Quarterly Financial Reports and the Stock Price Reaction at the Warsaw Stock Exchange

Adam Szyszka
The Poznań University of Economics
The Chair of Investments and Capital Markets
Al. Niepodleglosci 10
61-967 Poznan
Poland

e-mail: adam@w.pl
tel. +48 602 221152
tel/fax. +48 61 8543826
fax +48 61 8508803

Abstract

This paper deals with market reaction to announcements of quarterly earnings. We observe if information content of quarterly reports is accordingly reflected in stock prices, as theoretically implied by the Efficient Market Hypothesis. We focus on the small emerging market in Poland, and search for the post-announcement drift of abnormal returns, similar to the one observed on well-developed and mature world markets. We propose a relatively rare method of statistical verification of obtained results, tailored for specific characteristics and limitations resulting from conducting this kind of event studies on the small emerging market. The clearest finding of the paper is the significant post-announcement drift of negative abnormal returns in a group of companies that unexpectedly reported highly disappointing quarterly earnings.

Key words
quarterly earnings, Efficient Market Hypothesis, event studies, emerging market, abnormal returns, post-announcement drift, Warsaw Stock Exchange,

1. Introduction

One of the basic information commonly available for investors is undoubtedly the content of financial reports of public companies. If one believes the Efficient Market Hypothesis to hold, we should expect investors to be cautiously following current companies' reports and all the unexpected fluctuations in earnings level to be reflected accordingly in prices. However, the literature abounds with studies showing that even on well-developed capital markets investors react to the announcement of financial reports with a significant delay. Ball and Brown (1968), Rendeleman, Jones and Latane (1982), Foster, Olsen and Shelvin (1984) as well as Bernard and Thomas (1989, 1990) proved the presence of abnormal returns during at least three months after the financial report publication date. On the basis of the newer research carried out by Chan, Jegadeesh and Lakonishok (1996) we can even assume that the delay of investors' reaction can reach as much as three quarters of a year. However, this delay is not always symmetrical. Some of the above-mentioned studies show that companies that unexpectedly reported inauspicious results often yield slightly higher abnormal rates of return in post-announcement period (in absolute values) than the companies that reported surprisingly good results.

The Warsaw Stock Exchange is only a 10-years-old emerging market. Nevertheless, during the last decade we have witnessed a dynamic development of this market. Currently it appears to be one of the most important exchanges in the region of Central and Eastern Europe in terms of capitalization, number of listed companies, turnover, and other indicators. Because of its short history and data limitations, there has been not much done in terms of testing informational efficiency of this market. This paper is one of the first steps in this field. It aims to verify whether a similar to the American market anomaly of delayed reaction to quarterly earnings is present at The Warsaw Stock Exchange.

2. Methodology

The research has been carried out accordingly to methodology commonly used in the event studies. It consists of collecting a sample of companies in which events of the same kind occurred in the past and defining precisely the time when information was made public. The next step is to monitor prices during the period right before and after announcement was made. The

subject of analysis is the timing and the scale of abnormal rates of return that accompanied this event.

2.1. Calculation of abnormal rates of return

The most popular method to calculate abnormal rates of return, especially in studies in which an observation period oscillates between a few and a few dozen days, uses the market model as a benchmark. According to this model rates of return from *j* asset are generated in a process that can be described by the following equation:

$$\widetilde{R}_{jt} = \alpha_j + \beta_j \widetilde{R}_{mt} + \widetilde{u}_{jt}, \qquad (1)$$

where $\widetilde{u}_{jt}$ is a mean zero, independent disturbance term in period *t*. The equation 1 partitions a rate of return from *j* asset into a systematic component linearly dependent on the return from the market portfolio and an unsystematic element, $\widetilde{u}_{jt}$, that is uncorrelated with a market. The effect of firm-specific events is understood as fully captured in the unsystematic component, the assumption being that the information signal concerning an event has no influence on the return from the market portfolio. Abnormal rates of return in the analyzed pre- and post-announcement period are calculated in the following way:

$$\hat{u}_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}). \qquad (2)$$

Next for each *j* asset the Cumulated Abnormal Return is calculated during the period *k* to *t*:

$$CAR_{j,t-k} = \sum_{t=k}^{t} \hat{u}_{jt} \qquad (3)$$

After that the results are aggregated for all assets that were the subject of events of the same type. The Average Cumulated Abnormal Return is calculated as the arithmetic average of Cumulated Abnormal Returns of all *n* assets in the sample.

$$ACAR_{t-k} = \frac{\sum_{j=1}^{n} CAR_{j,t-k}}{n} \tag{4}$$

Parameters $\hat{\alpha}_j$ and $\hat{\beta}_j$ from the equation 2 are estimated previously by observing the relation between the rates of return from asset *j* and returns from the market portfolio in the so-called estimation period. Such estimation usually takes place by using the ordinary least squares method (OLS) or with the use of generalized least squares (GLS). In the first case, the assumptions of homoscedicity, lack of auto-correlation of residuals as well as lack of correlation between residuals and returns from the market portfolio are crucial. The assumption of normal distribution is not necessary, although it is often made in this type of studies for the purpose of statistical significance verification. The use of generalized least squares method makes it possible for the correlation of residuals and heteroscedicity. However, the definite disadvantage of this approach is usually the lack of precise knowledge of covariance matrix of residuals and the necessity of taking into account only estimated values. Simulation studies carried out by Malatesta (1986) and McDonald (1987) indicate that both methods yield similar results. On the other hand Chandra and Balachandran (1990) proved that the use of a more advanced method GLS makes an outcome more sensitive to the errors in specification of abnormal return model than it occurs when a comparatively simpler method OLS is applied. In the following paper the author decided to use the ordinary least square method despite his awareness of possible violation of OLS assumptions.

Both during the estimation of model parameters (equation 1) and the calculation of abnormal returns accordingly to the equation 2, returns were calculated as if with continuous capitalization. The rate of return of j asset on the day *t* was defined as:

$$R_{jt} = \ln(\frac{P_t + D}{P_{t-1}}), \tag{5}$$

where P_t is defined as the price of asset on the day *t* and P_{t-1} is the previous day price. In order to minimize the problems associated with non-synchronized trading, and also with the change of

operational system at the Warsaw Stock Exchange[1], an opening quotation was taken as the price of assets at each particular day. *D* stands for the amount of dividend per share paid out by a company for the previous financial year, the amount that is added to the current price of stock on the first day after the right to dividend was settled. It is worth mentioning that in Poland companies often decide to retain dividend or pay out only a small percentage of earnings, as they seek internal financing for further growth. That is why taking dividends into consideration in this case is only a formality and has no bigger influence on the obtained results. The rates of return from individual assets calculated in the above-mentioned way were related to the behavior of the market portfolio. As an approximation of the market portfolio WIG index (the main and widest index of Polish market) was used. The rate of return from the market portfolio was defined in the following way:

$$R_{mt} = \ln(\frac{I_t}{I_{t-1}}), \qquad (6)$$

where I_t is the value of index on the day t, and I_{t-1} is its value the previous day. WIG index is of profitable kind, i.e. besides changes in prices of assets it also reflects payments of dividends.

2.2. Estimation and observation periods

In the estimation period the parameters of a model, which is to describe the expected normal rates of return, are assessed. Afterwards, in the observation period adequately estimated model serves as a benchmark to calculate abnormal returns that accompany the event. The elementary assumption concerns invariability of model parameters both at the time of estimation and observation.

[1] Before introducing at the Warsaw Stock Exchange the new operational system WARSET in 1999, all stocks were quoted in fixing system in the morning, and later during a day the most liquid of them were traded also in a continuous system. In the first phase after introducing WARSET some stocks were quoted once a day, other twice daily, and the rest in continuous system. Later single fixing was totally abandoned and currently less liquid stocks are traded twice daily, while most of securities are traded continuously. In order to take into account prices quoted at the same time, the opening price was assumed to be the price on particular day. This is different from the most common approach in the literature in which the closing price is taken as the price of the day. Taking into the account opening prices results in a slightly different interpretation. It means that in this study the effect of new information that arrived after market opened can be observed not sooner than the following day.

On one hand the estimation period should be not too distant from the observation period, because otherwise the assumption of invariability of parameters may seem to be unreal. On the other hand, it should be remote enough from the disclosure date, so that not to influence security prices. As a rule the estimation period is determined directly before the observation period, although there has been proposals to estimate parameters partially before and partially after the period of observation, so that to enable taking into consideration the possibility of parameters shifts over the period of time (Strong (1992)). Every now and then we can come across the estimation horizon whose range embraces also the observation window (Vermaelen (1981)). This method may sound justified if the event influences not only the price of a given stock, but also to a considerable extent the behavior of the whole market (Thompson (1985)).

The length of estimation period varies significantly in the literature and is determined by two crucial elements. On one hand higher number of observations allows to achieve greater statistical precision. On the other hand the prolongation of estimation horizon may question the assumption of invariability of parameters. The length of observation period depends on the research goals and hypothesis advanced by the author. The narrower the analysis window of examined event the bigger the extent to which we can verify its direct influence on securities prices. Too wide range of observation can threaten with indistinct and hard to interpret results distorted as a result of other events that may occur in the meantime on the market.

In this paper market model parameters are estimated in the non-announcement period, which directly precedes the observation period. This approach helps to avoid introducing any spurious correlation into estimates, but simultaneously requires the assumption of zero correlation between the event under analysis and the market returns, as well as the assumption of no shifts in model's parameters. The length of estimation period is 240 trading days that approximately amount to one calendar year. The basic observation period embraces 121 sessions (60 trading days before the announcement and 60 days after; the day of disclosure is appointed as "day zero"). The observation period chosen in this way allows the analysis of abnormal returns three months before the day of disclosure and three months afterwards, that is from the time of the previous quarterly report to the following one. Relatively long period of observation results from the objectives of research. We can expect that the piece of information included in quarterly reports will be known to the public considerably in advance, e.g. on the basis of company's

monthly reports[2], general market situation or other signals. The author wants to verify the extent to which the market incorporates this information even before quarterly earnings are announced. On the other hand, the goal of prolonging the observation period after the announcement is to verify whether on the Polish capital market, similarly as it has been noticed on well-developed markets, we can observe the post-announcement drift of abnormal returns.

2.3. Verification of results statistical significance

One of the elementary ways to verify the statistical significance of obtained results in event studies is based on the assumption of normal distribution of cumulated abnormal returns. The homoscedicity and the lack of correlation between abnormal returns from individual assets are also assumed. According to the null hypothesis an event has no impact on the level of returns and the expected value ACAR amounts to zero (Campbell, Lo, MacKinlay, (1997), p. 162).

$$ACAR_{t-k} \sim N(0, \overline{\sigma}^2_{t-k}) \tag{7}$$

This way the zero hypothesis can be verified by means of the following statistic:

$$J_1 = \frac{ACAR_{t-k}}{(\hat{\overline{\sigma}}^2)^{0,5}} \overset{a}{\sim} N(0,1) \tag{8}$$

The true variance $\overline{\sigma}^2_{t-k}$ is unknown, so we use in the denominator the variance $\hat{\overline{\sigma}}^2$, estimated during the sample test. This is a reason why the above-mentioned distribution will not be precise and will be available only for large samples. It should also be emphasized that this approach does not allow different variances of abnormal returns for various assets.

The second method of results aggregation and significance verification uses the standardized cumulated abnormal returns (SCAR), that is defined for individual *j* asset as follows:

[2] Until the end of 1999 Polish public companies were obliged to publish abbreviated monthly financial reports.

$$SCAR_{j,t-k} = \frac{CAR_{j,t-k}}{\hat{\sigma}_j}, \tag{9}$$

where $\hat{\sigma}_j$ is estimated in the estimation period of *L* observation. Under the null hypothesis $SCAR_{j,t-k}$ is described by t-student distribution of *L-2* degrees of freedom. Based on the properties of t-student distribution $SCAR_{j,t-k}$ equals zero and variance equals $\frac{L-2}{L-4}$. The Average Standardized Cumulated Abnormal Return (ASCAR) is the arithmetic average for *N* assets:

$$ASCAR_{t-k} = \frac{1}{N}\sum_{j=1}^{N}\frac{CAR_{j,t-k}}{\hat{\sigma}_{j,t-k}} \tag{10}$$

The null hypothesis can be tested in that case by means of the following statistic:

$$J_2 = \left(\frac{N(L-4)}{L-2}\right)^{\frac{1}{2}} ASCAR_{t-k} \overset{a}{\sim} N(0,1) \tag{11}$$

The above-mentioned method is based on the same assumptions as in case of J_1 statistic with the only difference that J_2 allows variances of abnormal returns to alter among assets. In other words, in the J_1 approach the abnormal returns are equally weighted for all assets, contrary to the J_2 approach where abnormal returns form assets of lower variance are of greater importance.

Both of the foregoing methods, although they are commonly used in the literature of event studies, have some disadvantages resulting from their assumptions. The biggest controversy is homoscedicity as well as no correlation between the abnormal returns from individual assets. The significant correlation can be expected particularly in case of events like quarterly reports, because these announcements come to the market in a more or less the same time and the observation periods for individual assets overlap each other. Therefore, in the present paper the alternative method for verification of statistical significance of ACARs was applied. It relies on

comparison between the average cumulated abnormal returns in selected groups and sub-groups[3] and their empirical distribution.

In each of the groups and sub-groups the empirical distribution was generated in the following process:

1. From all the companies quoted at the Warsaw Stock Exchange at the end of year 2000 and the trading days in 1997-2000, five hundred combinations date/company were randomly chosen.
2. From the population of five hundred random combinations we selected, again randomly, the number of combinations equal to the number of observation in the group or sub-group chosen not randomly. For the random sub-sample the average cumulated abnormal return was calculated using the same estimation and observation periods as in the case of analyzed group or sub-group not randomly selected.
3. The step 2 was repeated thousand times. For each of 1000 random sub-samples the ACAR was calculated and the results were put in order from the smallest to the highest one. This way the empirical distribution was obtained. The ACAR for the given not randomly selected group is understood to be statistically significant if bigger than (ACAR>0) or smaller than (ACAR<0) for at least 972 results (or in a weaker version for at least 950 results) in randomly chosen sub-samples. It means that the probability of occurrence of obtained result in a random way, and not for the sake of intentional choice of test sample/sub-sample according to the established criteria (types of announcements) amounts to less than 2,5% (in a weaker version – less than 5%).

The above-mentioned method of verification of statistical significance has several advantages in comparison to the conventional or standardized t-tests. First of all, it is not based on the assumption of normal distribution of abnormal returns. Secondly, it assumes constant variances neither in time nor equal for all assets[4]. The assumption of no cross-correlation between abnormal returns is also not essential (in this study it would be most likely violated due to the overlapping periods of observation).

[3] See paragraph 2.5 for the description of the test sample, groups and sub-groups.
[4] Neverthelss, homoscedicity is assumed in the study, because OLS is used to estimate parameters of the market model.

2.4. The model of expected earnings

The analysis of market reaction to unexpected changes of quarterly financial results requires first of all the model describing the expected level of earnings. Following the paper of Foster *et al*. (1984) it was assumed that expected earnings of *j* company in a quarter *t* could be described by the following equation:

$$E(Q_{j,t}) = Q_{j,t-4} + \phi_i (Q_{j,t-1} - Q_{j,t-5}) + \delta_j , \tag{12}$$

where $Q_{j,t}$ stands for the earnings per share (EPS) in a given quarter of a year, and parameters ϕ_i and δ_j are estimated on the basis of data from the last 20 quarters (from t=-21 to t=-1) in the following equation of linear regression (using the OLS):

$$Q_{j,t} - Q_{j,t-4} = \hat{\phi}_i (Q_{j,t-1} - Q_{j,t-5}) + \hat{\delta}_j + \varepsilon_{i,t} , \tag{13}$$

It is assumed that $\varepsilon_{i,t}$ is non-correlated mean zero residual element.

The next step is to calculate for each observation the coefficient of forecast error defined as:

$$FE = \frac{Q_{i,t} - E(Q_{i,t})}{SE_Q} , \tag{14}$$

where SE_Q stands for the standard error of estimation $Q_{j,t}$ (regression residual error). The coefficient of forecast error informs of the extent to which the results of a given quarter may be regarded as unexpected. It provided the basis for division of collected observations into sub-samples, depending on the intensity and direction of information signal generated by the announcement of financial results in a given quarter.

2.5. General test sample, groups and sub-groups

The essential criterion for the choice of the general test sample was the accessibility of data. We selected the group of 22 companies quoted for the longest period of time at the Warsaw Stock Exchange, for which quarterly financial results were available at least from the first quarter of 1992. The next step was to collect the quarterly reports of these companies from years 1997-2000, which altogether gave 352 observations (22 companies times 16 quarters). The effort was made to establish the precise date of report publication (either a date of publication by Polish Press Agency or the announcement date in Emitent, the electronic information system of Polish Securities and Exchanges Committee, was considered as such). The occasional cases in which the definite date failed to be determined were removed from the test sample. The removal also concerns cases in which during the 121-session observation period some extraordinary events took place such as tender offers, mergers and acquisitions, or other firm specific events that could have had a fundamental influence on a given share price. The procedure of removing extraordinary events was indispensable, because otherwise the results of study could be significantly distorted and would not reflect the extent of market reaction to the quarterly results announcement. The author is aware that it was impossible to identify all extraordinary events that could have influenced the abnormal rates of return although such a possibility was minimized. Finally, the general test sample included 292 observations. The number of sample is a serious limitation of the present research. Unfortunately, the relatively short existence of Polish capital market makes it impossible to collect more observations.

Observations were divided into three main groups. First one includes cases in which quarterly results were surprisingly good, the second one - cases meeting the expectations, and the third one - cases in which quarterly results were far below expectations. The results were recognized as surprisingly good if coefficient of forecast error, calculated as in the equation (3), was larger than 1. The first group comprises 55 observations. Second group consisting of 174 observations included cases in which the difference between the actual and expected results did not exceed the standard estimation error (a coefficient of forecast error was encompassed by the bracket [-1,1]) Consequently, the results were classified as the third group if they were worse than the expected value diminished by the standard estimation error (a coefficient of forecast error smaller than –1). The third group consisted of 63 observations.

In further part of analysis the first and the third group were divided into additional sub-groups in which the power of unexpected aberration of earnings was taken into account. The subgroup I*a* comprises 29 cases for which the deviation from the expected quarterly results exceeded in plus the double value of standard error of estimation. The subgroup I *b* consists of 26 observations for which the quarterly results differed from the expected value more than the residual regression error, but less than twice its value. Similarly, the subgroup III *a* comprised 24 observations that departed from the expected quarterly results in minus more than twice as much as the standard error, and the subgroup III *b* consists of 29 cases for which the coefficient of forecast error was within the bracket [-2,-1).

3. Results

Table 1 and graph 1 present the average cumulated abnormal returns (ACARs) for the three main groups and the main observation period from the trading day –60 to +60. They represent respectively cases in which EPS for a given quarter was above, consistent with, or below the expectations. The average cumulated abnormal returns for shorter observation periods, which were distinguished for a more detailed analysis, have been presented additionally in table 2.

Table 1. Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000

Trading day	Group I	Group II	Group III	Trading day	Group I	Group II	Group III
-60	-0.2%	0.2%	-0.1%	1	6.6%	0.0%	-10.7%
-59	0.0%	0.1%	0.1%	2	6.3%	-0.1%	-11.5%
-58	-0.3%	-0.1%	-0.2%	3	6.4%	-0.3%	-11.4%
-57	0.1%	-0.1%	0.4%	4	6.4%	0.2%	-10.7%
-56	-0.3%	0.1%	0.4%	5	6.4%	0.4%	-10.9%
-55	0.0%	0.1%	0.0%	6	6.3%	0.2%	-11.4%
-54	0.3%	-0.3%	-0.5%	7	5.9%	0.6%	-11.2%
-53	0.3%	-0.5%	-1.1%	8	6.1%	0.8%	-11.1%
-52	0.6%	-0.6%	-1.1%	9	6.6%	0.7%	-11.3%
-51	0.6%	-0.6%	-1.9%	10	6.9%	0.9%	-11.9%
-50	0.1%	-0.7%	-1.8%	11	7.0%	0.6%	-11.6%
-49	0.1%	-0.8%	-1.8%	12	7.0%	0.1%	-11.8%
-48	0.4%	-0.9%	-2.5%	13	7.1%	0.3%	-11.8%
-47	0.1%	-0.7%	-2.1%	14	7.0%	0.0%	-11.8%
-46	0.7%	-0.8%	-2.3%	15	7.0%	0.3%	-12.0%
-45	1.0%	-0.9%	-2.4%	16	7.4%	0.1%	-11.8%
-44	0.8%	-0.7%	-2.2%	17	7.2%	-0.1%	-12.0%

Table 1. Continued

Trading day	Group I	Group II	Group III	Trading day	Group I	Group II	Group III
-43	1.6%	-0.7%	-2.1%	18	7.9%	0.4%	-12.1%
-42	1.8%	-1.0%	-3.0%	19	8.0%	0.7%	-12.7%
-41	2.0%	-1.0%	-3.2%	20	8.3%	0.9%	-12.8%
-40	2.6%	-0.6%	-3.5%	21	8.4%	0.9%	-13.5%
-39	2.9%	-0.7%	-3.8%	22	8.1%	0.8%	-13.5%
-38	3.4%	-0.8%	-4.2%	23	8.6%	0.4%	-13.4%
-37	3.9%	-0.6%	-4.4%	24	8.0%	0.3%	-13.8%
-36	4.3%	-0.4%	-4.6%	25	8.4%	0.6%	-14.2%
-35	4.8%	-0.5%	-4.8%	26	8.0%	0.2%	-14.6%
-34	4.5%	-0.5%	-5.1%	27	8.1%	0.1%	-13.9%
-33	4.5%	-0.8%	-5.3%	28	7.3%	0.2%	-13.8%
-32	4.3%	-0.8%	-5.5%	29	7.4%	0.4%	-13.7%
-31	4.6%	-0.7%	-5.5%	30	7.7%	0.2%	-13.6%
-30	4.5%	-0.5%	-5.5%	31	8.4%	0.3%	-13.4%
-29	4.8%	-0.6%	-5.9%	32	7.9%	0.2%	-14.0%
-28	5.4%	-0.8%	-5.9%	33	8.0%	0.0%	-14.3%
-27	6.1%	-0.7%	-6.2%	34	8.2%	0.1%	-14.5%
-26	6.2%	-0.6%	-6.6%	35	8.4%	0.2%	-14.6%
-25	5.9%	-0.3%	-6.2%	36	8.3%	0.8%	-15.0%
-24	5.6%	0.0%	-6.5%	37	7.9%	0.7%	-14.9%
-23	5.8%	0.3%	-6.6%	38	7.8%	0.8%	-15.4%
-22	5.3%	0.2%	-6.2%	39	8.0%	0.8%	-15.8%
-21	5.5%	0.1%	-6.0%	40	8.4%	0.7%	-16.3%
-20	5.8%	0.2%	-6.4%	41	8.3%	1.3%	-15.7%
-19	6.2%	0.0%	-6.4%	42	8.9%	1.2%	-15.4%
-18	6.5%	0.3%	-6.3%	43	8.3%	1.5%	-15.7%
-17	6.2%	0.3%	-7.0%	44	8.7%	1.3%	-15.8%
-16	6.5%	0.4%	-7.3%	45	8.3%	1.3%	-15.8%
-15	6.9%	0.3%	-7.6%	46	8.4%	1.3%	-15.6%
-14	6.2%	0.1%	-7.6%	47	8.3%	1.7%	-15.6%
-13	6.3%	0.0%	-8.3%	48	8.0%	1.3%	-15.2%
-12	6.3%	-0.1%	-8.3%	49	7.8%	1.2%	-16.4%
-11	5.7%	0.0%	-8.6%	50	7.8%	0.9%	-17.0%
-10	6.5%	0.0%	-8.5%	51	7.5%	0.8%	-16.6%
-9	6.5%	0.1%	-8.9%	52	7.4%	0.7%	-17.0%
-8	6.4%	-0.3%	-9.1%	53	7.3%	0.5%	-16.5%
-7	5.8%	-0.3%	-9.5%	54	8.5%	0.6%	-16.6%
-6	6.0%	-0.3%	-9.8%	55	9.0%	0.7%	-16.4%
-5	5.8%	-0.2%	-10.2%	56	9.1%	1.1%	-16.5%
-4	5.4%	-0.3%	-10.4%	57	9.2%	0.6%	-16.8%
-3	5.8%	-0.3%	-10.4%	58	8.8%	0.3%	-16.9%
-2	5.8%	-0.5%	-10.6%	59	8.2%	0.0%	-16.8%
-1	5.7%	-0.3%	-10.1%	60	7.8%	-0.4%	-16.7%
0	6.0%	-0.2%	-10.3%				

Group I – EPS in a given quarter above the expectations
Group II – EPS in a given quarter consistent with the expectations
Group III – EPS in a given quarter below the expectations

Table 2. Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000 for selected observation periods

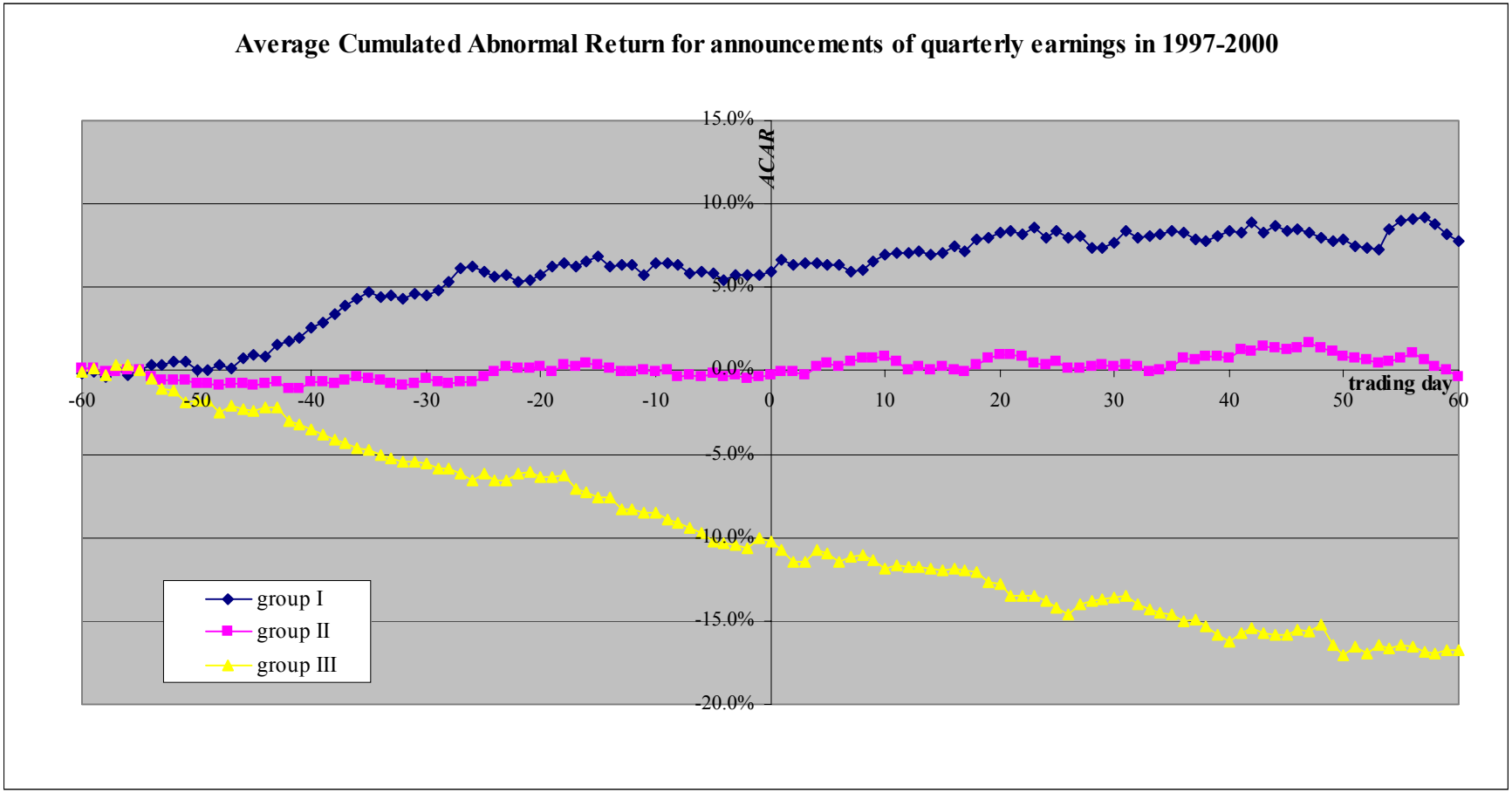
Observation period	Group I	Group II	Group III
from trading day –60 to trading day +1	**6.6%**	0.0%	**-10.7%**
from trading day 0 to trading day +1	0.9%	0.3%	*-0.7%*
from trading day +2 to trading day +10	0.3%	0.9%	-1.1%
from trading day +2 to trading day +20	1.7%	1.0%	-2.0%
from trading day +2 to trading day +60	1.2%	-0.4%	-6.0%

Statistical significance

Bold font indicates that the result is smaller (for $ACAR < 0$) or bigger (for $ACAR > 0$) than 97,5% cases of empirical distribution.

Italic indicates that the result is smaller (for $ACAR < 0$) or bigger (for $ACAR > 0$) than 95,0% cases of empirical distribution.

Chart 1.


Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000
ACAR
15.0%
10.0%
5.0%
0.0%
-5.0%
-10.0%
-15.0%
-20.0%
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
trading day
group I
group II
group III

As it could have been foreseen, the results presented above confirm the relationship between unexpected changes in quarterly earnings and stock returns. It also should not come as a surprise that the vast majority of market reaction takes place long before the quarterly results are made public. The investors can predict companies' results to a large degree on the basis of other pieces of information such as monthly reports[5], announcements about signing important contracts, analysis concerning the state of a sector or macro-economic data about the economy in general. In the group I the majority of abnormal returns occur within the first month of the quarter. In the group III the average cumulated abnormal return decreases gradually and later it gets stabilized a couple days before the quarterly results are made public. Such a behavior of abnormal returns differs slightly from the results reported on the American market. In the U.S. abnormal returns also occur gradually within the period of 60 sessions in the pre-announcement period, but the highest abnormal returns arise directly a few days prior to the publication date (Rendelman *et al*. (1982), p. 285, Foster *et al*., (1984), pp. 588-589, Bernard and Thomas, (1989), p. 10).

In order to check the direct market reaction to publication of quarterly reports, the average cumulated abnormal return was also calculated for the period that consisted only of two sessions, i.e. the day of publication and the next one (period from session 0 to session +1 in table 1). The two-days-long observation period instead of a single day "zero" is justified by the fact that vast majority of quarterly reports are published in the afternoon. This way, taking into account that we use opening quotes in this study, the public reaction can be observed the next day. The obtained values of ACARs are relatively low, although it is worth mentioning that their signs are adequate to the kind of announcements for respective groups (positive for the group I and negative for the group III). Only in the group III the result is statistically significant. The above confirms that majority of market reaction occurs much before the publication and has only a little influence on returns.

Until so far the observed market reaction to unexpected quarterly results has been compatible with the Efficient Market Hypothesis. However, we have to look also at returns in the post-announcement period. According to EMH, at this time we should not generally observe abnormal returns, but even a brief analysis of data in table 1 and chart 1 shows that ACARs

[5] Until the end of 1999 companies listed on the Warsaw Stock Exchange were obligated to publish short financial statements on monthly basis.

continue to increase long after the publication date. The drift is particularly visible in case of companies whose results came as an unpleasant surprise to the market. Nevertheless, the average cumulated abnormal returns calculated for each group for the period of a fortnight, a month, and three months after the announcement date are statistically insignificant. In other word, based on statistics we might draw a conclusion that theoretically the visible drift could happen by a chance. On the other hand we may suspect that the lack of significance results from too wide range of results in each group. Therefore, in further analysis the additional subgroups of group I and group III were selected. They take into account the degree to which the quarterly results were unexpected.

Table 3 and chart 2 present average cumulated abnormal returns that begin from session –60 to session +60 for:

- sub-group I*a* - consisting of observations that had a coefficient of forecast error (FE from equation 14) higher than 2,
- sub-group I*b* - consisting of observations with FE values within the bracket [1,2),
- sub-group III*b* - consisting of observations with FE values within the bracket (-2,-1],
- subgroup III*a* - consisting of cases with FE values below -2.

Table 4 includes average cumulated abnormal returns for shorter periods of accumulation distinguished respectively as in the table 2.

Table 3. Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000 – subgroups results

Trading day	Group Ia	Group Ib	Group II	Group IIIb	Group IIIa	Trading day	Group Ia	Group Ib	Group II	Group IIIb	Group IIIa
-60	0.3%	-0.8%	0.2%	0.0%	-0.2%	1	7.9%	5.2%	0.0%	-7.5%	-16.0%
-59	0.4%	-0.5%	0.1%	0.0%	0.2%	2	7.4%	5.1%	-0.1%	-8.5%	-16.4%
-58	0.7%	-1.4%	-0.1%	-0.4%	0.0%	3	7.7%	5.1%	-0.3%	-8.2%	-16.7%
-57	1.0%	-0.8%	-0.1%	1.0%	-0.7%	4	7.4%	5.3%	0.2%	-8.0%	-15.0%
-56	0.7%	-1.3%	0.1%	1.1%	-0.8%	5	7.6%	5.0%	0.4%	-8.8%	-14.4%
-55	0.3%	-0.3%	0.1%	0.6%	-1.0%	6	7.4%	5.1%	0.2%	-8.6%	-16.0%
-54	0.2%	0.5%	-0.3%	0.0%	-1.3%	7	6.8%	4.9%	0.6%	-8.3%	-15.8%
-53	-0.3%	1.0%	-0.5%	-1.1%	-1.0%	8	7.1%	4.9%	0.8%	-8.2%	-15.7%
-52	0.3%	0.9%	-0.6%	-1.3%	-0.8%	9	7.2%	5.9%	0.7%	-8.1%	-16.6%
-51	0.0%	1.2%	-0.6%	-2.1%	-1.5%	10	7.5%	6.2%	0.9%	-8.2%	-17.7%
-50	-0.7%	1.0%	-0.7%	-2.1%	-1.4%	11	7.5%	6.5%	0.6%	-8.6%	-16.6%
-49	-0.7%	1.0%	-0.8%	-1.9%	-1.7%	12	7.9%	6.1%	0.1%	-8.8%	-16.6%
-48	-0.2%	1.1%	-0.9%	-2.7%	-2.3%	13	7.9%	6.3%	0.3%	-8.5%	-17.2%
-47	-0.8%	1.1%	-0.7%	-2.3%	-1.9%	14	7.5%	6.5%	0.0%	-8.3%	-17.5%
-46	0.0%	1.5%	-0.8%	-2.3%	-2.5%	15	8.2%	5.7%	0.3%	-8.5%	-17.5%
-45	0.3%	1.7%	-0.9%	-2.3%	-2.6%	16	8.7%	6.0%	0.1%	-8.1%	-17.9%
-44	-0.2%	2.0%	-0.7%	-2.2%	-2.1%	17	8.2%	6.0%	-0.1%	-8.6%	-17.4%
-43	0.7%	2.6%	-0.7%	-2.2%	-2.0%	18	9.0%	6.7%	0.4%	-8.0%	-18.6%
-42	0.8%	2.9%	-1.0%	-2.8%	-3.2%	19	9.4%	6.4%	0.7%	-8.9%	-18.9%
-41	1.4%	2.7%	-1.0%	-3.1%	-3.4%	20	10.1%	6.2%	0.9%	-8.3%	-20.1%
-40	2.2%	3.0%	-0.6%	-3.5%	-3.6%	21	10.3%	6.2%	0.9%	-8.8%	-21.1%
-39	1.9%	4.0%	-0.7%	-4.1%	-3.4%	22	10.0%	6.1%	0.8%	-8.8%	-21.1%
-38	2.3%	4.7%	-0.8%	-4.1%	-4.3%	23	10.3%	6.7%	0.4%	-8.3%	-21.8%
-37	3.5%	4.4%	-0.6%	-3.9%	-5.1%	24	9.9%	5.9%	0.3%	-8.4%	-22.5%
-36	4.1%	4.5%	-0.4%	-4.1%	-5.4%	25	10.6%	5.9%	0.6%	-8.8%	-23.1%
-35	4.4%	5.2%	-0.5%	-4.0%	-6.1%	26	10.1%	5.6%	0.2%	-9.4%	-23.0%
-34	4.1%	4.8%	-0.5%	-4.1%	-6.7%	27	10.3%	5.6%	0.1%	-9.1%	-21.8%
-33	4.7%	4.2%	-0.8%	-3.7%	-7.7%	28	9.9%	4.4%	0.2%	-9.2%	-21.3%
-32	4.0%	4.8%	-0.8%	-3.8%	-8.2%	29	10.1%	4.3%	0.4%	-9.2%	-20.9%
-31	4.4%	4.8%	-0.7%	-4.2%	-7.6%	30	9.9%	5.3%	0.2%	-8.9%	-21.3%
-30	4.9%	4.1%	-0.5%	-4.2%	-7.7%	31	10.6%	5.9%	0.3%	-8.4%	-21.6%
-29	5.2%	4.4%	-0.6%	-4.7%	-7.8%	32	9.8%	5.9%	0.2%	-8.5%	-22.9%
-28	5.1%	5.6%	-0.8%	-4.8%	-7.6%	33	10.2%	5.6%	0.0%	-9.0%	-22.8%
-27	6.0%	6.3%	-0.7%	-5.1%	-7.8%	34	10.2%	5.9%	0.1%	-9.8%	-22.1%
-26	5.8%	6.6%	-0.6%	-4.9%	-9.2%	35	10.2%	6.3%	0.2%	-9.8%	-22.5%
-25	5.2%	6.8%	-0.3%	-4.6%	-8.8%	36	9.8%	6.6%	0.8%	-10.3%	-22.6%
-24	5.1%	6.2%	0.0%	-5.2%	-8.7%	37	8.9%	6.7%	0.7%	-10.2%	-22.5%
-23	6.1%	5.4%	0.3%	-5.1%	-9.0%	38	9.5%	5.9%	0.8%	-10.7%	-23.0%
-22	6.4%	4.1%	0.2%	-4.9%	-8.4%	39	10.0%	5.9%	0.8%	-11.2%	-23.4%
-21	6.6%	4.2%	0.1%	-4.9%	-7.9%	40	10.2%	6.4%	0.7%	-11.3%	-24.3%
-20	6.6%	4.8%	0.2%	-5.0%	-8.7%	41	10.5%	5.8%	1.3%	-10.9%	-23.5%
-19	7.5%	4.8%	0.0%	-4.9%	-8.9%	42	11.1%	6.3%	1.2%	-10.3%	-23.9%
-18	7.5%	5.3%	0.3%	-4.5%	-9.1%	43	11.0%	5.4%	1.5%	-11.0%	-23.3%
-17	7.1%	5.2%	0.3%	-5.9%	-8.9%	44	11.1%	6.1%	1.3%	-10.6%	-24.3%
-16	7.0%	6.0%	0.4%	-5.7%	-9.9%	45	10.0%	6.5%	1.3%	-10.5%	-24.4%
-15	8.2%	5.4%	0.3%	-6.0%	-10.3%	46	10.3%	6.3%	1.3%	-10.1%	-24.5%
-14	7.1%	5.2%	0.1%	-5.8%	-10.4%	47	9.9%	6.5%	1.7%	-9.7%	-25.1%

Table 3. Continued

Trading day	Group Ia	Group Ib	Group II	Group IIIb	Group IIIa	Trading day	Group Ia	Group Ib	Group II	Group IIIb	Group IIIa
-13	7.3%	5.3%	0.0%	-6.3%	-11.6%	48	9.4%	6.5%	1.3%	-9.1%	-25.1%
-12	6.8%	5.7%	-0.1%	-6.1%	-11.9%	49	8.9%	6.5%	1.2%	-10.2%	-26.6%
-11	5.9%	5.4%	0.0%	-6.0%	-12.7%	50	9.2%	6.4%	0.9%	-10.6%	-27.5%
-10	7.0%	5.9%	0.0%	-5.8%	-13.0%	51	9.0%	5.8%	0.8%	-9.7%	-27.7%
-9	6.7%	6.2%	0.1%	-6.2%	-13.3%	52	9.3%	5.2%	0.7%	-10.4%	-27.6%
-8	7.0%	5.7%	-0.3%	-6.3%	-13.7%	53	9.0%	5.4%	0.5%	-9.7%	-27.5%
-7	6.4%	5.2%	-0.3%	-6.9%	-13.7%	54	10.8%	5.9%	0.6%	-9.5%	-28.1%
-6	7.0%	4.8%	-0.3%	-7.3%	-13.8%	55	11.2%	6.5%	0.7%	-9.4%	-27.9%
-5	6.6%	4.9%	-0.2%	-7.8%	-14.2%	56	10.7%	7.3%	1.1%	-9.7%	-27.6%
-4	6.2%	4.5%	-0.3%	-7.6%	-14.8%	57	10.6%	7.6%	0.6%	-9.7%	-28.5%
-3	6.6%	4.9%	-0.3%	-7.3%	-15.4%	58	9.8%	7.5%	0.3%	-9.8%	-28.6%
-2	6.6%	4.8%	-0.5%	-7.4%	-15.9%	59	9.4%	6.8%	0.0%	-9.5%	-28.5%
-1	6.7%	4.6%	-0.3%	-7.3%	-14.6%	60	8.9%	6.5%	-0.4%	-9.5%	-28.5%
0	7.1%	4.7%	-0.2%	-7.5%	-14.7%						

Table 4. Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000 – subgroups results for selected observation periods

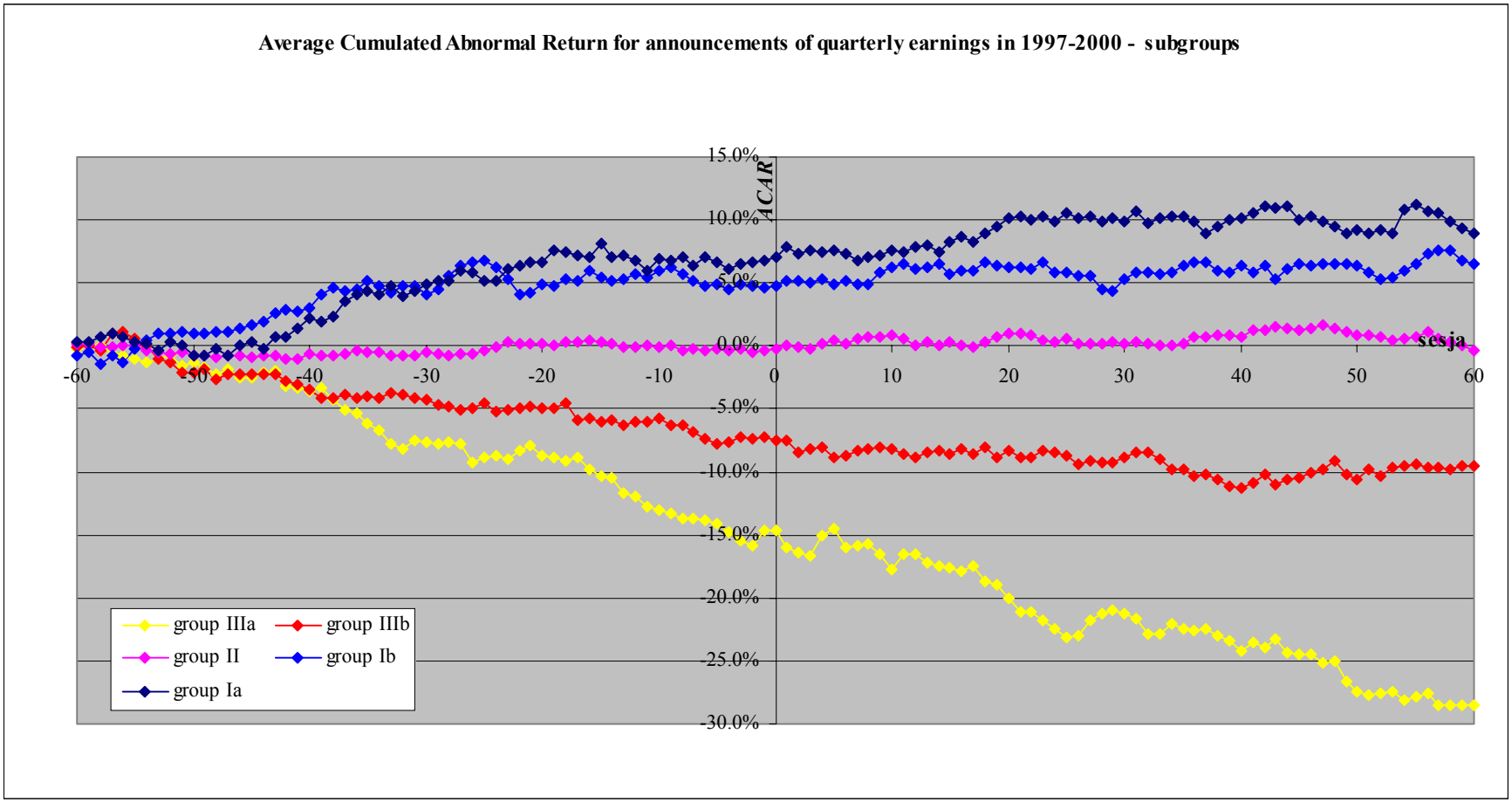
Observation period	Group Ia	Group Ib	Group II	Group IIIb	Group IIIa
od sesji –60 do sesji +1	*7.9%*	5.2%	0.0%	**-7.5%**	**-16.0%**
od sesji 0 do sesji +1	1.2%	0.6%	0.3%	-0.3%	**-1.3%**
od sesji +2 do sesji +10	-0.4%	1.0%	0.9%	-0.7%	-1.8%
od sesji +2 do sesji +20	2.2%	1.0%	1.0%	-0.7%	*-4.1%*
od sesji +2 do sesji +60	1.0%	1.3%	-0.4%	-2.0%	**-12.5%**

Statistical significance

Bold font indicates that the result is smaller (for $ACAR < 0$) or bigger (for $ACAR > 0$) than 97,5% cases of empirical distribution.

Italic indicates that the result is smaller (for $ACAR < 0$) or bigger (for $ACAR > 0$) than 95,0% cases of empirical distribution.

Chart 2.


Average Cumulated Abnormal Return for announcements of quarterly earnings in 1997-2000 - subgroups
15.0%
10.0%
5.0%
0.0%
-5.0%
-10.0%
-15.0%
-20.0%
-25.0%
-30.0%
CAR
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
sesja
group IIIa
group IIIb
group II
group Ib
group Ia

The results in individual subgroups confirm that in the pre-announcement period market generally reacts in a proper way to the unexpected changes in companies' earnings. The more quarterly reports differ in plus from expectations, the higher the cumulated abnormal return between the trading day –60 and +1, and vice versa – the more disappointing the results are, the lower abnormal returns we observe. The market reaction is not symmetrical. Negative information has much stronger influence than surprisingly positive data. The differences among individual groups cannot be justified by different level of system risk, because betas for each portfolio were very similar, e.g. beta of portfolio equivalent to group I*a* was 0.88 while beta of portfolio equivalent to group III*a* amounted to 0.80.

In case of analyzing the direct market reaction to publication of reports, the situation is similar. As one could predict, the strongest reaction between day 0 and +1 can be observed for the extreme groups I*a* and III*a*. Although, the level of statistical significance was exceeded only in case of group III*a*.

The analysis of abnormal returns in the post-announcement period also draws our attention in the first place to the extreme subgroups I*a* and III*a*. In the results for group I*a* we observe a small continuation of positive abnormal returns from session +2 to session +20 (altogether 2.2%). However, this drift is far from being statistically significant (which can also results from a small size of sample). There is a different situation in case of group III*a*. This group was characterized by the strongest market reaction in the pre-announcement period. Similarly, in the post-announcement period we also observe considerable continuation of negative abnormal returns, and this is even up to 60 trading days after the publication date. The average cumulated abnormal return from the session +2 to session +60 was -12,5%, nearly the same as in the pre-announcement period. There is no post-announcement drift in groups I*b*, II and III*b* .

4. Final remarks

In the literature on the American market the phenomenon of post-announcement drift of abnormal returns is one of many market anomalies. It has definitely challenged the Efficient Market Hypothesis. The majority of works proves the occurrence of abnormal returns long after the results are made public, both when they come as a pleasant surprise to the investors, and

when they are disappointing. In this respect the results obtained in this paper could suggest that Polish market can be seen as even more efficient, because the significant drift of abnormal returns can be observed in Warsaw only in case of the group of companies whose quarterly results were most dissatisfying. However, one should not forget that at that time companies listed on the Warsaw Stock Exchange were obliged to publish a short financial statement on monthly basis. We can assume therefore that quarterly reports were only in a small part a surprise to the market.

On the American market the level of cumulated abnormal returns in the post-announcement period often reaches half the value observed in the pre-announcement period. For the extremely surprising earnings announcements it reaches from 3% to 5% in absolute values (Rendelman *et al*. (1982), Foster *et al*. (1984), Bernard and Thomas (1989)). This phenomenon can be explained neither by differences on a risk level (Bernard and Thomas (1989) (1990)) nor the effect of company's size (Foster *et al.* (1984). The answer seems to be the incomplete and delayed market reaction to information included in financial reports. It means that investors cannot correctly form their expectations about future earnings flows and cannot estimate the companies' value immediately after the publication of unexpected results.

Let us come back again to the results observed on the Polish market. The question that needs to be posed at this moment is whether the observed for group III*a* abnormal returns in the post-announcement period can be a premise to reject the Efficient Market Hypothesis. The cumulated abnormal return amounts to -12.5%, and it is definitely higher than results obtained on the American market. It is also statistically significant. We are facing the case here when on the basis of information available to the public we can predict asset prices in the future. The definition of efficient market is violated if we take into account only this point of view (Fama (1970), Malkiel (1992), p. 267). However, the next question that appears here is whether the knowledge of this anomaly can give an investor an opportunity to gain additional profits. The answer is NO: the short sale of shares is not allowed on the Polish public market so there is no possibility to use the observed phenomenon to create an investment strategy that would yield extraordinary returns. Nevertheless, we can state that the announcement of quarterly results that considerably differed in minus from the simple model of expected earnings (equation 12) could be a valuable signal to sell the particular assets if they were in our portfolio. This way it would be

possible to avoid the loss that on average occurred in this type of cases in the following three months.

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