors.

As to the second and third time episodes, where the PDP is in use, we observe significant ARs and CARs on post-announcement in both periods (rejecting Hypothesis 1). While the PEAD continues to exist until the end of the fourth day when companies release their financial statements intra-day, it only lasts two days when the companies start releasing their financial statements at the market closure. A potential explanation for this outcome may be that intra-day announcement allows professional market players to more precisely review and evaluate the financial information.

When we tested the randomness in the behavior of ARs and CARs using the runs test, we found that the observed excess return series are random. The *t-runs* statistics in Tables 8 and 9 in "Appendix" shows insignificant values (supporting Hypothesis 2) for all periods and for all portfolios (positive and negative surprises portfolios). When we analyze the market reaction to the filings in different time spans in the market model by using sign test, we observe significant AR on the event day and after the release date. Tables 8 and 9 in Appendix" present *t-sign* statistics for ARs. Thus, one may conclude that ARs are random and there is a significant difference between the number of positive and negative ARs for all periods and for all portfolios (rejecting Hypothesis 3).

4.3 Earnings surprises

The market dynamics for positive and negative news may be different from each other. Therefore, we classify the announcement events as positive and negative surprises. We define net income of the firm as the quarterly earnings figure. Announcements were classified as positive surprises if the current quarterly earnings figure is higher than the previous year`s inflation-adjusted value, otherwise as negative

Table 3 Results for positive surprises

Days	2003/06–2009/03				2009/06–2013/03				2013/06–2017/03			
	AR	t stat	CAR	t stat	AR	t stat	CAR	t stat	AR	t stat	CAR	t stat
Day-10	0.0026	0.6222	0.0014	1.6259	0.0004	0.0988	− 0.0013	− 1.4366	0.0033	1.1631	0.0000	0.0742
Day-9	0.0012	0.2992	0.0009	0.9250	0.0018	0.4431	− 0.0003	− 0.2365	0.0032	1.1856	− 0.0015	− 1.7380
Day-8	0.0003	0.0821	− 0.0013	− 1.1599	0.0021	0.5758	− 0.0010	− 1.1041	0.0048	1.8004	0.0000	− 0.0894
Day-7	0.0016	0.5943	0.0010	1.0768	0.0031	0.8532	− 0.0006	− 1.0451	0.0048	1.8784	− 0.0008	− 1.3720
Day-6	0.0005	0.1589	− 0.0015	− 1.1924	0.0040	1.2323	0.0022	2.2553*	0.0065	2.4772*	− 0.0013	− 1.9421
Day-5	0.0020	0.7925	− 0.0006	− 0.7485	0.0017	0.6936	− 0.0006	− 0.6923	0.0078	3.3656*	0.0017	2.3329*
Day-4	0.0026	1.1595	− 0.0004	− 0.4792	0.0023	1.1215	− 0.0007	− 0.9083	0.0061	2.9684*	0.0011	1.6926
Day-3	0.0030	1.5583	0.0016	1.9989	0.0031	1.7345	0.0001	0.1305	0.0050	2.7532*	0.0006	1.0093
Day-2	0.0014	0.8577	0.0007	0.6792	0.0029	2.4525*	0.0003	0.3028	0.0044	2.8278*	0.0004	0.5149
Day-1	0.0007	0.5421	− 0.0006	− 0.6331	0.0027	2.3247*	− 0.0008	− 0.7472	0.0040	3.4868*	0.0012	1.8190
Day-0	0.0013	1.5814	0.0013	1.5814	0.0034	3.7763*	0.0034	3.7763*	0.0027	2.8562*	0.0027	2.8562*
Day 1	0.0066	4.1205*	0.0053	3.9342*	0.0031	2.0418*	− 0.0003	− 0.3238	0.0054	3.7155*	0.0026	1.9918*
Day 2	0.0051	2.4316*	− 0.0015	− 1.5672	0.0017	1.0968	− 0.0015	− 1.6885	0.0038	2.1059*	− 0.0016	− 1.6697
Day 3	0.0033	1.3429	− 0.0018	− 2.0511*	0.0005	0.2328	− 0.0012	− 1.0994	0.0036	1.6745	− 0.0002	− 0.2729
Day 4	0.0030	0.9764	− 0.0003	− 0.2487	− 0.0017	− 0.7420	− 0.0022	− 2.3723*	0.0027	1.0972	− 0.0009	− 1.4098
Day 5	0.0031	1.0388	0.0001	0.0812	− 0.0029	− 1.1099	− 0.0012	− 1.3825	0.0030	1.0466	0.0004	0.4466
Day 6	0.0038	1.3211	0.0007	0.8662	− 0.0022	− 0.7140	0.0008	0.8199	0.0033	1.0883	0.0003	0.3318
Day 7	0.0048	1.3986	0.0010	1.3563	− 0.0026	− 0.7719	− 0.0004	− 0.4735	0.0038	1.1371	0.0005	0.7696
Day 8	0.0047	1.1994	− 0.0001	− 0.2025	− 0.0027	− 0.8100	− 0.0001	− 0.1098	0.0038	1.0947	0.0000	− 0.0112
Day 9	0.0042	1.0106	− 0.0005	− 0.6696	− 0.0035	− 1.0356	− 0.0008	− 1.1155	0.0042	1.0931	0.0003	0.4577
Day 10	0.0053	1.2023	0.0012	1.8211	− 0.0037	− 1.0235	− 0.0002	− 0.2571	0.0045	1.0519	0.0004	0.4139

*Significance at 5% level

Table 4 Results for negative surprises

Days	2003/06–2009/03				2009/06–2013/03				2013/06–2017/03			
	AR	t stat	CAR	t stat	AR	t stat	CAR	t stat	AR	t stat	CAR	t stat
Day-10	0.0051	1.3416	0.0007	0.8281	– 0.0046	– 1.6441	– 0.0011	– 1.1074	– 0.0035	– 1.0982	– 0.0005	– 0.5022
Day-9	0.0044	1.2533	0.0012	1.3082	– 0.0035	– 1.3765	– 0.0007	– 0.5988	– 0.0029	– 0.9009	0.0004	0.4790
Day-8	0.0032	1.0159	0.0008	0.5892	– 0.0028	– 1.0386	0.0010	0.7783	– 0.0033	– 1.1276	– 0.0018	– 2.1964*
Day-7	0.0024	0.9175	– 0.0005	– 0.5506	– 0.0038	– 1.3733	0.0015	1.6899	– 0.0014	– 0.5497	– 0.0017	– 1.9784
Day-6	0.0032	1.3770	– 0.0003	– 0.2822	– 0.0051	– 1.7386	0.0011	1.0692	0.0003	0.1248	– 0.0004	– 0.4789
Day-5	0.0035	1.5077	0.0002	0.2331	– 0.0061	– 2.2333*	– 0.0001	– 0.1177	0.0007	0.3082	– 0.0001	– 0.1091
Day-4	0.0033	1.4975	0.0005	0.5267	– 0.0060	– 2.9124*	– 0.0004	– 0.3393	0.0008	0.3631	0.0003	0.3984
Day-3	0.0028	1.2373	0.0008	0.9862	– 0.0057	– 3.5219*	0.0003	0.3321	0.0005	0.2554	0.0005	0.6036
Day-2	0.0020	0.9769	0.0006	0.5771	– 0.0059	– 4.6275*	0.0003	0.3641	0.0000	– 0.0102	0.0001	0.0883
Day-1	0.0014	0.8375	– 0.0004	– 0.3243	– 0.0063	– 6.2271*	– 0.0016	– 1.5777	– 0.0001	– 0.0810	0.0002	0.2278
Day-0	0.0017	1.5324	0.0017	1.5324	– 0.0047	– 5.3951*	– 0.0047	– 5.3951*	– 0.0003	– 0.3405	– 0.0003	– 0.3405
Day 1	– 0.0045	– 2.4258*	– 0.0062	– 4.3949*	– 0.0113	– 6.5278*	– 0.0066	– 4.8228*	– 0.0107	– 6.6162*	– 0.0104	– 7.6487*
Day 2	– 0.0073	– 3.2285*	– 0.0029	– 3.1657*	– 0.0136	– 6.8264*	– 0.0023	– 2.2889*	– 0.0125	– 6.5908*	– 0.0018	– 2.0083*
Day 3	– 0.0082	– 3.0434*	– 0.0008	– 0.6378	– 0.0160	– 8.0683*	– 0.0024	– 3.3490*	– 0.0133	– 5.0493*	– 0.0008	– 0.7319
Day 4	– 0.0097	– 3.3723*	– 0.0016	– 1.5339	– 0.0163	– 6.3627*	– 0.0002	– 0.2372	– 0.0137	– 5.1562*	– 0.0003	– 0.5184
Day 5	– 0.0097	– 3.1478*	0.0000	0.0007	– 0.0139	– 5.1283*	0.0024	2.5461*	– 0.0145	– 5.0622*	– 0.0008	– 1.1481
Day 6	– 0.0084	– 2.4515*	0.0013	1.2778	– 0.0138	– 5.1253*	0.0001	0.0766	– 0.0151	– 5.1694*	– 0.0007	– 0.9515
Day 7	– 0.0078	– 2.1684*	0.0007	0.7473	– 0.0142	– 4.4252*	– 0.0003	– 0.3735	– 0.0153	– 5.0678*	– 0.0002	– 0.2042
Day 8	– 0.0090	– 2.2517*	– 0.0013	– 1.6120	– 0.0140	– 3.9190*	0.0002	0.2565	– 0.0147	– 4.0991*	0.0006	0.6434
Day 9	– 0.0094	– 1.9650*	– 0.0004	– 0.3296	– 0.0146	– 3.5884*	– 0.0006	– 0.6954	– 0.0148	– 3.7057*	– 0.0001	– 0.1062
Day 10	– 0.0080	– 1.5522	0.0013	1.2364	– 0.0154	– 3.9005*	– 0.0008	– 1.2980	– 0.0138	– 3.3286*	0.0009	2.0127*

*Significance at 5% level

surprises. Tables 3 and 4 report the results for positive and negative surprises respectively for the market model.[4]

The results are quite striking. For positive surprises, while we observe PEAD only for a limited number of days before the PDP (rejecting Hypothesis 1), this picture changes after the introduction of PDP, where we observe both pre- and post-announcement drifts (rejecting Hypothesis 1). More interestingly, in the last period, we detect pre-announcement drift to a large extent (rejecting Hypothesis 1). This outcome provokes us to ask whether there may be insider trading in some stocks during this period. As to the negative surprises, the picture is completely different. We observe PEAD for nine consecutive days before the PDP, and this continues to be the case in the second period but is complemented by pre-announcement drift starting five days before the release and the release date itself. Interestingly enough, we only observe PEAD in the last period and it differs from the results that we obtain for positive surprises. This may be due to the appeal of investors towards positive surprises as the latter gives a signal of a price increase.

4.4 Cross-sectional model

It may be that the results for ARs may be due to other factors such as firm size, industry, the magnitude and sign of earnings surprises, independent audit, the number of releases or the release day of the week. To provide additional insight into the analysis, we highlight the following questions that may help us fine-tuning market reaction in response to financial statements filings.

1. Does the firm size have an effect on ARs?
2. Does the type of news in earnings announcements have any effect on ARs?
3. Does industry (sector) differentiation (financial versus non-financial) have any effect on ARs?
4. Does it make any difference if the financial statements are audited or not? (In Turkey, only annual and semi-annual financial statements have to be audited)
5. Does the number of releases on the announcement day have any effect on ARs (Distraction effect)?
6. Does it make any difference if the financial statements filings occur on Friday (Friday effect)?

One should note that there are different measures in the literature to quantify earnings surprises. The traditional measure of earnings surprise is the difference between realized earnings and the consensus forecast. Since it is hard to get analyst forecast data for developing countries, including Turkey, we used the net income in the same quarter of the prior year as the benchmark point to calculate earnings

[4] The results for the mean adjusted model and the market adjusted model are not reported, but will be given upon request.

surprise. Announcements are classified as positive surprises if the current quarterly earnings figure is higher than last year`s inflation-adjusted value.

To measure the sensitivity of the results around the financial statements filing date, we calculate ARs and CARs surrounding the event day. The cross-sectional model used to explain the size of the ARs and CARs is given below:

$$\begin{aligned} AR_{it} = {} & \beta_0 + \beta_{NEWS} D_{NEWS} + \beta_{SIZE} D_{SIZE} + \beta_{SECTOR} D_{SECTOR} \\ & + \beta_{AUDIT} D_{AUDIT} + \beta_{RANK} D_{RANK} + \beta_{ISFR} D_{ISFR} + \varepsilon_{it} \end{aligned} \tag{17}$$

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_{NEWS} D_{NEWS} + \beta_{SIZE} D_{SIZE} + \beta_{SECTOR} D_{SECTOR} \\ & + \beta_{AUDIT} D_{AUDIT} + \beta_{RANK} D_{RANK} + \beta_{ISFR} D_{ISFR} + \varepsilon_{it} \end{aligned} \tag{18}$$

The variables for the regression equation are as follows:

AR_{it}: Abnormal return on event day for firm *i* in quarter *t; CAR_{it}*: Cumulative abnormal return over a 2-day window from day 0 through day 1 for firm *i* in quarter *t; NEWS*: Indicator dummy variable that equals 1 if the current quarterly earnings figure is higher than last year's inflation-adjusted value, otherwise 0; *SIZE*: Total assets of the firm; *SECTOR*: A binary variable, "0" indicates financial and "1" indicates non-financial sector; *AUDIT*: Indicator dummy variable that equals 1 if the released financial statements are audited or zero if they are not audited; *RANK*: Number of releases deciles; *ISFR*: Indicator dummy variable that equals 1 if the release day is Friday, otherwise 0.

Adding an interaction term to the model may change the interpretation of all coefficients. If there were no interaction terms, one may interpret *NEWS* as the unique effect of positive or negative news on ARs. However, the interaction means that the effect of *NEWS* on ARs is different for different values of *SIZE* and *SECTOR*. An interaction term is added to the model, which controls for the effects of each control variable *SIZE* and *SECTOR* on AR_{it} and CAR_{it}. The empirical model is as follows:

$$\begin{aligned} AR_{it} = {} & \beta_0 + \beta_{NEWS} D_{NEWS} + \beta_{SIZE} D_{SIZE} + \beta_{SECTOR} D_{SECTOR} \\ & + \beta_{AUDIT} D_{AUDIT} + \beta_{RANK} D_{RANK} + \beta_{ISFR} D_{ISFR} \\ & + \beta_{NEWS*SIZE} D_{NEWS*SIZE} + \beta_{NEWS*SECTOR} D_{NEWS*SECTOR} + \varepsilon_{it} \end{aligned} \tag{19}$$

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_{NEWS} D_{NEWS} + \beta_{SIZE} D_{SIZE} + \beta_{SECTOR} D_{SECTOR} \\ & + \beta_{AUDIT} D_{AUDIT} + \beta_{RANK} D_{RANK} + \beta_{ISFR} D_{ISFR} \\ & + \beta_{NEWS*SIZE} D_{NEWS*SIZE} + \beta_{NEWS*SECTOR} D_{NEWS*SECTOR} + \varepsilon_{it} \end{aligned} \tag{20}$$

The decile rank is based on quarterly sorts of financial statements release observations by the number of filings on the release day (following Hirshleifer et al. 2009). On high-news days, RANK = 1.0 and on low-news days, RANK = 0.0. To examine the size of the ARs and CARs in the cross-sectional model, we divide the data set into three sub-periods to reflect the impact of the regulatory policy changes about the timing and method of release of quarterly financial statements on the stock prices.

Table 5 Before the PDP (2003/06–2009/03)

Pooled OLS	Standard errors			Driscoll–Kraay standard errors		
	AR_{it}	CAR_{it}	CAR_{it} *(modified)*	AR_{it}	CAR_{it}	CAR_{it} *(modified)*
β_{NEWS}	− 0.0005702 (0.0010732)	0.0104395 (0.0018868) ***	0.0049871 (0.0044675)	− 0.0005702 (0.0013257)	0.0104395 (0.0022904)***	0.0049871 (0.002374)**
β_{SIZE}	− 6.69e−12 (4.03e−11)	− 2.52e−11 (7.09e−11)	5.07e−11 (1.10e− 0)	− 6.69e−12 (2.36e−11)	− 2.52e−11 (3.00e−11)	5.07e−11 (4.90e−11)
β_{SECTOR}	0.000235 (0.0013828)	− 0.0003793 (0.0024312)	− 0.0048201 (0.0035874)	0.000235 (0.0010295)	− 0.0003793 (0.0018215)	− 0.0048201 (0.0019275)**
β_{AUDIT}	− 0.0011141 (0.0011068)	− 0.0017062 (0.001946)	− 0.0018145 (0.0019446)	− 0.0011141 (0.0011376)	− 0.0017062 (0.0027782)	− 0.0018145 (0.0027577)
β_{RANK}	− 0.0036992 (0.0023258)	− 0.0069496 (0.0040891)*	− 0.0073976 (0.0040896)*	− 0.0036992 (0.0022127)	− 0.0069496 (0.0041927)	− 0.0073976 (0.003967)*
β_{ISFR}	0.0023395 (0.00122)*	0.0034605 (0.002145)	0.0035788 (0.0021438)*	0.0023395 (0.0011147)**	0.0034605 (0.0028534)	0.0035788 (0.0027939)
$\beta_{NEWS*SIZE}$			− 1.12e−10 (1.44e−10)			− 1.12e−10 (5.43e−11)**
$\beta_{NEWS*SECTOR}$			0.0080461 (0.0048687)			0.0080461 (0.0033206)**
β_0	0.0029892 (0.0020341)	− 0.0009075 (0.0035762)	0.0024263 (0.004234)	0.0029892 (0.0017088)*	− 0.0009075 (0.0031082)	0.0024263 (0.0026316)
F, Wald test (model)	0.89	5.79	5.06	1.97	8.62	8.48
Degrees of freedom	1930	1930	1928	23	23	23
R-squared	0.0027	0.0177	0.0206	0.0027	0.0177	0.0206
Sum of squares due to error (SSE)	1.05563538	3.26309233	3.25343795			
Standard errors of the estimates (SEE)	0.02339	0.04112	0.04108	0.0234	0.0411	0.0411
Number of observations	1937	1937	1937	1937	1937	1937

Standard errors in parenthesis. Statistical significance: $* < 0.10, ** < 0.05, *** < 0.01$

Prior to analysis, we first tested whether the assumptions of the regression model were violated. White's (1984) and Breusch-Pagan's (1980) tests were used for heteroscedasticity, Wooldridge's (2002) test was used for autocorrelation and Pesaran's (2004) test was used for cross-sectional dependence. The test results show that the panel exhibits cross-sectional dependence and heteroscedasticity. Therefore, we estimated both a model with cluster-robust standard errors and a model with Driscoll-Kraay (1998) standard errors. Before conducting the regression analysis, we also conducted a panel unit-root test and found that all the variables were stationary.

There are three main estimation methodologies for a panel dataset: the panel OLS, the fixed effects and the random effects. To estimate regression models for the event day AR_{it} and CAR_{it} using panel data, we first conducted a fixed effects model and an F test to see if any of the firm-specific characteristics existed. We failed to reject the null hypothesis and concluded that there were no individual effects and that the pooled OLS model is better. Secondly, we performed the Breusch–Pagan Lagrangian Multiplier test (Breusch and Pagan 1980) for random effects to identify the presence or absence of panel effects. We accepted the null hypothesis. Thus, there is no evidence of significant differences across firms. Therefore, we can run a simple OLS regression. Table 5 shows the results of estimates for the dependent variable AR_{it} and CAR_{it} with a pooled OLS model by employing market model for the period before PDP. Table 6 shows the results of estimates after PDP introduction (before the policy change) and Table 7 gives the results of estimates after the regulatory policy change for the announcement timing.

Before the PDP (Table 5), for dependent variable AR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level for market model ($F = 1.97$ and $p < 0$). We have significant coefficients for only *ISFR*. For dependent variable CAR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level ($F = 8.62$ and $p < 0$). We have significant coefficients for *NEWS*. When we look at the regression results for Eq. (16) ($F = 8.48$ and $p < 0$), we have significant coefficients for *NEWS, SECTOR, RANK, NEWS*SIZE* and *NEWS*SECTOR*. The significant coefficients for interaction terms show that firms in non-financial sectors are more likely to respond to positive announcements compared to those in the financial sector. Similarly, investors are more responsive to positive announcements for small companies. This result is in line with the findings of Foster et al. (1984), and Bernard and Thomas (1989).

During the initial implementation period of PDP (Table 6), for dependent variable AR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level for market model ($F = 80.23$ and $p < 0$). We have significant coefficients for *NEWS*. For dependent variable CAR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level for market model ($F = 88.22$ and $p < 0$). We have significant coefficients for *NEWS*, *SIZE, SECTOR* and *RANK*. When we look at the regression results for Eq. (15) ($F = 47.70$ and $p < 0$), we have significant coefficients for *NEWS, SIZE, NEWS*SIZE* and *NEWS*SECTOR*. The significant coefficients for interaction terms show that the small companies are more responsive to positive announcements. Different from the previous period, firms in the financial sector react more to the positive announcements.

Table 6 During the PDP, before the policy change (2009/06–2013/03)

Pooled OLS	Standard errors				Driscoll-Kraay standard errors			
	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*
β_{NEWS}	0.0081772 (0.0013188)***	0.0141151 (0.0029935)***	0.0140267 (0.0020167)***	0.0169407 (0.004584)***	0.0081772 (0.0010475)***	0.0141151 (0.0015455)***	0.0140267 (0.0019774)***	0.0169407 (0.0029819)***
β_{SIZE}	− 9.63e−12 (2.39e−11)	4.38e−11 (3.26e−11)	2.99e−11 (3.65e−11)	8.15e−11 (5.00e−11)	− 9.63e−12 (1.31e−11)	4.38e−11 (1.84e−11)**	2.99e−11 (1.68e−11)*	8.15e−11 (2.08e−11)***
β_{SECTOR}	− 0.0014342 (0.0016643)	0.0016573 (0.0023525)	− 0.0051536 (0.0025449)**	− 0.0041853 (0.0036023)	− 0.0014342 (0.0011562)	0.0016573 (0.0012823)	− 0.0051536 (0.0017725)*	− 0.0041853 (0.0018291)**
β_{AUDIT}	− 0.001088 (0.00139)	− 0.0010665 (0.0013879)	− 0.0019966 (0.0021255)	− 0.0019902 (0.0021253)	− 0.001088 (0.0011338)	− 0.0010665 (0.0011503)	− 0.0019966 (0.0026782)	− 0.0019902 (0.0027343)
β_{RANK}	− 0.0055058 (0.0030437)*	− 0.0053333 (0.0030403)*	− 0.0133436 (0.0046543)***	− 0.0132758 (0.0046555)***	− 0.0055058 (0.0044769)	− 0.0053333 (0.0043826)	− 0.0133436 (0.0059887)**	− 0.0132758 (0.0059863)**
β_{ISFR}	− 0.0007912 (0.0014839)	− 0.0007907 (0.0014819)	− 0.0013039 (0.0022691)	− 0.0013368 (0.0022692)	− 0.0007912 (0.0027431)	− 0.0007907 (0.0026813)	− 0.0013039 (0.0032254)	− 0.0013368 (0.0032255)
$\beta_{NEWS*SIZE}$		− 1.14e−10 (4.75e−11)**		− 1.10e−10 (7.27e−11)		− 1.14e−10 (2.19e−11)***		− 1.10e−10 (3.02e−11)***
$\beta_{NEWS*SECTOR}$		− 0.0063787 (0.0033088)*		− 0.002234 (0.0050668)		− 0.0063787 (0.0024338)**		− 0.002234 (0.0049)
β_0	0.0004212 (0.0026687)	− 0.0025359 (0.0030043)	0.0016403 (0.0040807)	0.0003042 (0.0046004)	0.0004212 (0.0027249)	− 0.0025359 (0.0024493)	0.0016403 (0.0022941)	0.0003042 (0.0031083)
F, Wald test (model)	7.54	6.50	11.65	9.03	80.23	47.70	88.22	84.19
Degrees of freedom	1484	1482	1484	1482	15	15	15	15
R-squared	0.0296	0.0339	0.0450	0.0414	0.0296	0.0339	0.0450	0.0465
Sum of squares due to error (SSE)	0.957127266	0.952889514	2.23799342	2.23439441				

Table 6 (continued)

Pooled OLS	Standard errors				Driscoll-Kraay standard errors			
	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*
Standard errors of the estimates (SEE)	0.0254	0.02536	0.03883	0.03883	0.0254	0.0254	0.0388	0.0388
Number of observations	1491	1491	1491	1491	1491	1491	1491	1491

Standard errors in parenthesis. Statistical significance: $* < 0.10, ** < 0.05, *** < 0.01$

Table 7 During the PDP, after the policy change (2013/06–2017/03)

Pooled OLS	Standard errors				Driscoll-Kraay standard errors			
	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*
β_{NEWS}	0.003005 (0.0010732)***	0.0070646 (0.0023259)***	0.0155565 (0.0019139)***	0.0195393 (0.0041436)***	0.003005 (0.0015005)**	0.0070646 (0.0027358)**	0.0155565 (0.001644)***	0.0195393 (0.0034189)***
β_{SIZE}	− 8.48e−12 (1.07e−11)	1.33e−11 (1.70e−11)	3.29e−12 (1.92e−11)	6.68e−11 (3.02e−11)**	− 8.48e−12 (9.10e−12)	1.33e−11 (1.38e−11)	3.29e−12 (1.63e−11)	6.68e−11 (1.40e−11)***
β_{SECTOR}	− 0.0009113 (0.0013111)	0.001461 (0.0018496)	0.000802 (0.0023382)	0.0022783 (0.003295)	− 0.0009113 (0.0015146)	0.001461 (0.0021663)	0.000802 (0.0013535)	0.0022783 (0.0022764)
β_{AUDIT}	− 0.0007063 (0.0011391)	− 0.0007489 (0.0011384)	− 0.001076 (0.0020314)	− 0.0011347 (0.0020281)	− 0.0007063 (0.0016081)	− 0.0007489 (0.0016225)	− 0.001076 (0.0021887)	− 0.0011347 (0.0021688)
β_{RANK}	− 0.0001623 (0.00235)	− 0.0001329 (0.0023483)	− 0.0030927 (0.0041908)	− 0.0030292 (0.0041834)	− 0.0001623 (0.0026235)	− 0.0001329 (0.0026869)	− 0.0030927 (0.0049975)	− 0.0030292 (0.0049637)
β_{ISFR}	0.0014282 (0.0013777)	0.0013464 (0.0013773)	0.006539 (0.002457)***	0.006439 (0.0024536)***	0.0014282 (0.001209)	0.0013464 (0.001185)	0.006539 (0.0029111)**	0.006439 (0.0028844)**
$\beta_{NEWS*SIZE}$		− 3.78e−11 (2.17e−11)*		− 1.04e−10 (3.87e−11)***		− 3.78e−11 (1.28e−11)**		− 1.04e−10 (1.26e−11)***
$\beta_{NEWS*SECTOR}$		− 0.0046809 (0.002605)		− 0.0027063 (0.0046408)		− 0.0046809 (0.0019144)**		− 0.0027063 (0.0041546)
β_0	0.0007891 (0.0023163)	− 0.0012548 (0.002531)	− 0.009643 (0.0041308)**	− 0.0118185 (0.004509)***	0.0007891 (0.0032048)	− 0.0012548 (0.0039976)	− 0.009643 (0.0042097)**	− 0.0118185 (0.005454)**
F, Wald test (model)	1.64	1.78	12.68	10.49	13.86	11.44	31.90	46.78
Degrees of freedom	1561	1559	1561	1559	15	15	15	15
R-squared	0.0063	0.0090	0.0465	0.0511	0.0063	0.0090	0.0465	0.0511

Table 7 (continued)

Pooled OLS	Standard errors				Driscoll-Kraay standard errors			
	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*	AR_{it}	AR_{it} *(modified)*	CAR_{it}	CAR_{it} *(modified)*
Sum of squares due to error (SSE)	0.699605324	0.697649549	2.22495925	2.21418605				
Standard errors of the estimates (SEE)	0.02117	0.02115	0.03775	0.03769	0.0212	0.0212	0.0378	0.0377
Number of observations	1568	1568	1568	1568	1568	1568	1568	1568

Standard errors in parenthesis. Statistical significance: $* < 0.10, ** < 0.05, *** < 0.01$

Table 8 Regression results for XBRL adoption (2015/06–2017/03)

Pooled OLS	Standard errors		Driscoll–Kraay standard errors	
	AR_{it}	CAR_{it}	AR_{it}	CAR_{it}
β_{NEWS}	0.0033 (0.0015)**	0.0142 (0.0027)***	0.0033 (0.0012)**	0.0142 (0.0033)***
β_{SIZE}	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
β_{SECTOR}	− 0.0040 (0.0018)**	0.0001 (0.0032)	− 0.0040 (0.0012)**	0.0001 (0.0012)
β_{AUDIT}	− 0.0020 (0.0016)	− 0.0026 (0.0028)	− 0.0020 (0.0017)	− 0.0026 (0.0036)
β_{RANK}	0.0024 (0.0034)	0.0024 (0.0061)	0.0024 (0.0050)	0.0024 (0.0061)
β_{ISFR}	0.0016 (0.0019)	0.0065 (0.0034)*	0.0016 (0.0019)	0.0065 (0.0044)
β_{XBRL}	− 0.0002 (0.0015)	0.0004 (0.0027)	− 0.0002 (0.0015)	0.0004 (0.0021)
β_0	0.0031 (0.0033)	− 0.0091 (0.0060)	0.0031 (0.0051)	− 0.0091 (0.0071)
F, Wald test (model)	1.99	4.65	211.61	734.95
Degrees of Freedom	762	762	7	7
R-squared	0.0180	0.0409	0.0180	0.0409
Number of Observations	770	770	770	770

Standard errors in parenthesis. Statistical significance: * < 0.10,** < 0.05,*** < 0.01

During the second stage of PDP, after the policy change (Table 7), for dependent variable AR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level for market model (F = 13.86 and p < 0). We have significant coefficients for *NEWS*. For dependent variable CAR_t, the pooled OLS model with robust standard errors fits the data at the 5% significance level for market model (F = 31.90 and p < 0). We have significant coefficients for *NEWS* and *ISFR*. When we look at the regression results for Eq. (15) (F = 11.44 and p < 0), we have significant coefficients for *NEWS, NEWS*SIZE* and *NEWS*SECTOR*, for Eq. (16) (F = 46.78 and p < 0), and we have significant coefficients for *NEWS, SIZE, ISFR, NEWS*SIZE.*

For each time episode, we may summarize the results as follows:

1. Before the PDP (2003/06–2009/03)

   The release of financial statements on Friday (*ISFR* = 1) significantly affects ARs. The results also show that CARs calculated on a 2-day window, covering the announcement day and the day after the announcement, give different reactions to positive and negative news. More specifically, non-financial firms that declare positive results, i.e. net income, generate higher CARs than financial ones. The same is true for small-size companies that declare positive net income. They generate higher CARs compared to medium or large-size companies.
2. During the PDP, before the policy change (2009/06–2013/03)

   Both the positive and negative results, NEWS, in financial statements have statistically significant effects on ARs. Different from the first episode, besides the NEWS variable, SIZE, SECTOR and RANK variables also significantly affect CARs. While small-size companies give more reaction to positive news, as it is the case in the first period, different from the previous period, financial companies depict more reaction to positive news than non-financial ones.

3. During the PDP, after the policy change (2013/06–2017/03)

During this period, since companies are required to release their financial statements after the closing session, ARs and CARs columns show the results for different days. Since companies release their financial statements after the closing session, ARs column shows the AR of the previous day and CARs column shows the cumulative return of previous day and the announcement day itself. The results are interesting since the positive or negative results in financial statements affect ARs of the previous day. Similarly, if the companies release their financial statements on Thursday night, they significantly affect ARs on Friday. These results are in agreement with the results given in Tables 3 and 4 and they are in line with the findings of Bernard and Thomas (1989) and DellaVigna and Pollet (2009). When we look at Table 3, if there are positive results (news) in financial statements, they lead to statistically significant AR (0.0027, *t-stat* = 2.8562) and CAR (− 1,0) (0.0026, *t-stat* = 1.9918). On the other hand, when we look at Table 4, we observe that negative news affects the market differently; that is, if the news is negative we observe no AR on the previous day (− 0.0003, *t-stat* = − 0.3405), but we see statistically significant negative CAR (− 0.0104, *t-stat* = − 7.6487) after the financial information is disseminated to the market. Further, as it is the case for the second period, small-size companies react to positive results more than large firms and financial firms do the same compared to non-financial ones.

Although the results for abnormal returns in the Turkish stock market do not vary significantly from developed markets, when comparing the results, one should note that there are fewer stocks listed in Borsa Istanbul and the history of listing for some stocks is comparatively short. Moreover, unlike in mature markets, regulations governing disclosure policy have changed three times over the last decade in Turkey, making comparisons across time difficult, especially in precisely identifying the moment of announcement. Another noteworthy feature of the Turkish market is that while the share of foreign investors is on average 65% of the free float in the last decade, their share in the trading volume is only 18%, which refers to the fact that the daily market activities are mainly dominated by individual day traders.

4.5 The effect of XBRL adaptation on information costs and market reaction

Regulatory authorities have recognized the vital role of internet and electronic communications in modernizing the disclosure system and in promoting transparency, liquidity and efficiency in financial markets. Since information costs (awareness costs, acquisition costs and integration costs) are important ingredients for investors in reacting to regular earnings announcements, a research-facilitation technology may ease their task (Hodge et al. 2004). XBRL (eXtensible Business Reporting Language) provides such an opportunity. It allows firms to file their financial statements electronically so that data can be easily extracted using computer code. It aims to create greater investor awareness of financial disclosures and reduce acquisition costs by eliminating the need to hand collect or purchase data. Thus, its primary motivation is to aid investors and reduce costs of accessing information from filings, especially for investors who are "neither lawyers, accountants, nor investment bankers" (Blankespoor et al. 2019).

Consistent with this belief, the Central Securities Depository of Turkey (MKK)[5] initiated the XBRL Filing Program in June 2016. To support our findings, we searched whether using an XBRL-enhanced search engine helps financial statement users to acquire and integrate relevant financial information when making investment decisions and how XBRL affects PEAD. We incorporated an XBRL dummy as a proxy into the cross-sectional analysis in the following formula to investigate how PEAD varies across firms when they can use XBRL facility. XBRL is an indicator dummy variable that equals "1", after the adoption of XBRL Filing Program and "0" otherwise.

$$\begin{aligned} AR_{it} = {} & \beta_0 + \beta_{NEWS}D_{NEWS} + \beta_{SIZE}D_{SIZE} + \beta_{SECTOR}D_{SECTOR} \\ & + \beta_{AUDIT}D_{AUDIT} + \beta_{RANK}D_{RANK} + \beta_{ISFR}D_{ISFR} + \beta_{XBRL}D_{XBRL} + \varepsilon_{it} \end{aligned} \tag{21}$$

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_{NEWS}D_{NEWS} + \beta_{SIZE}D_{SIZE} + \beta_{SECTOR}D_{SECTOR} \\ & + \beta_{AUDIT}D_{AUDIT} + \beta_{RANK}D_{RANK} + \beta_{ISFR}D_{ISFR} + +\beta_{XBRL}D_{XBRL} + \varepsilon_{it} \end{aligned} \tag{22}$$

Table 8 provides the regression results for the effect of XBRL adaptation on PEAD. The findings reveal that there are no significant coefficients for XBRL. Thus, XBRL technology has no influence on PEAD, depicting that investors may be subject to behavioral biases such as overconfidence in trading strategies. This finding reveals that regulations designed to reduce awareness and integration costs are unlikely to motivate the use of financial information in pricing and it is in line with other studies (Blankespoor et al. 2019).

5 Conclusion

Financial statement filing forms a vital part of the listed companies' business strategy. It conveys information on how well they have achieved their operating and business goals. It also significantly influences capital markets and investors' behavior. This study examines whether corporate financial statements disclosure conveys information to the market via an announcement effect, and how changes in regulatory disclosure policy for financial statements filing affect market reaction for the companies listed on the BIST 100 Index over the period 2003–2017 by using market model, mean-adjusted and market-adjusted models. It elaborates the impact of

[5] https://www.mkk.com.tr/en/content/About-Us/About-MKK, 22/11/2019.

regulatory changes of CMB on disclosure by conducting the analysis in three sub-periods; (1) 2003–2009, (2) 2009–2013 and (3) 2013–2017. For each firm and filing, we computed ARs and CARs. Additionally, we analyzed firm size, positive/negative surprises, financial vs. non-financial sectors, audited vs. non-audited financial statements and Friday effect through regression analysis.

Although the results derived by each model differ from each other, we observe significant ARs and CARs in all three models for the whole sample period (2003–2017). In the market model, there is significant AR and CAR on the event day and after the announcement day. Thus, financial information is not quickly reflected in the prices and there is a post-earnings announcement drift in the Turkish stock market. Therefore, the existence of significant abnormal negative returns may offer an opportunity to beat the market through short selling and the investors may be better off if they take long positions after financial statement releases.

When we ran the same analysis by dividing the sample into three sub-periods according to the regulatory policy changes, we obtain somewhat different results. Over the period of 2003–2009, when financial statements were disseminated to BIST, and then to the public through the bulletin and trading screen by BIST, we observe positive AR only on the event day, but nowhere else. As for the period of 2009–2013, the picture changes and this is where there is the highest post-announcement drift. The same is true after 2013, but to a lesser extent. The limited and heterogeneous investor attention and a lack of financial literacy may offer some possible explanations for the difference in anomalies across periods. The investors seem to react more rationally to financial information declared through the bulletin, and technological ease does not affect the investors' behavior, as is the case in developed markets. However, other studies should further address the validity of this argument.

In cross-sectional analysis, the results show a significant news effect and Friday effect. That is, small-cap companies are more exposed to abnormalities than large-cap firms for positive news, and financial statements released on Thursday night significantly affect ARs on Friday. Another striking finding is that the number of financial statements filings made on the same day affects the ARs, leading to lower AR_{it} and CAR_{it}, which may be due to limited investor attention to intensive flow of information.

Further, the results show that the introduction of a search-facilitating technology such as XBRL does not have any significant influence on the awareness of the investors. They do not use value-relevant financial information, even when it is readily at hand. Instead, they prefer trading either by using past information or technical trends. These findings suggest that awareness is not the primary barrier to investors' use of financial information. Rather, the likely obstacles are high integration costs or behavioral biases, or both. They do not employ financial information or its timely use in valuation. This result reveals that regulatory policies aiming to improve awareness environment are less likely to matter to investors for financial disclosure.

To conclude, there is post-announcement drift in the Turkish stock market. This may be due to either the inefficient reflections of the available information by market players in pricing the shares or insufficient information disclosure on the firms' activities. Another important finding is that the regulatory changes in disclosure policy seem to have differential effects on the anomalies, which may be because of the limited investor attention or lack of financial and technological literacy among investors. This is an interesting research topic worthy of study in future.

5.1 Implications and limitations of the study

The implication of this study is that investors can benefit from the announcements of quarterly financial results. The results show that companies listed on Borsa Istanbul are not successful in disseminating their quarterly earnings information to investors. Further, the findings suggest that market efficiency is not static but dynamic. It continuously adjusts to changes in regulatory environment, and has broad implications for managers to produce price information. Thus, while regulators can employ the findings to improve market efficiency by mitigating behavioral biases and educating investors about the benefits of new regulations, traders and investors can design their strategies to exploit the anomalous behavior.

We acknowledge that our study has also some limitations. Our research design assumes that the association between abnormal returns and financial statements filings captures the extent to which investors use this information in trading decisions. Another limitation is that since the analyst profession in the Turkish stock market is mainly developed for large-size companies, there is a lack of analysts' reports for all firms included on the BIST 100 Index. Thus, we did not take the analysts' reports in consideration in this paper.

Appendix

See Tables 9, 10 and 11.

Table 9 Runs test and sign test results for positive surprises

Days	2003/06–2009/03				2009/06–2013/03				2013/06–2017/03			
	AR		CAR		AR		CAR		AR		CAR	
	t-runs	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*
Day-10	− 0.1116	1.2247	1.7169	0.4082	0.5921	− 0.5000	0.2773	− 1.0000	− 0.9869	− 0.5000	1.4142	2.0000**
Day-9	0.1433	0.8165	0.7815	1.2247	0.2773	1.0000	1.1185	− 0.5000	− 1.5132	− 0.5000	1.0024	2.5000*
Day-8	− 0.3148	− 1.6330	− 1.0048	1.2247	0.0000	0.0000	− 0.4605	0.5000	− 0.2773	− 1.0000	1.0024	2.5000*
Day-7	1.2964	0.4082	− 0.7871	1.6330	0.2773	− 1.0000	0.0657	0.5000	− 0.4605	− 0.5000	1.0024	2.5000*
Day-6	0.8759	− 0.4082	1.1020	1.6330	0.0761	1.5000	0.0761	1.5000	− 0.2773	− 1.0000	1.0024	2.5000*
Day-5	− 1.2263	− 0.4082	0.5651	2.4495*	0.5921	− 0.5000	− 0.2773	1.0000	1.0024	2.5000*	1.0024	2.5000*
Day-4	− 0.3854	− 0.4082	1.0625	2.0412*	0.0657	− 0.5000	0.0657	0.5000	− 1.1426	1.5000	0.7071	2.0000*
Day-3	0.6297	1.6330	0.5651	2.4495*	0.0761	1.5000	− 0.5332	1.5000	1.6448	0.5000	0.6546	3.0000*
Day-2	0.8348	0.0000	− 0.5582	1.2247	0.0657	0.5000	0.8320	1.0000	0.8320	− 1.0000	1.0024	2.5000*
Day-1	0.0350	0.4082	− 0.8059	− 0.4082	− 0.5332	− 1.5000	1.9414	1.0000	− 1.3867	1.0000	0.3779	3.5000*
Day-0	0.0425	2.0412*	0.0425	2.0412*	0.6546	3.0000*	0.6546	3.0000*	− 0.7797	2.5000*	− 0.7797	2.5000*
Day 1	0.0000	2.4495*	− 0.5940	2.8577*	1.6448	0.5000	0.0761	1.5000	0.6855	1.5000	1.0024	2.5000*
Day 2	0.5732	− 0.8165	0.1574	1.6330	0.7071	− 2.0000*	1.3867	1.0000	− 0.9869	− 0.5000	0.2773	1.0000
Day 3	1.2964	− 0.4082	− 0.5582	1.2247	0.2773	− 1.0000	0.5175	0.0000	0.2773	− 1.0000	1.1185	0.5000
Day 4	0.8348	0.0000	− 0.2866	0.8165	0.0761	− 1.5000	0.8320	− 1.0000	0.0761	− 1.5000	1.5526	0.0000
Day 5	0.0350	− 0.4082	0.1433	0.8165	1.0350	0.0000	0.8320	− 1.0000	− 0.4605	− 0.5000	0.5921	0.5000
Day 6	2.5578*	0.4082	0.3349	1.2247	− 0.5332	1.5000	0.5921	− 0.5000	− 1.5526	0.0000	0.5921	0.5000
Day 7	− 0.5651	2.4495*	− 0.3148	1.6330	− 0.5175	0.0000	0.5921	− 0.5000	0.2773	1.0000	0.8320	1.0000
Day 8	0.4555	− 0.4082	0.0425	2.0412*	0.5175	0.0000	0.5921	− 0.5000	− 0.9869	− 0.5000	0.8320	1.0000
Day 9	− 1.0048	− 1.2247	0.0425	2.0412*	1.9043	− 1.5000	− 0.5175	0.0000	− 1.0350	0.0000	0.8320	1.0000
Day 10	2.0825*	2.0412*	0.0425	2.0412*	− 0.4605	0.5000	0.5921	− 0.5000	0.0000	0.0000	0.8320	1.0000

*Significance at 5% level

Table 10 Runs test and sign test results for negative surprises

Days	2003/06–2009/03				2009/06–2013/03				2013/06–2017/03			
	AR		CAR		AR		CAR		AR		CAR	
	t-runs	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*	*t-runs*	*t-sign*
Day-10	− 1.6469	0.4082	− 0.7165	0.8165	0.6856	− 1.5000	0.5922	− 0.5000	1.1185	− 0.5000	− 0.5175	0.0000
Day-9	1.2282	1.2247	− 0.1117	1.2247	− 1.0351	0.0000	0.5922	− 0.5000	− 0.9869	0.5000	− 1.5133	− 0.5000
Day-8	− 0.7165	0.8165	1.2282	1.2247	0.0000	2.0000*	0.5922	− 0.5000	0.6856	− 1.5000	− 1.3868	− 1.0000
Day-7	− 2.4361*	− 0.8165	− 0.2866	0.8165	− 1.7520	1.5000	0.5175	0.0000	− 0.4606	− 0.5000	− 1.3868	1.0000
Day-6	− 1.6469	− 0.4082	1.0031	0.8165	0.2774	1.0000	0.5922	− 0.5000	1.9415	− 1.0000	0.0762	1.5000
Day-5	1.2523	0.0000	2.1214*	1.2247	0.0658	0.5000	− 0.7071	− 2.0000*	− 1.7520	1.5000	− 0.2774	1.0000
Day-4	0.0350	0.4082	1.0625	2.0412*	1.1185	− 0.5000	− 0.7071	− 2.0000*	1.9415	1.0000	− 0.2774	1.0000
Day-3	2.5045*	0.0000	0.1433	0.8165	0.0762	− 1.5000	− 3.2733*	− 3.0000*	0.0658	0.5000	1.6449	− 0.5000
Day-2	− 0.2866	0.8165	0.4555	0.4082	0.5175	0.0000	− 3.2733*	− 3.0000*	0.5922	0.5000	0.5922	0.5000
Day-1	− 0.7872	− 1.6330	1.2965	0.4082	− 0.2774	− 1.0000	0.0000	− 4.0000*	− 0.4606	− 0.5000	− 0.5175	0.0000
Day-0	1.8629	− 0.8165	1.8629	− 0.8165	0.3780	− 3.5000*	0.3780	− 3.5000*	− 0.5175	0.0000	− 0.5175	0.0000
Day 1	0.5112	− 4.0825*	0.0540	− 2.8577*	0.6547	− 3.0000*	0.3780	− 3.5000*	0.3780	− 3.5000*	0.6547	− 3.0000*
Day 2	− 0.4675	− 2.0412*	1.3502	− 2.8577*	− 0.9869	− 0.5000	0.0000	− 4.0000*	− 0.5332	− 1.5000	0.0000	− 4.0000*
Day 3	0.0000	0.0000	0.5652	− 2.4495*	− 0.7797	− 2.5000*	0.0000	− 4.0000*	0.5922	− 0.5000	0.3780	− 3.5000*
Day 4	0.6297	− 1.6330	0.0540	− 2.8577*	− 1.3868	1.0000	0.3780	− 3.5000*	− 0.9869	0.5000	0.3780	− 3.5000*
Day 5	− 0.7165	− 0.8165	0.5652	− 2.4495*	1.0025	2.5000*	0.6547	− 3.0000*	0.8321	− 1.0000	0.3780	− 3.5000*
Day 6	0.3350	1.2247	− 0.1117	− 1.2247	2.1712*	0.5000	− 1.6708	− 2.5000*	0.5922	− 0.5000	0.3780	− 3.5000*
Day 7	2.1214*	− 1.2247	0.5732	− 0.8165	− 0.5175	0.0000	− 0.7071	− 2.0000*	1.3868	− 1.0000	0.3780	− 3.5000*
Day 8	0.6297	− 1.6330	1.5743	− 1.6330	1.6449	0.5000	− 0.7071	− 2.0000*	− 0.7071	2.0000*	0.6547	− 3.0000*
Day 9	− 0.8059	− 0.4082	0.6297	− 1.6330	− 0.9869	− 0.5000	− 0.7071	− 2.0000*	1.6449	− 0.5000	− 0.7797	− 2.5000*
Day 10	0.0350	0.4082	− 0.1117	− 1.2247	0.5922	0.5000	− 0.7071	− 2.0000*	1.0025	2.5000*	− 0.7797	− 2.5000*

*Significance at 5% level

Table 11 Overview of firms as of 2017/03

Stock	Total assets (mil. US$)	Equity (mil. US$)	Market Cap. (mil. US$)	Non-financial	Financial	Stock	Total assets (mil. US$)	Equity (mil. US$)	Market Cap. (mil. US$)	Non-financial	Financial
KCHOL	25,650.80	7207.17	10,695.58		x	DOHOL	2171.66	696.46	488.95		x
GARAN	82,545.48	9992.92	10,224.62		x	KORDS	759.02	322.61	434.02	x	
AKBNK	77,753.57	9350.39	9375.04		x	GUBRF	955.43	267.85	418.48	x	
ISCTR	91,620.63	10,274.45	8197.61		x	PGSUS	1552.82	398.82	403.53	x	
TCELL	9054.85	4534.68	7235.71	x		SASA	348.29	140.75	402.59	x	
ENKAI	7935.27	5929.40	7039.53	x		ANACM	1263.48	493.82	389.17	x	
TUPRS	9353.67	2012.75	6206.38	x		LOGO	91.57	45.52	383.64	x	
EREGL	6903.02	4177.71	5673.93	x		KONYA	110.00	82.82	370.25	x	
TTKOM	7336.72	953.79	5673.93	x		ISGYO	1380.22	856.78	338.65		x
SAHOL	87,206.99	6493.79	5606.35		x	ALARK	650.86	318.03	327.88		x
ASELS	2351.98	1082.55	4668.29	x		IZMDC	844.11	169.43	310.14	x	
BIMAS	1475.45	578.37	4663.13	x		ALBRK	9073.16	625.85	309.11		x
YKBNK	72,025.58	7611.05	4538.82		x	BANVT	323.12	104.82	297.37	x	
ARCLK	5104.87	1654.93	4207.23	x		TATGD	197.01	121.61	283.25	x	
TOASO	3383.34	770.80	3739.58	x		GOODY	246.54	132.13	271.52	x	
VAKBN	60,726.69	5681.07	3681.88		x	KRDMD	1569.42	613.06	248.68	x	
HALKB	68,095.52	6264.64	3561.66		x	AFYON	179.19	46.97	247.56	x	
FROTO	2733.00	817.03	3432.50	x		GOZDE	474.45	253.20	239.07		x
AEFES	7454.89	2673.20	3222.91	x		EGEEN	99.20	78.58	225.03	x	
EKGYO	5392.85	3036.14	3027.93		x	TMSN	119.75	80.60	219.29	x	
CCOLA	3054.36	1213.90	2490.97	x		KARTN	93.49	78.01	216.71	x	
SISE	5606.00	2426.57	2348.84		x	DEVA	303.48	146.64	212.69	x	
PETKM	2003.47	762.19	2089.60	x		HLGYO	519.29	450.95	208.38		x
THYAO	18,465.15	4666.91	2074.10	x		KARSN	457.13	90.14	194.53	x	

Table 11 (continued)

Stock	Total assets (mil. US$)	Equity (mil. US$)	Market Cap. (mil. US$)	Non-financial	Financial	Stock	Total assets (mil. US$)	Equity (mil. US$)	Market Cap. (mil. US$)	Non-financial	Financial
ULKER	1659.64	451.19	1734.69	x		AYEN	527.66	57.60	191.28	x	
TAVHL	3214.89	816.45	1446.36		x	NETAS	374.33	156.54	181.08	x	
CRFSA	802.08	96.61	1279.04	x		AKENR	1323.05	261.58	176.31	x	
SODA	950.12	714.52	1255.00	x		NTTUR	477.96	365.78	173.10	x	
AYGAZ	1219.07	670.10	1211.72	x		ALKIM	101.58	64.60	168.62	x	
TTRAK	744.53	138.27	1198.78	x		VKGYO	285.71	238.33	165.63		x
MGROS	2352.22	303.98	1083.99	x		GOLTS	206.70	75.30	164.60	x	
POLHO	486.81	359.62	930.22		x	GLYHO	1109.88	128.12	156.31		x
TKFEN	2352.43	655.56	879.39		x	CLEBI	217.32	25.34	156.24	x	
TRKCM	1989.52	940.59	807.48	x		ODAS	321.13	39.22	142.69	x	
OTKAR	512.59	60.12	782.10	x		BIZIM	166.61	31.97	131.34	x	
TSKB	6982.34	821.72	777.32		x	ALGYO	202.01	197.67	127.77		x
ECILC	1120.61	904.29	692.90		x	BAGFS	340.23	135.11	124.14	x	
VESBE	658.24	269.84	669.28	x		PRKME	296.82	257.22	109.62	x	
VESTL	2819.86	498.00	640.60	x		METRO	274.88	262.17	102.21		x
TRGYO	2943.15	1632.14	619.60		x	NUGYO	516.16	51.37	101.77		x
SELEC	1396.61	551.70	569.90	x		YATAS	101.93	31.19	101.14	x	
AKSA	781.23	364.95	545.93	x		IHLAS	685.71	138.55	89.04		x
BRISA	839.62	160.49	530.68	x		ERBOS	75.86	55.73	82.33	x	
AKSEN	1130.11	79.10	522.28	x		CEMTS	89.32	60.02	78.52	x	

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