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Share price response to earnings announcements in the steel industry

Master Thesis in Economics

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Abstract

Purpose:

The purpose of the thesis is to study share price response to quarterly earnings per share (EPS) announcements in the world steel industry for the last five years (from 2007 to 2011), using the event study methodology. Moreover, the paper attempts to test share price reactions to earnings releases for yearly aggregation (pre-crisis, crisis and post-crisis periods) and countries aggregation (developed and developing countries) of sample steel companies.

Method:

The research is conducted employing a sample of 30 listed companies, operating in the steel industry. The steel producers' headquarters are situated in thirteen countries; they are traded on twelve stock markets as primary listing stock exchanges and are referred to thirteen respective indexes.

The thesis uses the event study methodology in order to address the purpose of the research. This methodology provides an insight on how numerous corporate events (M&As and takeovers announcements, regulatory changings and earnings announcements) influence company's stock prices. All the announcements were divided into two groups: "negative" announcements (Group I) and "positive" announcements (Group II). By "negative" announcements it is meant, that new actual earnings per share are smaller than earnings per share from the last quarter, and vice versa for "positive" announcements.

Findings:

The pattern for overall aggregation of sample companies showed the significant and expected share price response to earnings announcements for Group I only. The output for Group II was puzzling. This led to the assumption of negative market perception on the steel industry stock prices as a result of 2007-2008 financial crises. Indeed, for 2007, which was determined as a pre-crisis period for the steel industry, the share price reaction was significant for both groups of EPS announcements. However, within the two other periods (crisis period of 2008-2009 and post-crisis period of 2010-2011) significant and expected pattern was obtained only for Group I once again. The 2007 yearly aggregation comprised only twenty companies due to the data availability. This revealed the assumption, that this sample of twenty steel companies should be tested for the two other periods. However, the pattern remained the same as in the overall aggregation case. Furthermore, the sample steel companies were aggregated on countries basis. The obtained response was analogous to overall aggregation response, the only difference is that Group I reaction was more significant for developed countries than for developing countries sample.

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Jönköping, 2012-05-14

Artem Martynyuk

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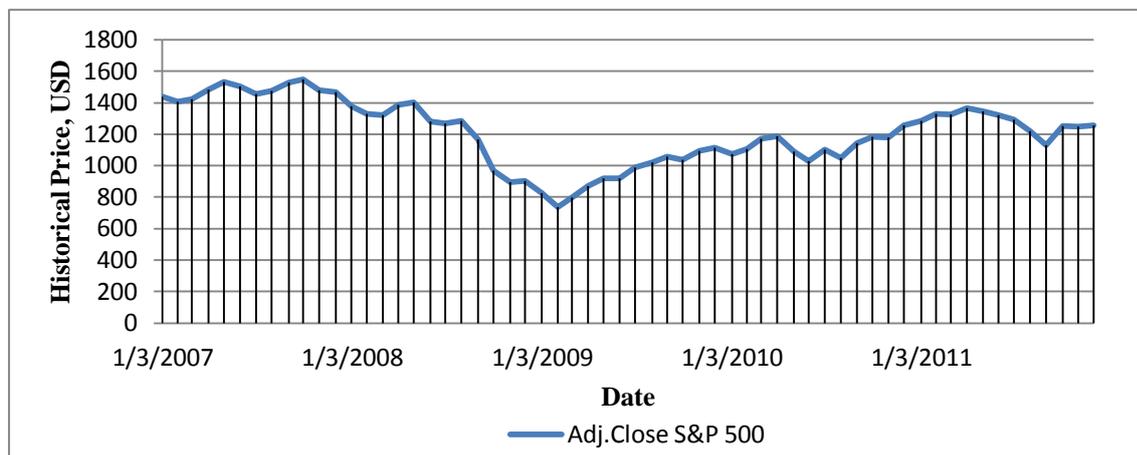
1. INTRODUCTION

This chapter presents the background and problem sections of the thesis. It also provides the purpose of the study and presents the paper outline.

1.1. Background

The world economy before the 2007-2008 financial crisis was to a large extent characterized by enormously growing corporate activity: financial world saw numerous mergers and acquisitions, takeovers, divestitures, etc. (Frykman & Jakob, 2003). World's leading financial indexes showed upward trends. However, Figure 1 demonstrates that S&P 500 index was decreasing from Jan 2008, but further showed recovery from Jan 2009. The same pattern can be seen from plotting other financial indexes: Dow Jones industrial average, Amsterdam Exchange index, FTSE 100, etc.

Figure 1. *S&P 500 Adjustment Close Monthly Price, 03 Jan 2007-31 Dec 2012*



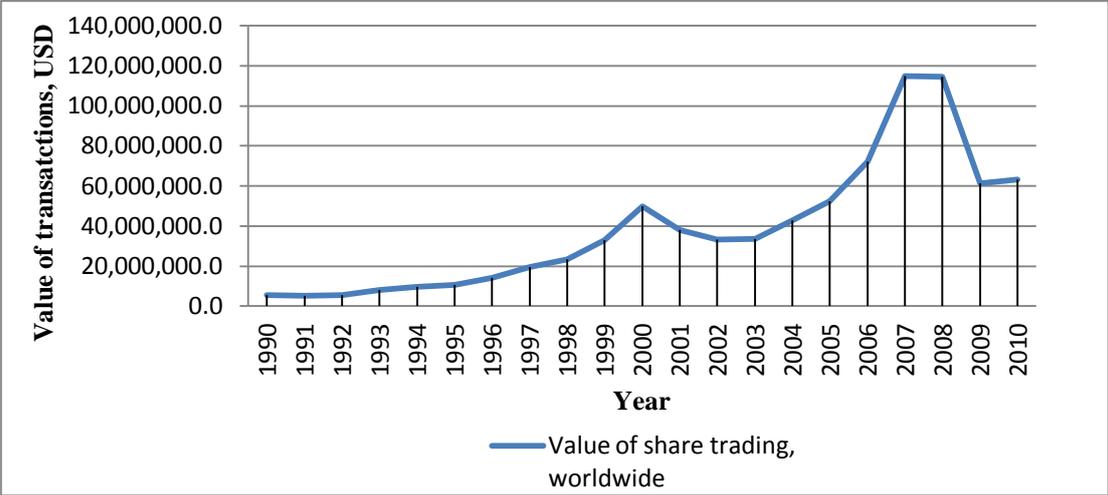
Source: Yahoo Finance website

Chordia, Roll and Subrahmanyam (2011) report increase of value-weighted average monthly share turnover and the rise of average number of daily transactions on NYSE from 1993 to 2008. Figure 2 supports the fact of enlarged number of share trading value for the period (with the downturn in year 2000), however revealing the abrupt decline of the value from 2008 with its clear reversion from 2009.

Such a situation, both with volatility of world financial markets and share trading activity, requires interested parties to be able to assess a value of a company, in order to determine, whether the company is possibly overvalued or undervalued by market. The current value of a company can be driven downwards by overall market perception, which is reflected in values of various financial indexes and the share trading activity of investors. In this case, if a company has strong internal financial indicators, it can possibly outperform the market, when its perception recovers. The valuation of a company can be done by getting insight of how much external and internal to a company economic events influence its value.

The interested parties are corporate finance professionals, private investors and managers. For corporate finance professionals, who work in investment banks or corporate finance departments of consulting or auditing firms, it is vital to assess a company for identifying M&A or takeover opportunities for their clients or simply provide industry or sector analysis.

Figure 2. Value of share trading: Worldwide, 1990-2010



Source: World Federation of Exchanges website

Private investors, valuating entity, can make justified decisions on investments on a stock market in order to be more profitable. Managers’ purpose, in their turn, is to maximize shareholder’s value. Thus, in order to understand how their decisions influence a company’s value and hence a shareholder’s value, managers first need to determine it, possessing information on what it depends on (Neale & McElroy, 2004).

1.2. Problem

The obvious question occurs: how is it possible to assess a company, obtaining its share price response to diverse economic events?

1.2.1. Discounted cash flow model and event study methodology

Copeland, Koller and Murrin (2000) state, that nowadays the most useful and widely accepted valuation model to assess a company is Discounted Cash Flow (DCF) model, which discounts expected future free cash flows to present time, taking into account the corresponding cost of capital of the company. Authors support the idea of using cash flows in corporate valuation, claiming that the value of a company directly depends on how well it generates cash flows. In their turn, Neale and McElroy (2004) consider cash flows valuation as a theoretical framework, converging to practice. At the same time, some researchers (e.g. Hecht and Vuolteenaho, 2006) claim the usefulness of accounting earnings as proxies for cash-flows. The advantage of using accruals is the timing, so cash flows even being the real

underlying reason of returns variation, cannot be always reconciled with share price movements at the same period. Thus, by studying response of share prices to earnings, the one explores underlying relationship between a company's value variation and expected cash flows.

In order to grasp the influence of corporate events on share prices of an entity, economists use so-called event study methodology (Kothari, Warner, 2004). The methodology employs financial market data to obtain a response of a company's value to various events (MacKinlay, 1997). Such corporate events are announcements of mergers and acquisitions, divestitures and takeovers, macroeconomic figures publications and earnings announcements.

In line with the DCF theoretical approach, the thesis attempts to provide a research on how earnings announcements, as a type of corporate event, influence share price movements in the steel industry, which is one of the "building blocks of modern world" (Steel's contribution to a low carbon future, 2012).

Fama (1991) states significance of event studies in conducting research, reporting, that the body of event studies results is extremely large. MacKinlay (1997) reports, that the first research, using this methodology, goes back in history and was conducted by James Dolley (1933). The advantageous feature of using event studies framework is its widely recognized and non-controversial statistical properties (Kothari, Warner, 2004).

There are numerous papers providing research on share price response to earnings announcements.

Chari, Jagannathan and Ofer (1988) studied seasonal trends of stock returns as a result of response to quarterly earnings announcements. The data comprised 56147 quarterly announcements for 2527 firms during 1976-1984. The researchers found significant positive abnormal returns for small size firms.

The share price response using the event study methodology was obtained as well by Kross and Schroeder (1984). The sample included 297 NYSE and American Stock Exchange companies for 1977-1980 time period, implying twelve quarterly announcements for each of the firm.

MacKinlay (1997) used 30 companies, included into Dow Jones Industrial Index, as a sample to test the influence of quarterly earnings announcements to share prices. The researcher examined totally 600 quarterly announcements. As a result, MacKinlay (1997) obtained share price response separately to bad news, good news and no news cases of EPS announcements.

The influence of quarterly earnings announcements to share returns in the Nigerian Stock Market was tested by Afego (2011). Using a sample of sixteen firms with quarterly earnings announcements during 2005-2008, listed on Nigerian Stock Exchange, the researcher found statistical significance of abnormal returns around earnings news release.

Su (2003) provided research on Chinese stock markets. The researcher examined the share price response to 183 quarterly earnings per share (EPS) announcements for the 1997-1998 time period, employing information from Shanghai and Shenzhen stock exchanges. Su (2003) reports statistically significant impact of earnings news releases to A-share prices (A-shares are securities, which can be traded by Chinese citizens only).

Apart from discussed papers, Su (2003) lists other studies, which found stock price response to earnings announcements in US and non-US markets: Ball and Brown (1968), Gennotte and Truemann (1996), Alford, Jones, Leftwish, and Zmijewski (1993), etc.

1.2.2. The steel industry

Steel is used in enormous number of industries, such as automobile manufacturing, construction industry, appliances production, etc. (International Iron and Steel Institute, 2002). Hence, the demand for steel products reflects the well-being of dozens of manufacturings. In other words, the state of the steel industry indicates the state of the world's economy. By studying the steel industry, the one indirectly covers processes evolving in other economic sectors. Apart from that, the steel market is highly competitive: "In 2009, the top five producers accounted for less than 16% of global production, with the top ten accounting for 23%". (ArcelorMittal Annual report, 2010). As a contrast, in the mining industry there are only three major players with 70% market share. Same pattern (as in mining industry) can be seen in other industries, such as automobile production. Hence, by studying steel industry, the one conducts research of a fairly big number of companies (depending on availability of data, up to 45 companies). And last, the steel manufacturing was highly affected by 2007-2008 financial crises (that is obvious if the one looks at share prices and earnings of any steel producer after year 2008). E.g. Nippon Steel, the fourth world's steel producer in 2009, faced almost 85% share price reduction from June 2008 till November 2008 (Nippon Steel Corporation historical share prices, 2012).

Hence, the steel industry provides a reach ground for conducting research on relationship between stock prices and earnings announcements.

1.3. Purpose

The purpose of the thesis is to study share price response to quarterly earnings announcements (EPS) in the world steel industry for the last five years (from 2007 to 2011), using the event study methodology.

This five year time period comprises year 2007, which was pre-crisis year for the steel manufacturing, recessionary period of 2008-2009 and the 2010-2011 time period of recovery in the industry.

Thus, the research questions are:

- a) Do earnings announcements influence share prices changes in the steel industry, and how significant is the response of share prices to announcements?
- b) When does such an influence take place?

1.4. Paper outline

The Introduction section outlines the importance of companies' valuation in the uncertain financial and economic environment. The chapter introduces interested parties in such

valuation and how this valuation can be conducted using DCF approach. The core idea is that a company's share prices respond to various economic events (to quarterly earnings announcements in the case of the thesis). As well, the section gives the steel industry description. The Introduction ends up with the presentation of purpose of conducting the research.

The second section, Methodology, introduces Event Study Methodology, providing its description. The chapter describes data collection process and limitations, which were faced in the process of conducting research.

The third chapter, Theoretical Framework, outlines theoretical basis for the Discounted Cash Flow (DCF) approach and Event Study procedure, for which it presents market model description and techniques for its estimation for obtaining abnormal returns and cumulative abnormal returns.

The fourth section is Empirical Results and Analysis chapter, where obtained results and findings, based on theoretical concepts of previous chapter, are presented. The chapter also comprises possible explanations of obtained results and further adjustments in companies sample for testing various assumptions.

The fifth chapter provides various conclusions drawn upon the obtained results and findings.

2. METHODOLOGY

This chapter outlines employed research methodology to conduct the study. As well, it presents the secondary data collection approach and lists limitations, which occurred in the process of conducting research.

2.1. Event study methodology

The thesis primarily uses the event study methodology in order to address the purpose of the research. This methodology provides an insight on how numerous corporate events (M&As and takeovers announcements, regulatory changings and earnings announcements) influence company's stock prices.

Although the event study methodology evolved during last three decades, the core concept in the approach remains the same: the methodology estimates the mean of cumulative abnormal returns for the time period related to the event (Kothari, Warner, 2004). However, authors mention two key transformations, which took place in conducting event studies research: first, the usage of daily returns in contrary to monthly data and second, the estimation process itself became more complicated.

The key assumption of the methodology is that abnormal returns reflect the influence of an economic event on share prices performance (MacKinlay, 1997). Abnormal returns are equal to the difference between actual returns and normal returns (anticipated returns) over the event window. They are to be measured relatively to a chosen benchmark (Brown, Warner, 1980). The thesis focuses on market adjusted returns or, in other words, employs market indexes as such a benchmark.

Methodology of conducting research directly relates to decision-making (Brannick and Roche, 1997). According to Campbell, Lo and MacKinlay (1997), there are seven steps in conducting event study. Each of the steps implies decision-making process:

1. *The choice of event*, where also the event window should be determined. The nature of earnings announcements is such that EPS can be announced at day -1 and then reported at day 0. If the announcement at day -1 happened before the market close, then the news will take place at that date, one day before the reporting of the announcement. If this announcement was made after the market close, then the news will influence stock price at day 0 (Su, 2003).
2. *Data selection process*, where some specific criteria are to be set by a researcher, such as listing on particular stock exchange or operating in a specific industry.
3. *Normal returns calculations*, where one of the methods for obtaining normal returns has to be defined. The positive performance of market model was outlined by Brown and Warner (1980). The model represents market adjustment of returns.
4. *The choice of estimation window*, which can be set up to 120 days before the event window. The estimation window data is being used to evaluate parameters of chosen model at previous step.
5. *Testing*, where abnormal returns are obtained using parameters of estimated model and afterwards have to be statistically tested.

The last two steps (empirical results and interpretation) do not need further explanation.

McCall and Bobko (1990) state, that none of the methods or approaches is superior to others, however the most important is to match a problem and methodology. Therefore, the paper's challenge is to provide a sound methodology, which allows obtaining relevant evidence, leading to concrete results.

2.2. Data collection

The research is conducted employing a sample of 30 companies, operating in the steel industry. Table 1 presents the names of the sample steel companies, countries, where their headquarters are situated, stock exchanges, on which sample companies' stocks are traded, respective stock indexes and the number of obtained earnings announcements for each steel company. The steel producers' headquarters are situated in thirteen countries; their shares are traded on twelve stock exchanges as primary listing stock exchanges and are referred to thirteen respective indexes. The number of quarterly earnings announcements varies from three to twenty EPS announcements, depending on the availability of data.

The pieces of information, relevant to the study for the time period of 2007-2011 are: daily stock prices of each company, earnings per share values and dates of their announcements. To provide a market adjustment, market returns from respected indexes were obtained. This information is obtained from DataStream and Thomson One Banker databases, Yahoo Finance and Nasdaq OMX Nordic websites, etc. Such a procedure implies a secondary data collection approach. Myers (2009) defines this approach as a mean, when data was previously collected and cannot be influenced by current researcher.

2.3. Limitations

The limitations are listed as a result of completed empirical research, where some various data limitations were faced in line with difficulties with other issues.

The initial list of sample companies comprised 45 listed steel producers. However, due to limitations in data availability, the sample size shrank to 30 steel manufacturers.

The biggest difficulties caused data regarding steel companies, operating in Japan and Russia. The historical stock price data of these companies and historical values of respective indexes could not be obtained. In this case the historical data from secondary stock exchanges was employed. For instance, Russian steel companies (Mechel OAO, Novolipetsk OAO and Severstal OAO) are primarily listed on Moscow Interbank Currency Exchange (MICEX). Nonetheless, due to the mentioned circumstances, the historical data from London Stock Exchange (LSE) and New York Stock Exchange (NYSE) and respective FTSE All-Share Index and NYSE Composite Index was taken. Since Russian steel companies are only recently listed on LSE and NYSE, the number of quarterly earnings announcements was limited to four quarterly EPS announcements for Novolipetsk OAO and Severstal OAO and

Table 1. *Sample companies for conducting research*

Company name	Headquarter*	Trading Symbol **	Stock Exchange*	Respective Index	NEA
Acerinox SA	ESP	ACX.MC	MCE	IBEX 35	17
AK Steel Holding Corporation	USA	AKS	NYSE	S&P 500	20
Allegheny Technologies Inc.	USA	ATI	NYSE	S&P 500	20
ArcelorMittal SA	LUX	MT.AS	AEX	AEX	17
China Steel Corporation	TWN	2002.TW	TAI	TSEC weighted Index	14
Commercial Metals Company	USA	CMC	NYSE	S&P 500	19
Dongkuk Steel Mill Co. Ltd.	KOR	001230.KS	KSC	KOSPI Composite Index	3
Hyundai Steel Company	KOR	004020.KS	KSC	KOSPI Composite Index	3
Industrias CH, SAB de CV	MEX	ICHB.MX	MEX	IPC	18
JSW Steel Ltd.	IND	JSWSL.B O	NSI	BSE Sensitive	14
Mahindra Ugine Steel Company Ltd.	IND	MAHIUGI N.BO	NSI	BSE Sensitive	15
Mechel OAO	RUS	MTL	NYSE	NYSE COMPOSITE INDEX	16
Novolipetsk Steel OJSC	RUS	NLMK	LSE	FTSE ALL-SHARE	4
Nucor Corporation	USA	NUE	NYSE	S&P 500	20
Olympic Steel Inc.	USA	ZEUS	NYSE	S&P 500	20
Outokumpu Oyj	FIN	OUT1V.H E	HEX	OMX Helsinki 25	20
POSCO	KOR	005490.KS	KSC	KOSPI Composite Index	3
Rautaruukki Oyj	FIN	RTRKS.H E	HEX	OMX Helsinki 25	20
Salzgitter AG	GER	SZG.DE	FRA	DAX	20
Severstal OAO	RUS	SVST	LSE	FTSE ALL-SHARE	4
Schnitzer Steel Industries Inc.	USA	SCHN	NSQ	NASDAQ Composite	19
SSAB A	SWE	SSAB- A.ST	STO	OMX Stockholm 30 Index	20
Steel Authority of India Limited	IND	SAIL.BO	NSI	BSE Sensitive	7
Steel Dynamics Inc.	USA	STLD	NSQ	NASDAQ Composite	20
Tata Steel Ltd.	IND	TATASTL .BO	NSI	BSE Sensitive	19
Ternium S.A.	LUX	TX	NYSE	S&P 500	16
ThyssenKrupp AG	GER	TKA.DE	FRA	DAX	20
United States Steel Corp.	USA	X	NYSE	S&P 500	20
Voest-Alpine AG	AUT	VAS.DE	FRA	DAX	8
Wuhan Iron And Steel Company Ltd.	CHN	600005.SS	SHH	SSE A Share Index	12

* the description of abbreviations is presented in Abbreviations section, Appendix A; **the symbols are taken from Yahoo Finance web-site

Source: Thomson One Banker database, Yahoo Finance and Financial Times websites

to sixteen quarterly EPS announcements for Mechel OAO. Japanese steel producers are also listed on secondary stock exchanges (e.g. Kobe Steel and Tokyo Steel Manufacturing Limited

apart from being primarily listed on Tokyo Stock Exchange are traded as well on Berlin Stock Exchange). However, the historical price data is either still not available, or does not lead to even 10% R^2 in the market model regressions.

For Korean steel companies (Dongkuk Steel Mill Co. Ltd., Hyundai Steel Company, and POSCO) only three quarterly earnings announcement data was available in the Thomson One Banker database. Other companies EPS announcements data (e.g. Schnitzer Steel Industries Inc., Ternium S.A., etc.) revealed the same obstacles.

A number of companies (e.g. Industrias CH, SAB de CV, China Steel Corporation, etc.) were making earnings announcements for different quarters either at the same date, or the date, which was close to announcement date of another quarter (that can happen, if a company delays EPS announcement for any quarter). In this case the influence of such EPS announcements was overlapping, possibly leading to non-reliable outcome, since it is difficult in this case to determine which of the announcements drives the changes in share prices. Thus, both such announcements were excluded from the sample. This apparently caused the reduction of overall sample of EPS releases.

For the rest of the companies, which did not appear on the final sample list, only incomplete information of the dates of EPS announcements could be obtained (e.g. for Onesteel Limited and Bluescope Steel Limited).

Overall, a total number of 448 quarterly earnings announcements for 30 sample steel companies were analyzed.

3. THEORETICAL FRAMEWORK

This chapter presents theoretical basis for the Discounted Cash Flow (DCF) approach, provides theoretical description of the procedure of an Event Study, introducing and describing the market model and techniques for its estimation.

3.1. Discounted cash flow (DCF) approach

Damodaran (2002) presents the two-stage free cash flow to equity (FCFE) model as a type of DCF approach. It is used in the case, when the growth rate of a company's expected cash flows is a subject to change: for some subsequent years the particular cash flows demonstrate extraordinary growth rate or in other words, the particular FCFEs for a number of subsequent years can be predicted for a company. And thus they should be evaluated and discounted back to the present time one by one. Then it is assumed, that the company will grow at a constant perpetual rate, so the terminal value should be discounted back to the present time. The mathematical representation of the model is:

$$Value = \sum_{t=1}^n \frac{E[FCFE_t]}{(1 + k_{e,hg})^t} + \frac{P_n}{(1 + k_{e,hg})^n}$$
$$P_n = \frac{E[FCFE_{n+1}]}{k_{e,st} - g_n}$$

where

- $E [FCFE]$ stands for expected free cash flow at year t
- n is the number of years with extraordinary growth
- P_n is the terminal value for the period with constant growth rate
- k_e implies cost of equity (can be weighted average cost of capital (WACC)) in various periods: high growth (hg) period and stable growth period (st) period.
- g_n stands for perpetual growth rate

Free cash flow to equity for a company can be obtained in a following way:

$$\begin{aligned} \text{Free cash flow to equity} &= \text{Net income} - (\text{Capital expenditures} - \text{Depreciation}) \\ &\quad - (\text{Change in noncash working capital}) + (\text{New debt issued} \\ &\quad - \text{Debt repayments}) \end{aligned}$$

This model allows obtaining the market value. In order to get equity value, it is necessary to subtract debt value from the obtained figure. To calculate the stock price, the one has to divide equity value by the number of outstanding shares.

3.2. Procedure of an event study

FCFE model shows that the stock price of any company depends on expected future cash flows, which, as it was argued before, can be well approximated by earnings. Event study methodology enables to grasp, how these earnings influence share prices changes.

The procedure of conducting event study, as it was outlined in the event study methodology is following:

- The choice of event
- Data selection process
- Normal returns calculations
- The choice of estimation window
- Calculating abnormal returns and their statistical testing
- Obtaining empirical results
- Interpretation

The introduction part shows that the earnings announcements are taken as an economic event, which is expected to influence stock prices of steel companies. There is no any specific algorithm of event window choice. The previous research shows, that the share price response to earnings announcements is mostly reflected at the 21 day event window. (e.g. MacKinlay (1997); Su (2003)). Apart from that, Chari, Jagannatha and Ofer (1988) employs 17 day event window. The thesis sets 21 days period as an event window (from -10 to +10 days) with day 0 as earnings announcement day. Then T represents the event window. Due to the nature of earnings announcements, discussed in methodology section, and in case of announcement and reporting at day 0 with continuous strong effect at day +1, the announcement period is set to be equal three (day -1 to day +1).

Data collection part presents selection criteria for conducting the research: daily stock prices and quarterly earnings per share announcements for 30 listed steel companies from 2007 to 2011, market returns of various indexes: S&P 500, AEX, Taiwan SE Weighted, etc.

The estimation of normal returns is descriptively presented by Lo, Campbell and MacKinlay (1997). The authors describe market model, which adjusts a company's returns to market returns.

Mathematically the market model is given as:

$$R_{it_T} = \alpha_i + \beta_i R_{mt_T} + \varepsilon_{it_T}$$

where

- $E(\varepsilon_{it}) = 0$
- $var(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2$
- R_{it_T} is share i return at time t referred to estimation window T ,
- R_{mt_T} stands for returns of market portfolio,
- ε_{it_T} is zero mean white noise,
- α_i, β_i and $\sigma_{\varepsilon_i}^2$ are market model parameters.

The model is superior to Constant Mean Return model and to other statistical models due to its ability to reduce abnormal returns variations (MacKinlay, 1997). The performance of the market model is represented by the R^2 of its regression.

In order to estimate regression, the estimation window has to be chosen. The paper does not provide any exact number of days for estimation. The size of window for valuation depends on the number of trading days between earnings announcements. This number usually varies from 30 to 80 trading days. The key idea is to minimize effect of previous earnings announcements. Then T_1 stands for the event window. Together the estimation and the event windows are presented by Figure 1.

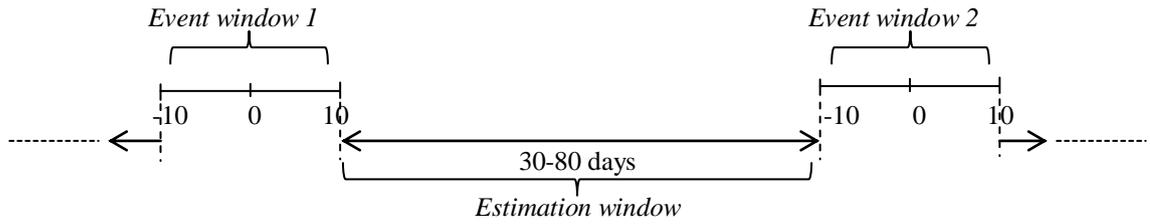


Figure 1. Time line of the event study

It is appropriate to estimate the market model using ordinary least squares approach (MacKinlay, 1997).

When the market model OLS regression is estimated for the estimation period and regression parameters are obtained, they are used to get expected stock i returns for the event window period, employing actual market returns for the same time.

Mathematically this is represented in a following way:

$$E(\check{R}_{it_{T_1}}) = \alpha_i + \beta_i R_{mt_{T_1}}$$

where

- $E(\check{R}_{it_{T_1}})$ is share i expected return at time t referred to the event window T_1 ,
- $R_{mt_{T_1}}$ stands for actual returns of market portfolio at the event window T_1 ,
- α_i and β_i are market model parameters, obtained as a result of market model estimation for the estimation period T .

The expected stock i returns allow to calculate so-called abnormal returns, which are assumed to reflect the response to earnings announcements.

The calculation for abnormal returns in mathematical terms is given by Su (2003):

$$AR_{i,t_{T_1}} = R_{i,t_{T_1}} - E(\check{R}_{it_{T_1}})$$

where

- $AR_{i,t_{T_1}}$ is abnormal return for share i at the day t of T_1 event window,
- $R_{i,t_{T_1}}$ stands for actual share i return at day t of T_1 event window and
- $E(\check{R}_{it_{T_1}})$ is expected return of stock i at day t referred to T_1 event window.

Therefore, for the case of using market model, the abnormal return calculation takes the form:

$$AR_{i,t_{T_1}} = R_{i,t_{T_1}} - \alpha_i + \beta_i R_{mt_{T_1}}$$

Furthermore, it is necessary to aggregate abnormal returns through time and across companies. All the announcements are expected to be divided into two groups: “negative” announcements (Group I) and “positive” announcements (Group II). By “negative” announcements it is meant, that new actual earnings per share are smaller than earnings per share from the last quarter, and vice versa for “positive” announcements. That is done in order to capture the difference in responding by share prices to bad (“negative” announcements) and good (“positive” announcements) news.

It is important to understand, that e.g. “positive” news announcements can be indeed “negative”, if the expected quarterly EPS is still higher than the previous quarter one, but less than the market expectations. The same holds for “negative” news announcements. However, it is problematic to obtain an objective value of expected EPS, and that is discussed in further research of Conclusion chapter.

Then the formula for negative abnormal returns aggregation is:

$$\overline{AR}_{n,t_{T_1}} = \frac{1}{N} \sum_{i_n=1}^N AR_{i_n,t_{T_1}}$$

where N is the number of “negative” announcements ARs over time and across shares for day t of T_1 event window.

Analogously, the mathematical representation of positive abnormal returns is:

$$\overline{AR}_{p,t_{T_1}} = \frac{1}{N} \sum_{i_p=1}^N AR_{i_p,t_{T_1}}$$

where N stands for amount of “positive” announcements ARs through time and across companies of T_1 event window.

The cumulative abnormal returns (CARs) are obtained by adding up average abnormal returns over time. For “negative” news ARs:

$$CAR_{n,A,B} = \sum_{t=A}^B \overline{AR}_{n,t_{T_1}}$$

where $CAR_{n,A,B}$ stands for “negative” news cumulative abnormal returns from day A till day B

Respectively for “positive” news ARs:

$$CAR_{p,A,B} = \sum_{t=A}^B \overline{AR}_{p,tT_1}$$

where $CAR_{p,A,B}$ stands for “positive” news cumulative abnormal returns from day A till day B

The abnormal returns are the market regression model white noise, obtained for an out-of-sample event window. Due to the assumption of OLS regression disturbance, the abnormal returns should be jointly normally distributed with a zero white noise and a conditional volatility:

$$AR_{i,tT_1} \sim N(0, \sigma^2 (AR_{i,tT_1}))$$

where $\sigma^2(AR_{i,tT_1})$ is conditional volatility of AR_{i,tT_1}

The same applies for the cumulative abnormal returns (CARs). In the case of Group I CARs the normal distribution with a zero white noise and a conditional volatility is mathematically represented in the following way:

$$CAR_{n,A,B} \sim N(0, \sigma^2 (CAR_{n,A,B}))$$

where $\sigma^2(CAR_{n,A,B})$ is conditional volatility of $CAR_{n,A,B}$

For Group II CARs:

$$CAR_{p,A,B} \sim N(0, \sigma^2 (CAR_{p,A,B}))$$

where $\sigma^2(CAR_{p,A,B})$ is conditional volatility of $CAR_{p,A,B}$

This is represented by the null hypothesis, stating that an event has no any influence on share prices. More specifically for both, Group I and Group II CARs:

$$H_0: CARs_{A,B} = 0$$

$$H_A: CARs_{A,B} \neq 0$$

where H_0 and H_A are null and alternative hypotheses respectively

Therefore, if excess returns occur and they are significant, this will lead to rejection of the null hypothesis. The latter implies, that there is a leakage of information related to company’s earnings announcements, if the response occurs prior to earnings announcements, or the market was unable to implement information, if the influence is reflected after the announcement day. In both cases it is worthy to trade around a day of earnings news releases.

By plotting CARs it is possible to see, if there is any trend or pattern in abnormal returns. However, in order to understand, whether the pattern, if it occurs, is significant or not,

the t statistics for $CAR_{A,B}$ should be obtained (Su, 2003):

$$tCAR_{A,B} = \frac{CAR_{A,B}}{SD(CAR_{A,B})}$$

where $SD(CAR_{A,B})$ is standard deviation of cumulative abnormal returns from day A to day B

Calculation of statistical significance of cumulated abnormal returns allows to understand how significant is an event itself, or in case of the thesis, is the response of share prices to earnings announcements significant.

However, the more powerful statistical tests are available, if more pervasive significance testing is preferred. MacKinlay (1997) cites Patell (1976), who considered standardization tests, and Brown and Warner (1980), who compared other advanced methods to the customary approach.

4. EMPIRICAL RESULTS AND ANALYSIS

The chapter outlines the results of the research, conducted for variously aggregate samples, analyzing the obtained output. As well it presents descriptive statistics of steel companies stocks.

4.1. Descriptive statistics

Descriptive Statistics for stock of Sample Companies are presented in Table 2. The table shows currencies (Cur.), in which shares are traded on respective stock exchanges (Table 1); minimum (Min) and maximum (Max) of share prices; mean and standard deviation (Std.D.) of returns of each of the stocks and number of taken trading days (N of TD) for conducting the research. The stocks of sample companies are traded in eight world currencies (e.g. Euros, US Dollars, Swedish Kronas, etc.); the average return for the respective period varies from -0.28% (Dongkuk Steel Mill Co. Ltd.: less profitable share on average) to 0.29% (Voest-Alpine AG: most profitable share on average); the range of standard deviation of stock returns is from 1.73% (China Steel Corporation: less volatile share returns), to 6.44% (Mechel OAO: the most volatile share returns); the number of trading days varies from 175 trading days (Dongkuk Steel Mill Co. Ltd., Hyundai Steel Company and POSCO) to 1293 trading days (ThyssenKrupp AG and Salzgitter AG). Such a noticeable (seven-fold) range of the last measure is explained by the limitations of data availability (see 'Limitations' section).

4.2. Analysis of the sample

4.2.1. Overall aggregation

The values of abnormal returns (ARs) and cumulative abnormal returns (CARs) for 'negative' (Group I) and 'positive' (Group II) news over the 21 day event window for all 30 companies over five years period (overall aggregation) is presented in Table 3.

In order to obtain the significance of leakage of information, if it exists, before the announcement, the significance of CAR from day -10 to day -1 (pre-announcement period) was tested. The significance of announcement period response was tested for CAR at day -1 to day +1 (announcement period). To grasp the significance of market's fail of information implementation, in case of its occurrence, the significance of CAR from day +1 to day +10 (post-announcement period) was tested.

The null hypothesis, discussed in the theoretical framework section, states that cumulative abnormal returns around earnings announcements should be equal zero.

However, the visual observation of Table 3 and Figure 3 suggests that CARs are either larger or smaller than zero.

Group I reveals the expected pattern: the CARs for pre-announcement period are negative and statistically significant at 1% level (Table 4) and the CARs for announcement and post-announcement periods are negative and statistically significant at 5% level.

Table 2. *Descriptive Statistics for Sample Companies shares prices and share returns*

Company Name	Cur*.	Min	Max	Mean, %	Std. D., %	N of TD
Acerinox SA	EUR	7.59	19.19	-0.03	2.03	1133
AK Steel Holding Corporation	USD	4.96	68.80	0.06	4.91	1260
Allegheny Technologies Inc.	USD	14.28	109.88	0.03	4.01	1261
ArcelorMittal SA	EUR	11.22	60.66	-0.02	3.70	1095
China Steel Corporation	TWD	19.50	47.29	-0.02	1.73	1032
Commercial Metals Company	USD	5.63	34.69	0.03	3.79	1281
Dongkuk Steel Mill Co. Ltd.	KRW	20000.00	42500.00	-0.28	3.97	175
Hyundai Steel Company	KRW	77800.00	137500.00	-0.12	3.30	175
Industrias CH, SAB de CV	MXN	21.60	59.21	0.03	2.19	1257
JSW Steel Ltd.	INR	161.50	1388.35	0.11	4.09	942
Mahindra Ugine Steel Company Ltd.	INR	17.33	124.15	-0.0003	3.21	1180
Mechel OAO	USD	2.57	57.62	0.18	6.44	1190
Novolipetsk Steel OJSC	USD	18.40	49.60	-0.02	3.26	570
Nucor Corporation	USD	22.65	71.53	0.04	3.25	1262
Olympic Steel Inc.	USD	10.64	72.94	0.08	4.27	1287
Outokumpu Oyj	EUR	4.60	33.99	-0.07	3.32	1273
POSCO	KRW	351000.00	480000.00	-0.09	2.06	175
Rautaruukki Oyj	EUR	5.93	52.04	-0.05	3.08	1286
Salzgitter AG	EUR	33.69	152.02	-0.01	3.28	1293
Severstal OAO	USD	9.35	20.17	0.13	3.22	465
Schnitzer Steel Industries Inc.	USD	16.50	113.96	0.11	3.97	1279
SSAB A	SEK	47.35	315.50	-0.01	3.28	1282
Steel Authority of India Limited	INR	57.25	256.35	0.17	4.08	457
Steel Dynamics Inc.	USD	4.79	36.99	0.09	4.16	1276
Tata Steel Ltd.	INR	140.91	914.31	0.06	3.49	1263
Ternium S.A.	USD	4.47	43.25	0.05	4.00	1223
ThyssenKrupp AG	EUR	10.22	39.37	0.02	2.86	1293
United States Steel Corp.	USD	16.63	185.30	0.003	4.21	1265
Voest-Alpine AG	EUR	8.90	37.21	0.29	2.83	564
Wuhan Iron And Steel Company Ltd.	CNY	1793.06	6395.76	-0.02	2.05	1082

Note: 'Cur*.' stands for the currency at which stocks are traded, 'Min' and 'Max' are respectively minimum and maximum of share prices of each company, 'Mean' and 'St Dev.'" refer to average return of each stock and standard deviation of the return respectively, 'N of TD' is number of obtained trading days

*the currencies full names are given in 'Abbreviations' section, Appendix A

Source: The data was taken from Thomson One Banker database and Yahoo Finance website and processed by the author

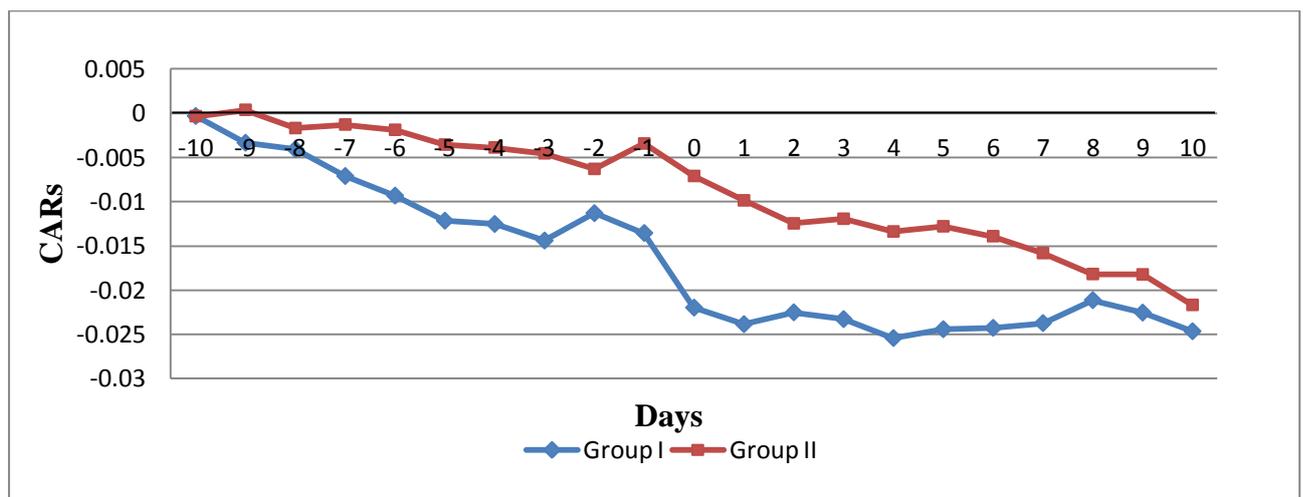
Moreover, Figure 3 exhibits anticipated pattern: first, the Group I curve is beyond the zero axis and it is decreasing from day -10 to day -3 (although there is an increase of the

Table 3. Event window abnormal returns (ARs) and cumulative abnormal returns (CARs), overall aggregation

Day	Group I		Group II	
	AR (%)	CAR (%)	AR(%)	CAR (%)
-10	-0.03	-0.03	-0.03	-0.03
-9	-0.30	-0.34	0.07	0.04
-8	-0.07	-0.41	-0.21	-0.17
-7	-0.30	-0.71	0.04	-0.13
-6	-0.22	-0.93	-0.06	-0.19
-5	-0.28	-1.22	-0.17	-0.36
-4	-0.04	-1.25	-0.03	-0.39
-3	-0.19	-1.44	-0.07	-0.45
-2	0.31	-1.13	-0.18	-0.63
-1	-0.22	-1.36	0.29	-0.34
0	-0.84	-2.20	-0.37	-0.71
1	-0.19	-2.39	-0.28	-0.99
2	0.13	-2.25	-0.26	-1.25
3	-0.08	-2.33	0.05	-1.19
4	-0.21	-2.54	-0.14	-1.34
5	0.10	-2.44	0.06	-1.28
6	0.02	-2.43	-0.11	-1.39
7	0.05	-2.37	-0.19	-1.58
8	0.26	-2.11	-0.24	-1.82
9	-0.14	-2.26	0.00	-1.82
10	-0.21	-2.47	-0.34	-2.17

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Figure 3. CARs for the 21 day event window, overall aggregation



Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

curve from day -3 to day -2, it is still at negative region), suggesting, that there is leakage of information related to companies earnings announcements; second, from day -2 to day 1 the curve is decreasing to a larger extent than for the period from day -10 to day -3, revealing the response of share prices to ‘negative’ news EPS announcements; third, the CARs from day 1 to day 10 is neither decreasing, nor increasing, but at constantly negative levels, signifying the fail of stock markets to timely implement the announced information. The larger degree of Group I curve declining from day -2 to day 1 supports the assumption of three day announcement period (from day -1 to day 1).

Conversely, the outcome for Group II is puzzling, since by reviewing previous studies, it was expected, that ‘positive’ news announcements will lead to positive CARs, at least for the announcement period. The Group II CARs demonstrate opposite pattern. Figure 3 shows downward movement from day -10 to day +10: the CAR is positive only at day -9, contradicting the intuition.

According to Table 4, using p-values, the pre-announcement period response for Group II is significant only at 10% level, the announcement period response is not significant and only the post-announcement period response (the CAR is negative) shows significance at 1% level.

Table 4. CARs for pre-announcement, announcement and post-announcement periods, overall aggregation

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-1.36	-2.79	0.006*	-0.34	-1.68	0.094***
Day -1 to +1	-1.25	-2.29	0.023**	-0.36	-1.10	0.271
Day +1 to +20	-0.27	-2.13	0.034**	-1.46	-4.05	0.000*

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: *The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author*

The existence of the significant response in Group I is in line with Campbell, Lo and MacKinlay (1997), Su (2003), Chari, Jagannathan and Ofer (1988) and other papers discussed in the methodology section.

The outcome for Group I confirms the assumption, that EPS announcements convey the information, which can be employed for companies valuation.

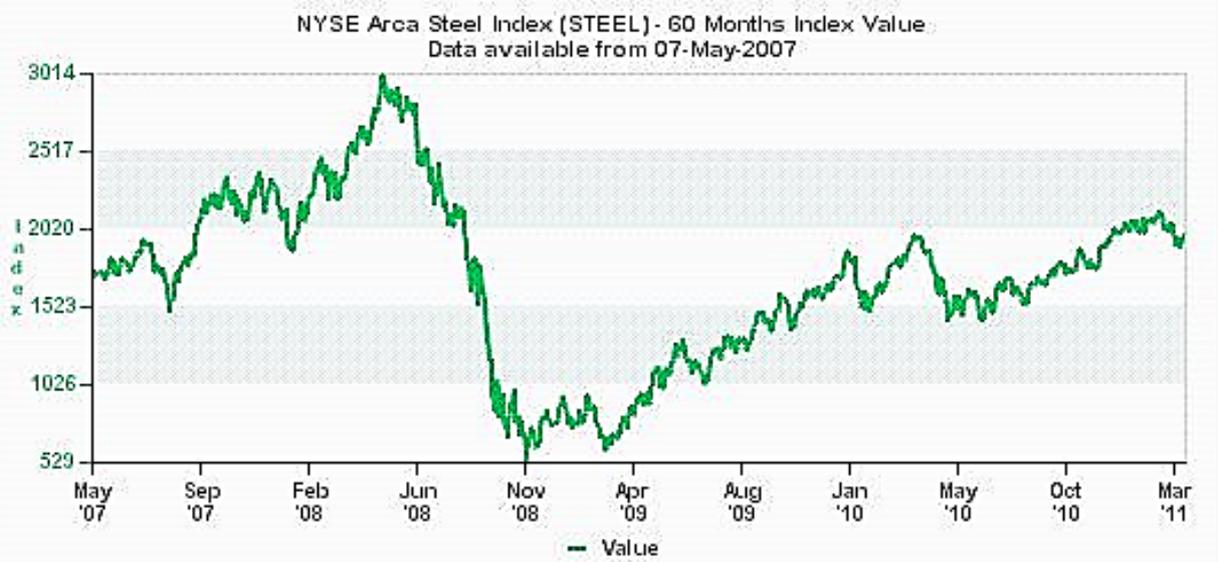
4.2.2. Yearly and countries aggregation

As it was concluded above, the pattern from overall aggregation for Group II EPS announcements are confusing. The paper, therefore assumes, that such a behavior of ‘positive’ news CARs can be explained by market perception: although the steel companies were

reporting higher current quarterly EPS in comparison to previous EPS, the market nevertheless expected the reduction of steel production and decrease of steel prices as a response to 2007-2008 financial crisis, and this drove steel companies share prices to fall. Table 1A (see appendix) presents crude steel output of sixteen biggest listed steel producers from 2006 to 2009. Thirteen out of sixteen companies reduced their crude steel output from 2007 to 2009. Swedish steel producer Svenskt Stål AB (SSAB) faced the biggest output reduction, which achieved -41%.

The earnings per share (EPS) stands for a company’s net income divided by number of outstanding shares. At the same time, the net income is overall revenues, adjusted for operational costs, depreciation, interest and taxes. Therefore, although the revenues of steel companies were declining as a result of reduction in steel output and falling steel prices, steel companies could show growing quarterly EPS by cutting their costs. However, the market could view the overall situation and nevertheless was reacting negatively. The latter is supported by Figure 4, which demonstrates the dynamics of NYSE Arca Steel Index from May 2007 till March 2011 (the constituents of the index are shown in Table 2A, see appendix).

Figure 4. *The dynamics of NYSE Arca Steel Index, May 2007 – March 2011*



Source: NYSE Euronext website

NYSE Arca Steel Index (STEEL) is a market capitalization weighted index, which includes publicly traded companies processing iron ore and producing steel (NYSE Euronext, 2012). The revision of the index takes place every quarter in March, June, September and December. The benchmark value, equal to 500.00, was initially determined in December 2003. From Figure 4 it is clear that share prices of major steel companies peaked in May 2008, achieving the value of 3014, and then were declining until April 2009, when the modest growth comparing to the peak value occurred.

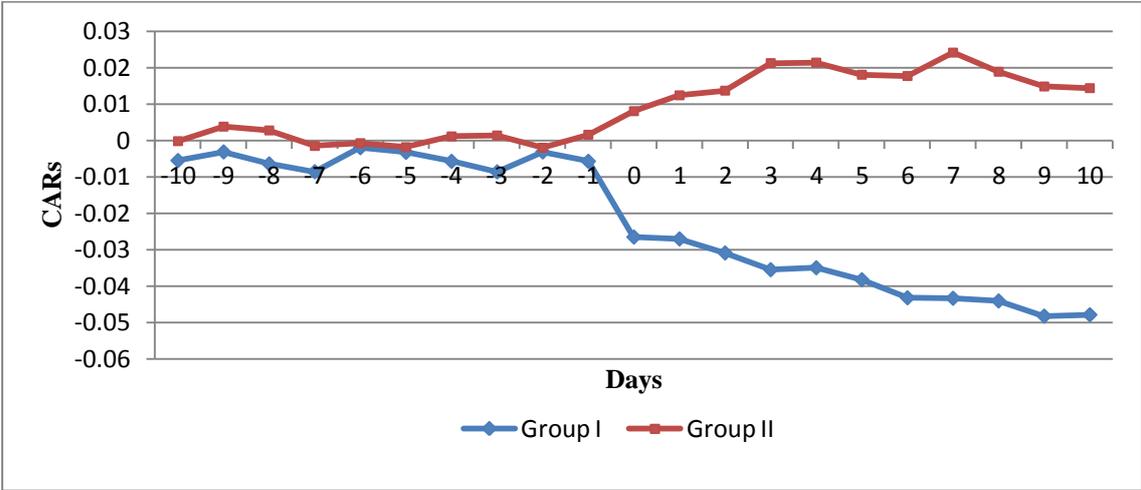
For simplification purposes, the further aggregation of sample firms was conducted on a yearly basis. However, due to the limitations, which occurred during the data collection process, the yearly aggregation for each period comprised various amount of sample companies (Table 3A, appendix).

The paper determines three periods for the steel industry: the pre-crisis year 2007 (this year is set as a pre-crisis year, because the financial crisis of 2007-2008 influenced the steel sector in 2008-2009, what is obvious from Figure 4), the period of crisis years 2008-2009 and the post-crisis period of 2010-2011. It is expected, that Group II CARs will exhibit the different pattern for each period.

Indeed, the 2007 yearly aggregation reveals previously expected pattern, which are shown in Figure 5.

Tables 4A and 5A support the visual observation. For Group II the CARs are negative and statistically significant for each period. Although for Group I the CARs for pre-announcement period and post-announcement period are not significant, however, the response at announcement period is both, positive and statistically significant. Though the leakage of information for Group I EPS announcements is significant, its CAR value is low (-0.57%) in comparison to CAR values of announcement and post-announcement periods (-2.39 and -2.14 respectively).

Figure 5. CARs for the 21 day event window, 2007 yearly aggregation



Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

The significant response of share prices to earnings announcements in Group I and in Group II is in line with Campbell, Lo and MacKinlay (1997), Su (2003), Chari, Jagannathan and Ofer (1988) and other papers, which were presented in the methodology section.

Both patterns for Group I and Group II in 2007 yearly aggregation confirm the assumption, that EPS announcements convey the information, which can be employed for companies' valuation.

However, the outcome for crisis and post-crisis yearly aggregation repeats the pattern, obtained in the first case: Group I patterns are negative and statistically significant, Group II outcome is negative as well, but insignificant for announcement period (2008-2009 yearly aggregation) and pre-announcement period (2010-2011 yearly aggregation). However, the Group II response for 2010-2011 yearly aggregation is significant at 5% level comparing to insignificant pattern for the overall aggregation (Table 4, Tables 6A and 7A, appendix). The possible explanation for such behavior of CARs at post-crisis period is that the steel industry market perception is still not at the pre-crisis levels. Moreover, the outcome for pre-announcement and announcement periods of Group I support the assumption of obtaining diverse patterns for crisis and post-crisis years: the pre-announcement and announcement periods CARs, being statistically significant, are lower for 2008-2009 than for 2010-2011.

Due to earlier outlined data collection limitations, the size of the 2007 yearly aggregated sample comprised twenty companies (Table 3A, appendix). This can lead to the conclusion, that significant response for both groups was obtained only because of the reduced sample size, in other words, only these twenty 2007 yearly aggregated companies demonstrate positive CARs for ‘positive’ news EPS announcements and vice versa for ‘negative’ news EPS. However, the pattern for same twenty companies, aggregated over 2008-2009 and 2010-2011 do not support this conclusion: the Group I output is significantly negative for both aggregations and Group II shows insignificant pattern for pre-announcement period (2008-2009 yearly aggregation, twenty companies and 2010-2011 yearly aggregation, twenty companies) and insignificant response for announcement period (2010-2011 yearly aggregation, twenty companies), which are in the negative area (Tables 8A and 9A). This finding one again supports the assumption of market perception influence on abnormal returns.

Another possible reason for the puzzling initial pattern may occur because of overall aggregation of companies with headquarters in developed and developing countries. The difference of response to EPS announcements on developed and non-developed markets reported Su (2003). Companies with head offices in developed countries tend to choose their primary listing on stock exchanges, situated in developed countries. And vice versa for companies with head offices in developing countries.

As it is shown in the limitations section, only for companies with headquarters situated in Russia (Mechel OAO, Novolipetsk Steel OJSC, Severstal OAO) the respective taken stock exchanges are not primary listing stock exchanges (Moscow Interbank Currency Exchange). These steel makers are counted as companies from developing countries. The separation on developed and developing country was based on the list of Organization for Economic Co-operation and Development (OECD): if a country is the member of OECD, then it is considered as developed.

As a result, Table 3A (see appendix) shows, that sample companies comprise twenty steel producers from developed countries and ten steel producers from developing countries. It is worthy to note, that the paper names a company, being from developed country, if it has a headquarter in this country. At the same time, the company can operate all over the world.

The pattern from obtaining share price response to earnings announcements in developed and developing countries are presented in Tables 10A and 11A respectively (see appendix).

The Group I still exhibits significant negative response to ‘negative’ news EPS announcements during the pre-announcement and announcement periods for developed countries. The Group II in the same aggregation shows the similar behavior as in the case of overall aggregation. The only difference is that the response, being negative to the ‘positive’ news EPS announcements as in overall aggregation case, became more significant: the pre-announcement period response is at 5% level of significance and the announcement period response is almost at 10% level of significance. For the developing countries case, in both groups the significant response is obtained only for post-announcement period.

Therefore, the overall aggregation of steel producers from developed and developing countries does not change the nature of the response, but influence its significance.

All the aggregations’ patterns for Group I CARs, except for developing countries aggregation, are in line with other previous papers, which conducted research on share price response to earnings announcements. The pattern for Group II CARs of 2007 yearly aggregation is consistent with previous studies as well.

5. CONCLUSION

The volatility of world financial markets and share trading activity, requires corporate finance professionals, private investors and managers to be able to assess a value of a company, in order to determine, whether the company is possibly overvalued or undervalued by market. The valuation of a company can be done by getting insight of how much external and internal to a company economic events influence its value.

Therefore, the paper set the purpose: to conduct a research on share price reaction to quarterly earnings per share (EPS) announcements, as a particular economic event, in the world steel industry for the last five years (from 2007 to 2011), using the event study methodology.

In order to achieve the purpose, the thesis attempted to answer the pre-determined research questions:

- a) Do earnings announcements influence share prices changes in the steel industry, and how significant is the response of share prices to announcements?
- b) When does such an influence take place?

For the sample size of 30 listed steel companies all the announcements were divided into two groups: “negative” announcements (Group I) and “positive” announcements (Group II).

The pattern for overall aggregation of sample companies showed the significant and expected share price response to earnings announcements for Group I only. The output for Group II was puzzling. This led to the assumption of negative market perception on the steel industry stock prices as a result of 2007-2008 financial crises. Indeed, for 2007, which was determined as a pre-crisis period for the steel industry, the share price reaction was significant for both groups of EPS announcements.

However, within the two other periods (crisis period of 2008-2009 and post-crisis period of 2010-2011) significant and expected pattern were obtained only for Group I once again. The 2007 yearly aggregation comprised only twenty companies due to the data availability. This revealed the assumption, that this sample of twenty steel companies should be tested for the two other periods. However, the pattern remained the same as in the overall aggregation case. Furthermore, the sample steel companies were aggregated on the countries basis. The obtained response was analogous to overall aggregation response, the only difference is that Group I reaction was more significant for developed countries than for developing countries sample.

All the aggregations’ pattern for Group I CARs, except for developing countries aggregation, are in line with Campbell, Lo and MacKinlay (1997), Su (2003), Chari, Jagannathan and Ofer (1988) and other papers discussed in the methodology section, which conducted research on share price response to earnings announcements. The pattern for Group II CARs of 2007 yearly aggregation is consistent with previous studies as well.

These patterns confirm the assumption, that EPS announcements convey the information, which can be employed for companies’ valuation.

For further research it would be possibly beneficial to look at the difference between expected EPS and current EPS for a period. The intuition is that there might be the case, when ‘positive’ news EPS announcements, obtained in the paper, were indeed ‘negative’ EPS

announcements, because of the market expectations. However, it is problematic to obtain a reliable data of EPS expectations.

Second, it might be worthy to look at company's level (certainly, enlarging the research period) to obtain share price response for each company and to reconcile it with internal financial indicators. This could lead to feasible explanation of confusing pattern for Group II overall aggregation case.

Finally, it could be interesting to explore, how market perception influences share prices changes of steel companies, even if they demonstrate the same internal financial indicators at different values of shareholders equity.

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APPENDIX A

Abbreviations

Countries		Currencies		Stock Exchanges	
AUT	Austria	CNY	Chinese Yuan	AEX	Amsterdam Stock Exchange
CHN	China	EUR	Euro	FRA	Frankfurt Stock Exchange
ESP	Spain	INR	Indian Rupee	HEX	Helsinki Stock Exchange
FIN	Finland	KRW	South Korean Won	KSC	Korea Stock Exchange
GER	Germany	MXN	Mexican Peso	LSE	London Stock Exchange
IND	India	SEK	Swedish Krona	MCE	Madrid Stock Exchange
KOR	South Korea	TWD	Taiwan Dollar	MEX	Mexican Stock Exchange
LUX	Luxembourg	USD	US Dollar	NSI	National Stock Exchange of India
MEX	Mexico			NSQ	NASDAQ
RUS	Russia			NYSE	New York Stock Exchange
SWE	Sweden			SHH	Shanghai Stock Exchange
TWN	Taiwan			STO	Stockholm Stock Exchange
USA	United States			TAI	Taiwan Stock Exchange

APPENDIX B

Tables

Table 1A. *Production output of biggest listed steel producers, 2006-2009, mln. metric tones*

Company name	2006	2007	2008	2009	2007 to 2009, %
ArcelorMittal SA	117	116.4	103.3	77.5	-33.42
China Steel Corporation	10.7	10.9	11	8.9	-18.35
Hyundai Steel Company	8.9	10	9.9	8.4	-16.00
JSW Steel Ltd.	n/a	3	3.8	5.5	83.33
Novolipetsk Steel OJSC	9.1	9.7	11.3	10.9	12.37
Nucor Corporation	20.3	20	20.4	14	-30.00
POSCO	30.1	31.1	34.7	31.1	0.00
Salzgitter AG	7.4	7.3	6.9	4.9	-32.88
Severstal OAO	17.5	17.3	19.2	16.7	-3.47
SSAB	3.7	6.1	6.1	3.6	-40.98
Steel Authority of India Limited	13.5	13.9	13.7	13.5	-2.88
Tata Steel Ltd.	6.4	26.5	24.4	20.5	-22.64
ThyssenKrupp AG	16.8	17	15.9	11	-35.29
United States Steel Corp.	21.2	21.5	23.2	15.2	-29.30
Voest-Alpine AG	6.5	6.9	6.8	5.5	-20.29
Wuhan Iron And Steel Company Ltd.	15.1	20.2	27.7	13.7	-32.18

Source: World Steel Association website

Table 2A. *The components of NYSE Arca Steel Index as of Jan 2011*

Company Name	Symbol	% Weighting
Companhia Vale do Rio Doce	RIO	12.28
N.A.	VALE	10.87
Posco Ads	PKX	7.90
Mittal Steel Co. N.V.	MT	7.66
Reliance Steel & Aluminum Co.	RS	5.40
Timken Co	TKR	5.09
Allegheny Technologies	ATI	4.99
Nucor Corp	NUE	4.91
U.S. Steel	X	4.75
Cleveland-Cliffs	CLF	4.73
Companhia Siderurgical Nacional	SID	4.58
Gerdau S.A.	GGB	4.45
Mechel Steel GR ADS	MTL	3.79
Steel Dynamics Inc	STLD	3.41
Ternium S.A.	TX	3.24
Carpenter Technology	CRS	2.83
Commercial Metals Co.	CMC	1.90
Schnitzer Steel Ind'a'	SCHN	1.52
Worthington Indus	WOR	1.48
Grupo Simec Ads	SIM	1.38
Ak Steel Holding	AKS	1.07
Gibraltar Steel Corp	ROCK	0.48
Castle (a.m.)	CAS	0.35
LB Foster Co	FSTR	0.35
Universal Stainless & Alloy Products Inc	USAP	0.30
Olympic Steel	ZEUS	0.29

Source: NYSE Euronext website

Table 3A. *Yearly aggregation and Countries aggregation of sample companies*

Company Name	Yearly aggregation			Yearly aggregation, 20 companies		Countries aggregation	
	2007	2008-2009	2010-2011	2008-2009	2010-2011	Developed	Developing
Acerinox SA		*	*			*	
AK Steel Holding Corporation	*	*	*	*	*	*	
Allegheny Technologies Inc.	*	*	*	*	*	*	
ArcelorMittal SA	*	*	*	*	*	*	
China Steel Corporation		*	*				*
Commercial Metals Company	*	*	*	*	*	*	
Dongkuk Steel Mill Co. Ltd.			*			*	
Hyundai Steel Company			*			*	
Industrias CH, SAB de CV	*	*	*	*	*		*
JSW Steel Ltd.		*	*				*
Mahindra Ugine Steel Company Ltd.	*	*	*	*	*		*
Mechel OAO	*	*	*	*	*		*
Novolipetsk Steel OJSC			*				*
Nucor Corporation	*	*	*	*	*	*	
Olympic Steel Inc.	*	*	*	*	*	*	
Outokumpu Oyj	*	*	*	*	*	*	
POSCO			*			*	
Rautaruukki Oyj	*	*	*	*	*	*	
Salzgitter AG	*	*	*	*	*	*	
Severstal OAO			*			*	
Schnitzer Steel Industries Inc.	*	*	*	*	*	*	
SSAB A	*	*	*	*	*		*
Steel Authority of India Limited			*				*
Steel Dynamics Inc.	*	*	*	*	*	*	
Tata Steel Ltd.	*	*	*	*	*		*
Ternium S.A.	*	*	*	*	*	*	
ThyssenKrupp AG	*	*	*	*	*	*	
United States Steel Corp.	*	*	*	*	*	*	
Voest-Alpine AG			*			*	
Wuhan Iron And Steel Company Ltd.	*	*	*	*	*		*

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 4 A. *Event window abnormal returns (ARs) and cumulative abnormal returns (CARs), 2007 yearly aggregation*

Day	Group I		Group II	
	AR (%)	CAR (%)	AR (%)	CAR (%)
-10	-0.55	-0.55	-0.02	-0.02
-9	0.24	-0.32	0.40	0.38
-8	-0.33	-0.6	-0.10	0.27
-7	-0.22	-0.86	-0.43	-0.15
-6	0.66	-0.20	0.08	-0.08
-5	-0.13	-0.33	-0.11	-0.19
-4	-0.25	-0.58	0.30	0.11
-3	-0.29	-0.86	0.03	0.14
-2	0.55	-0.32	-0.34	-0.20
-1	-0.26	-0.57	0.36	0.16
0	-2.08	-2.66	0.65	0.80
1	-0.05	-2.71	0.44	1.24
2	-0.39	-3.09	0.13	1.37
3	-0.46	-3.55	0.76	2.13
4	0.05	-3.50	0.01	2.14
5	-0.33	-3.83	-0.33	1.80
6	-0.50	-4.33	-0.04	1.77
7	-0.01	-4.34	0.64	2.41
8	-0.07	-4.41	-0.53	1.89
9	-0.42	-4.83	-0.40	1.48
10	0.04	-4.79	-0.05	1.44

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 5 A. *CARs for pre-announcement, announcement and post-announcement periods, 2007 yearly aggregation*

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-0.57	-2.49	0.017**	0.16	0.78	0.441
Day -1 to +1	-2.39	-1.96	0.056***	1.44	2.64	0.013**
Day +1 to +20	-2.14	-2.98	0.005*	0.63	1.65	0.109

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 6 A. CARs for pre-announcement, announcement and post-announcement periods, 2008-2009 yearly aggregation

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-2.33	-3.71	0.000*	-1.02	-2.49	0.015**
Day -1 to +1	-1.35	-2.66	0.010*	-0.39	-0.83	0.408
Day +1 to +20	1.62	3.23	0.002*	-1.01	-2.50	0.014**

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 7 A. CARs for pre-announcement, announcement and post-announcement periods, 2010-2011 yearly aggregation

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-0.89	-2.07	0.041**	-0.18	-1.03	0.305
Day -1 to +1	-0.66	-2.19	0.031**	-0.94	-2.22	0.028**
Day +1 to +20	0.95	2.08	0.041**	-1.05	-4.02	0.000*

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 8 A. CARs for pre-announcement, announcement and post-announcement periods, 2008-2009 yearly aggregation, 20 companies

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-1.32	-2.51	0.014**	-0.02	-0.11	0.910
Day -1 to +1	-0.63	-2.14	0.035**	-0.93	-2.11	0.039**
Day +1 to +20	1.41	2.84	0.006*	-1.36	-4.62	0.000*

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 9 A. CARs for pre-announcement, announcement and post-announcement periods, 2010-2011 yearly aggregation, 20 companies

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-2.06	-3.74	0.000*	-0.62	-1.59	0.115
Day -1 to +1	-1.39	-2.52	0.014**	-0.40	-0.82	0.415
Day +1 to +20	1.57	3.15	0.002*	-1.53	-3.26	0.002*

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 10 A. CARs for pre-announcement, announcement and post-announcement periods, Developed Countries aggregation

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-1.75	-3.73	0.000*	-0.31	-2.15	0.033*
Day -1 to +1	-1.28	-2.50	0.013*	-0.53	-1.62	0.107
Day +1 to +20	1.29	3.17	0.002*	-0.81	-3.17	0.002*

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author

Table 11 A. CARs for pre-announcement, announcement and post-announcement periods, Developing Countries aggregation

Period	Group I			Group II		
	CAR (%)	tCAR	p-value	CAR (%)	tCAR	p-value
Day -10 to -1	-0.23%	-0.64	0.524	-0.10%	-0.20	0.845
Day -1 to +1	-1.18%	-1.65	0.104	0.08%	0.37	0.715
Day +1 to +20	-1.38%	-4.55	0.000*	-0.72%	-1.88	0.065***

Note: tCAR is t-statistic of cumulative abnormal returns, * is 1% significance level, ** is 5% significance level and *** stands for 10% significance level.

Source: The data was taken from Thomson One Banker database, Yahoo Finance, Financial Times and NASDAQ OMX Nordic websites and processed by the author