

Insider Trading at Zagreb Stock Exchange

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Abstract: *This paper is the first paper that systematically observes and describes all publicly available data on insider trading on the Zagreb Stock Exchange during the period of June 2010 - June 2021. To accomplish this objective both parametric and non-parametric event-study tests are conducted using the data collected from 827 notifications published on the Zagreb Stock Exchange website. After filtering the notifications for overlapping events, there were 48 insiders' purchase events and 50 insiders' sales events. The results indicate that insiders can earn abnormal returns on share purchases based on their insider knowledge and that the information on insider purchases can bring additional information to outside investors. However, in the case of notifications of share sales by insiders, Cumulative Average Abnormal Returns (CAARs) after the event are not statistically significant and are just slightly positive, thus bringing no abnormal returns for insiders and not conveying information to the public. This suggests that the market may perceive sales having a lower informational content, as motivation for sales may be other needs, such as liquidity.*

Keywords: event study; abnormal return; insider trading; Zagreb Stock Exchange

JEL Classification: G14, G11, C12

Introduction

In early 2020, the COVID-19 epidemic brought huge turmoil in economic activities, particularly on stock markets around the globe, not circumventing the Zagreb Stock Exchange (“ZSE”). There was no person, no matter of profession, not having an opinion about when the epidemic itself would end and what kind of consequences it would have on different economic, cultural, and social activities and at what scale.

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Tourism, having a big influence and being a part of all three, economic, cultural, and social activities and being a significant contributor to the Croatian GDP, was especially under scrutiny from the Croatian public. Furthermore, tourism companies play significant role on the ZSE. Hence their price movements were in the loop when it became apparent that the COVID-19 epidemic would, after all, leave a mark on the Croatian tourism sector. However, there were still speculations regarding how deep the mark would be. Naturally, investors were analysing whether it was the right time to invest in shares under the new, much lower, valuations. Hence, notification under Issuer Announcements on the ZSE's website that a CEO of a Croatian tourism company was buying his company's shares on several occasions under the new, lower valuation raised two questions. Was the CEO buying the shares to show investors that an investment in the company under the current lower valuation was a good buy? Did he have insider information, such as the resistance of the company from external shock, which would assure him the share was undervalued? This inspired a systematic look into insider trading on the ZSE.

This study has two goals. The first one is to systematically observe and describe all publicly available data on insider trading on the ZSE. The second goal is to investigate and to try to answer whether insiders earn abnormal returns on the ZSE and if investors i.e., outsiders, can mimic their transactions to earn such returns themselves. Parametric and non-parametric event-study tests are conducted using the data collected from 827 notifications published on the ZSE's website during the period of June 2010 – June 2021. After filtering the notifications for overlapping events, 48 insiders' purchase events and 50 insiders' sales events remained. The results suggest that insiders can earn abnormal returns on share purchases and that information on insider purchases can bring additional information to outside investors. In the case of notifications of share sales by insiders however, CAARs after the event are not statistically significant.

This is the first paper that systematically observes and describes all publicly available data on insider trading on the ZSE for the selected period. The rest of the paper is structured as follows. After the introductory part, an overview of relevant literature on insider trading on the Croatian stock market and international markets is presented, followed by the data and summary statistics. After that section methodology, data analysis and empirical results of the conducted research are presented. The conclusion, at the end of the paper, recapitulates the findings and limitations and gives recommendations for further research.

Literature Overview

Compared to other developed stock markets, the Croatian stock market, with its modern history of a bit longer than 20 years, is a relatively young one. As per Šego &

Škrinjarić's (2018) literature overview of the ZSE's from establishment until 2018, there are no studies covering the topic on insider trading with a specific focus on the ZSE. The only other paper covering the topic of insider trading in Croatia is Kim et al. (2019). It is a study of the influence of insider regulations enforcement on the informativeness of insider trades and stock price efficiency across 44 countries, during 2008-2013. To calculate abnormal stock returns, they used the data obtained from Director Deals, a database of share transactions from 56 countries made by management of about 40.000 firms. The study measures the cumulative returns of the traded stocks in excess of the index return over 5, 10, 20, 60 and 120 days. The returns for Croatia are not statistically significant except for purchases at 60 and 120 days with the negative returns of -1.12% and -1.91% respectively. The study puts Croatia in the list of countries that do not actively enforce insider trading regulations. Authors state that in such countries, insider trades are less informative because in the presence of better-informed insiders, the information is unevenly distributed and the consequence is less competitive market and less efficient stock prices. Since 2014, Croatia follows the European Union regulations on insider trading, so this paper will hopefully bring some new and worthy insights on the topic since the dataset covers the period of uniformed regulations on the EU level. There is no justified reason to consider Croatia a country that does not actively enforce insider trading regulations.

There are a number of papers written about answering the questions, who is a Croatian investor, how does such an investor gather and process publicly available information, and how do they bring their decisions based on such information. These papers could help build an enhanced understanding of insider trading and its influence on the Croatian stock market.

The first group consists of papers that try to understand who a Croatian investor is. Bubaš, Alajbeg & Gamulin (2012) present data on sophisticated market participants who invest for their own account and what factors drive their behaviour in the market. According to their results, the most trusted sources of information for sophisticated market participants are business websites (54%), followed by conversations with friends who also invest (36%) and internet forums and blogs (31%). However, the paper does not directly answer the question of whether investors use data on insiders' transactions, but presents that, investors are using many different sources in similar proportions to get valuable information, thus, it cannot be excluded that they consider insiders' transactions when making decisions about investments. Croatian investors' level of rationality was above average with vigilance being the dominant style of decision making, which overlaps with the rational decision-making style (Mušura Gabor & Knezović, 2016). However, empirical research of Mušura Gabor & Gamulin (2016) concludes that investors, in general, are susceptible to heuristically/biased reasoning i.e., to make irrational decisions and errors in judgment and to use heuristics to make faster decisions but not necessarily correct ones.

The second group consists of papers that try to answer the question of what information Croatian investors gather to make their investment decisions. Altras Penda's (2017) paper shows that investors on the ZSE do not react to published earnings. Miletić (2011), on the other hand, claims that dividend change announcements have significant information value for investors on the Croatian stock market. If dividends are to increase, prices increase as well, if dividends are to decrease, prices of the stock decrease.

Arnerić, Jurun & Rozga (2010) paper confirms the existence of significant correlation between the information content of the incoming news and price volatility. Their results indicate that the influence of bad news on price changes is greater than of the good ones. Another paper (Čižmešija, Sorić & Matošec, 2017) proved the interdependence between news information and the Croatian stock market. Investors react to negative news both in terms of the return and daily trading activity. In regards to positive news there is a link to returns, but no link in terms of daily trading activity.

The literature on insider trading on the stock markets around the world is vast. The topic has intrigued researchers as it has intrigued investors. The history of researching the topic is long and can be observed from many angles and in many ways. The data on insider trading on the US stock market, for example, go back as far as 1934, when the obligation to file the data on insider trading was introduced. Clacher, Hillier & Lhaopadchan (2009) divided current empirical research into three key subjects: profitability, timing and regulation of insider trading.

On the US stock market, there is a range of research from different time periods [Finnerty (1976), Givoly & Palmon (1985), Ravina & Sapienza (2010), Wang, Shin & Francis (2012)] that all state, using different methodologies, that insider traders earn significantly abnormal returns. Seyhun (1992), Chowdhury, Howe & Lin (1993) and Lakonishok & Lee (2001) base their studies on aggregate insider trading approach, using regression analysis, vector autoregressive model and factor models trying to answer if broader investment strategies can be developed around insider trading information. In short, yes, aggregate insider trading can be a good forecaster of market movements, but Lakonishok & Lee (2001) say that implementing investment strategies built on insider trading information is not straightforward. The other types of studies are the ones like Ravina & Sapienza (2010) and Wang, Shin & Francis (2012) that try to answer if some categories of insider traders earn more than the others. Ravina & Sapienza's (2010) research investigates independent board members and the return of their insider trading using event study methodology, indicating that they do earn abnormal returns, like executives do. Wang, Shin & Francis (2012) explore whether chief financial officers trade with more success than chief executive officers. Their premise is based on the belief that CFOs have more insight in the financials of the company. Their research has proved their premise that CFOs trade with more success than CEOs. Additionally, they claim that CFO's trades can be mimicked by investors, since risk-adjusted abnormal returns are still realized after information on

CFO's trades becomes publicly available. Seyhun (1990) and Gangopadhyay, Yook & Sarwar (2009) look into insider responses at times of stock market crashes. Seyhun (1990) explores insider trading before and after the NYSE crash in October 1987 and Gangopadhyay, Yook & Sarwar (2009) examined insider trading in the 2000-2002 crash period and the recovery in 2003. Both studies concluded that insiders increased their trading around the crash period and that profits from insider trading can be attributed to possession of superior information and thus, insider trading in a volatile market can be very profitable.

Certainly, the topic of insider trading has caught attention outside the US stock market. Gebka et al. (2017) have done thorough research in 18 European countries for a period of 14 years. Their approach was to analyse purchase and sales portfolios, separately, that consist of all shares bought or sold by insiders in a particular country and then estimate whether such portfolios perform better than the respective market on the risk-adjusted basis. Holding periods of portfolios were 1, 3, 6 and 12 months. They have used extensive analysis using different subsamples of companies based on analyst coverage, size, industry, and ownership structure and introduction of the European Union Market Abuse Directive into local laws. They came to same conclusion that in only a few European countries insider portfolios generate significant risk-adjusted abnormal returns withal the decreasing average profitability in the longer holding horizon. He & Rui (2016) give an insight on insider trading in China with an emphasis on ownership structure and insider trading. Using event study methodology and regression model they did find evidence of insider trading earning positive abnormal returns both when selling and buying stocks. Also, they found evidence that different ownership concentration has influence on market returns of insider purchases.

When it comes to research papers on the performance of insider trading using event study methodology, Brio, Miguel & Perote (2002) investigate information content and the profitability of insider trading in the Spanish stock market. Their sample used the daily data on publicly available insider transactions. The estimation window was set to 80 days prior to day -10 with the event window set from day -10 to day +60. They used a traditional market model and a modified market model adjusted for conditional heteroscedasticity as their expected-return models. Based on the conducted study their conclusion is that insiders on the Spanish market earn returns that beat the market. On the other hand, by using the publicly available information outsiders cannot earn abnormal profits. Degryse, de Jong & Lefebvre (2014) analyse legal insider trading for Dutch listed companies by top executives and other insiders with the event date set on the date of the transaction. In their analysis the estimation window is set at 250 trading days and the event window is set at 51 days, 20 days before the event, the event itself and 30 trading days after the event. For the normal rate of return they use the market model, with Amsterdam Exchange Index as a proxy for the market return. The study has shown that abnormal returns for insider purchases is significant, up to 2% in a window of 30 days, but less significant and lower

for sales. Also, abnormal return is larger for the executives than for other insiders. In addition, the trades in smaller companies are more informative than the trades in larger companies. Biesta et al. (2003) is another article with regards to the Dutch market using event study, but also a buy-and-hold strategy. In the study, the estimation window was also set to 250 trading days prior to the event window. However, the event window was shorter, being 41 days, 20 days prior to the event and 20 after the event. The normal returns were estimated with the market model, using broad-based index compiled by the national statistics agency as the proxy for the market. This research showed that mimicking insider buys, outsiders can achieve a short-term benefit. Another example of an event study by Antoniadis, Gkasis & Sormas (2015) comes from the Athens Stock Exchange with focus on the Greek technology sector. The transaction announcement was set as the event. The event window was set at -20 to +20, and the estimation window was set to 160 trading days [-180, -21]. To calculate abnormal returns, the adjusted market model was used and the beta coefficient for the return of each stock is calculated in relation to the market returns of the General Index of the ATHEX market. Their study showed that insider purchases were non relevant to investors and that insider sales provoked some reaction in the market, but within 10 days of the announcement. Bajo & Petracci (2006) investigate the Italian stock market. Their event study with a window of 21 days did not find any significant reaction around these dates (the market adjusted model used to measure abnormal returns and an estimation window of 52 weeks before the analysis period.) Also, some other examples of the use of event study in measuring the effect on insider trading are Bacon & Roddenberry, (2011) for the US stock market, Fidrmuc, Goergen & Renneboog, (2006) for the United Kingdom stock market and Heinkel & Kraus (1987) for Canadian market.

The objective of this paper is to contribute to the field of the performance of insider trading using event study methodology for short-term performance of insider trading as in the literature presented above. This study investigates Croatian stock market, a developing market with short history, thus brining new insights to the existing literature dominantly preoccupied with developed and well-established stock markets.

Data and Summary Statistics

The data on insiders' transactions used in this study are publicly available on the ZSE's website. Hence, it is easily available for an interested investor alongside other publicly available information such as dividend announcements, mergers, financial statements, general assembly resolutions, and other important information that can affect the price of shares. All insiders' transactions must be published according to the Exchange Rules under Article 4.2.1.3. on the ZSE website. This article is in accordance with the provisions of Article 19 of Regulation (EU) No 596/2014. EU

regulations prescribe that notifications on insiders' transactions and closely related persons have to be published no later than three business days after the date of such transaction. All data that such notification must contain, such as name, nature, price etc. are prescribed in the Exchange Rules¹ document.

The data used in this study covers the period from June 2010 to June 2021, all publicly available notifications on the ZSE's website. In this period there are 827 notifications on insider's transactions. The most common example is where one notification presents one transaction by a single insider. However, one notification may include more than one transaction. There may be several transactions by a single insider on a single day or several days close by or notifications comprising of several insiders' transactions, notifications on different types of shares etc. For the purpose of this research the following approach is used for calculating returns on insider trading: each notification is observed as one transaction, when there are several transactions by one insider, the date of the newest one is taken as the date of the transaction, when there are several insiders and several dates the, date of the newest one is taken as the date of the transaction if it is obvious from the nature of transactions that they are all the result of the same decision.

Table 1: Summary of Transactions by Participants from June 2010 to June 2021

Type of transaction	Participants	Number of transactions	Percentage in the type of the transaction	Percentage in total transactions	Mean value in HRK	Median value in HRK
Purchase						
	Management Board	383	44%	31%	900.828	141.450
	Supervisory Board	257	30%	21%	259.413	69.484
	Other Management	151	17%	12%	181.881	50.000
	Employees	10	1%	1%	43.495	50.000
	Closely Related Persons	32	4%	3%	1.998.373	35.315
	Not Specified and Other	37	4%	3%	199.270	120.000
Total Purchase		870	100%	70%	551.487	86.428
Sale						
	Management Board	159	43%	13%	674.697	312.475
	Supervisory Board	99	27%	8%	2.139.145	112.095
	Other Management	92	25%	7%	233.141	124.059
	Employees	2	1%	0%	n/a	n/a
	Closely Related Persons	16	4%	1%	46.950	36.198
	Not Specified and Other	5	1%	0%	80.950	80.950
Total Sale		373	100%	30%	891.326	135.641
Total Transactions		1243		100%	657.046	97.643
<i>Mean Value and Median Value do not count entries with no data on transaction value in the calculation</i>						

Source: Authors' calculation based on the ZSE's website

However, in order to better describe insider trading on ZSE, the summary statistics based on the participant is presented in Table 1. *Summary of Transactions by Participants from June 2010 to June 2021*. In case one participant made several transactions published in the same notification, it is considered as one transaction. In case there are several participants in the same notification, each of their transactions is presented as standalone transactions. In case one participant submitted a notification including different types of shares or purchases and sales, each is presented as one transaction. Hence the total number of transactions is higher than the number of notifications in the given period.

In total, insiders on the ZSE are net buyers, with more than twice the number of purchases of shares than sales of shares, same as reported by Brio, Miguel & Perote (2002) for Spanish and Antoniadis, Gkasis & Sormas (2015) for Greek market. As expected, the most transactions are executed by the members of the Management Boards followed by the members of the Supervisory Boards. Both, Total Sales and Total Purchases are highly skewed by a few transactions on the high end. Table 2 presents the distribution of the transactions by size and type.

Table 2: The distribution of the transactions by type and size

Type of transaction	Size of transaction in HRK						
	All Transactions	Less than 10.000	10.000 - 50.000	50.001 - 200.000	200.001 - 500.000	500.001 - 2.000.000	More than 2.000.000
Purchase	627	74	164	206	102	54	27
<i>in Percentage</i>	100%	12%	26%	33%	16%	9%	4%
Sale	278	13	59	87	39	61	19
<i>in Percentage</i>	100%	5%	21%	31%	14%	22%	7%
All Transactions	905	87	223	293	141	115	46
<i>in Percentage</i>	100%	10%	25%	32%	16%	13%	5%
<i>All Transactions' count excludes the transaction without data</i>							

Source: Authors' calculation based on the ZSE's website

In both cases, for Purchases and Sales, the most transactions executed were in the range of 50.001 to 200.000 HRK. It can be concluded that the transactions' values in both Sales and Purchases show similar distribution across the value ranges.

In the Table 3, the data on the share of the transaction to total number of listed shares are presented². As it can be seen, more than 90% of the transactions for both sales and purchases are up to 0,5% of the total shares, meaning that insider transactions are mostly the transactions which do not bear significance in the terms of the share ownership in the company.

Table 3: Size of transaction in percentage to total number of shares

Type of transaction	Size of transaction in percentage to total number of shares						
	All Transactions	0 - 0,1%	0,1 - 0,5%	0,5 - 1%	1% - 2%	2 - 5%	More than 5%
Purchase	361	253	78	13	7	7	3
<i>in Percentage</i>	100%	70%	22%	4%	2%	2%	1%
Sale	171	128	26	6	2	1	8
<i>in Percentage</i>	100%	75%	15%	4%	1%	1%	5%
All Transactions	532	381	104	19	9	8	11
<i>in Percentage</i>	100%	72%	20%	4%	2%	2%	2%
<i>All Transactions' count excludes the transaction without data</i>							

Source: Authors' calculation based on the ZSE's website

Methodology and Empirical Results

An event study methodology is used for calculating if there are abnormal returns by insiders. As described by MacKinlay (1997) given the rationality of the market, this study investigates the influence of a certain event on the value of the company if such an event is reflected in the prices immediately.

Based on the experience of the researchers using event study methodology on insider trading [Heinkel & Kraus (1987), Brio, Miguel & Perote (2002), Biesta et al. (2003), Bajo & Petracci (2006), Fidrmuc, Goergen & Renneboog (2006), Bacon & Roddenberry (2011), Degryse, de Jong & Lefebvre (2014), Antoniadis, Gkasis & Sormas (2015)] presented in Literature Review section, event study analysis is conducted only on sales and purchases on the open-market. Hence, another set of data filtration is needed before the calculation. All of the purchases and sales with a nature of transaction such as acceptance of share options, purchase in accordance with the own shares' distribution plan, company's business results scheme, dividends, increase of the issued capital, reward, inheritance or any other similar reason, are excluded from calculation as all of these transactions are not explicitly or not necessary conducted by the information driven reasons. Secondly, the transactions without a purchase or sale price are excluded. More of these transactions are to be found closer to year 2010, to be assumed due to less strict regulation on insider trading at the time. Thirdly, all transactions of the shares which are no longer traded at the time of the writing of this paper, third quarter of 2021 are excluded. Finally, all of sale and purchase events are filtered from the overlapping events such as general assembly notification, financial statements disclosure, dividends announcement, merger announcement and change of management announcement. This leaves 48 purchase events and 50 sale events.

The event study is conducted in the following way. First, the estimation window is set to 250 days as in MacKinlay (1997), Biesta et al. (2003) and Degryse, de Jong &

Lefebvre (2014). The event window is set at -10 to +10 days i.e 21 days as in MacKinlay (1997) and Bajo & Petracchi (2006). The formulae follow the study of Antoniadis, Gkasis & Sormas (2015).

The following formula for simple returns is used to convert the prices to returns:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (1)$$

where P_t is the closing price of the stock at day t and P_{t-1} is the closing price of the stock at day $t-1$. To compute the Abnormal Returns, the stock returns are subtracted from the market model.³ The beta coefficient for the return of each stock is estimated in relation to the market returns of the CROBEX Index. The formula is;

$$AR_{it} = R_{it} - (\alpha + \beta * R_{mt}) \quad (2)$$

The above formula is similar to the residuals of a regression model. Therefore, a regression model is fitted and the residuals of the model, the Abnormal Returns, are obtained.

The Cumulative Abnormal Returns (CAR) are computed as the sum of all Abnormal Returns for each company during the event window where;

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (3)$$

Then, the Cumulative Average Abnormal Returns (CAAR) are also calculated

$$CAAR(t_1, t_2) = 1/N \sum_{t=t_1}^{t_2} CAR(t_1, t_2) \quad (4)$$

Finally, a test of significance must be performed to examine the hypothesis that the events had an impact on the cumulative average abnormal returns. This hypothesis can be illustrated as;

$$\begin{aligned} H_0: CAAR &= 0 \\ H_1: CAAR &\neq 0 \end{aligned} \quad (5)$$

Firstly, the parametric test is conducted as proposed in MacKinlay (1997) to bring the decision of whether to accept or reject the null hypothesis is based on the absolute value of the t statistic. The t statistic is computed as:

$$t = \frac{CAAR(t_1, t_2)}{\sqrt{Var(CAAR(t_1, t_2))}} \quad (6)$$

where $(CAAR(t_1, t_2))$ is the variance of the CAARs in that event window.

The t statistic follows the normal distribution, and therefore with this knowledge the critical values of the t statistics can easily be obtained. If the absolute value of the t-value is greater than the critical value, the null hypothesis is rejected; meaning the sale or purchase was significant. The tables presented below contain the CAARs of the stocks for purchases and sales and their t statistics (absolute values of the t statistic). The robustness check is conducted with non-parametric test of significance – sign test that assumes the cumulative average abnormal returns do not follow a particular distribution but are independent across stocks. The expected proportion of positive CAARs in an event window is equal to the proportion of negative ones. The hypothesis test is that:

$$\begin{aligned} H_0: p &\leq 0.5 \\ H_1: p &\geq 0.5 \end{aligned} \quad (7)$$

Where p denotes the proportion of positive CAARs, $p = P(\text{CAAR} \geq 0)$. The test statistic is given by:

$$\theta = \left(\frac{N^+}{N} - 0.5 \right) \times \frac{\sqrt{N}}{0.5} \sim N(0,1) \quad (8)$$

where N^+ is the number of positive CAARs in the event window (MacKinlay, 1997).

Table 4: Purchases of the stocks

Event period	CAAR	CAAR standard t-test	Sign test
(-10, 0)	0.43%	13.925	0.9045
(-9, 0)	0.10%	0.3551	2.5298 **
(-8, 0)	0.67%	2.2024 *	0.3333
(-7, 0)	0.41%	12.762	1.4142
(-6, 0)	0.21%	0.6814	1.8898 *
(-5, 0)	0.48%	14.350	1.6330
(-4, 0)	0.59%	15.721	1.3416
(-3, 0)	0.70%	16.031	1.0000
(-2, 0)	0.74%	14.036	0.5773
(-1, 0)	0.79%	11.189	0.6123
(0, 0)	0.99%	NA	1.0000
(1, 0)	1.01%	115.47 ***	1.4142
(2, 0)	0.87%	11.832 ***	1.7320 *
(3, 0)	1.41%	6.0124 ***	2.0000 *
(4, 0)	1.67%	4.9574 ***	1.2909
(5, 0)	1.69%	4.6413 ***	2.4495 **
(6, 0)	1.83%	4.6598 ***	2.6458 **
(7, 0)	1.96%	4.6367 ***	2.8284 **
(8, 0)	2.56%	4.6863 ***	1.4433
(9, 0)	2.61%	4.2576 ***	3.1623 ***
(10, 0)	2.39%	3.8398 ***	3.3166 ***
* indicates 0.1% significance level, ** 1% significance level, *** 5% significance level.			

Source: Authors' calculation

The results of Table 4 show a positive reaction to announcements related to insiders' share purchases. For the total event window period there is a positive CAAR of 2.39%. However, in the period prior to the event, the results are not significant except on day -8. After the share purchases all the CAARs are significant and positive. This indicates that insiders can earn abnormal returns on share purchases based on their insider knowledge and that the information on insider purchases can bring additional information to outside investors. However, based on the depth of the ZSE and spreads on buy and sale side and transaction costs, it should be further investigated regarding outsiders' use of such information.

Table 5: Sales of the stocks

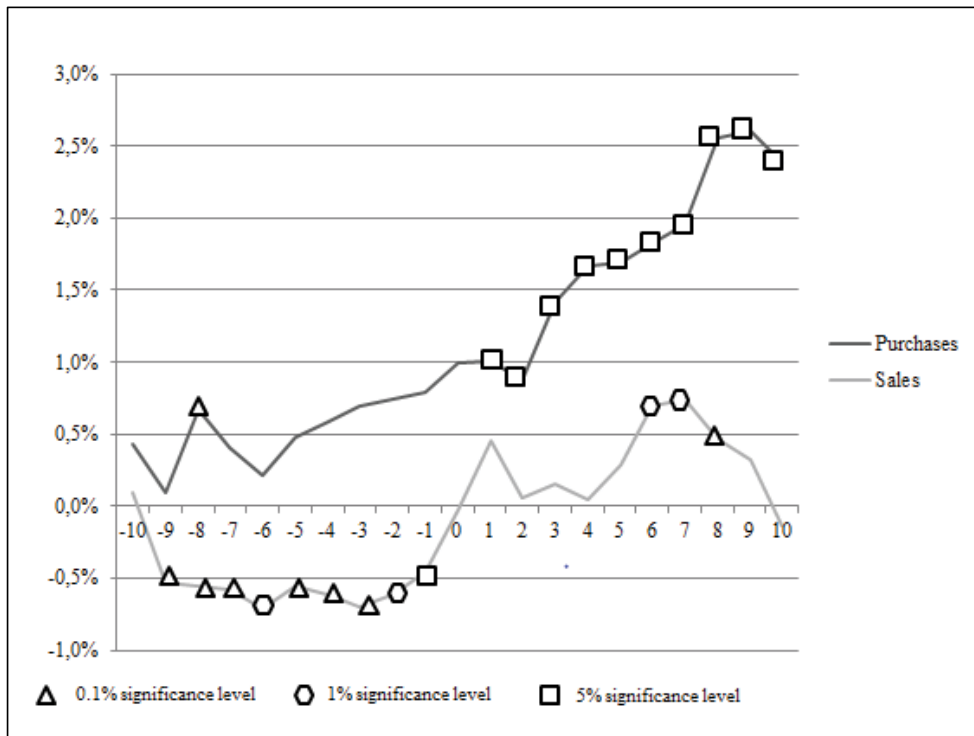
Event period	CAAR	CAAR standard t-test	Sign test
(-10, 0)	0.09%	0.3736	3.3166 ***
(-9, 0)	-0.53%	2.0420 *	0.9035
(-8, 0)	-0.56%	2.0611 *	0.3333
(-7, 0)	-0.58%	2.0317 *	0.0000
(-6, 0)	-0.71%	2.4497 **	2.6458 **
(-5, 0)	-0.55%	1.7614 *	0.0000
(-4, 0)	-0.62%	1.8843 *	0.4472
(-3, 0)	-0.70%	2.2396 *	2.0000 *
(-2, 0)	-0.62%	2.4167 **	1.7320 *
(-1, 0)	-0.46%	23.085 ***	1.4142
(0, 0)	-0.03%	NA	1.0000
(1, 0)	0.45%	13.319	0.0000
(2, 0)	0.06%	0.2325	0.5773
(3, 0)	0.16%	0.7520	1.0000
(4, 0)	0.05%	0.2868	1.3416
(5, 0)	0.29%	16.116	1.6330
(6, 0)	0.70%	2.6950 **	1.8898 *
(7, 0)	0.74%	2.4712 **	2.1213 *
(8, 0)	0.47%	1.6528 *	2.3333 *
(9, 0)	0.32%	11.849	2.5298 **
(10, 0)	-0.13%	0.4498	2.1106 *

* indicates 0.1% significance level, ** 1% significance level, *** 5% significance level.

Source: Authors' calculation

Sales of shares by insiders carry much lower significance as CAARs after the event are not statistically significant and are just slightly positive. There is no indication of asymmetry of information. The returns before the event are significant and carry negative returns. This revelation is in line with Ravina & Sapienza (2010) who say that sales can be seen as problematic because they may be driven by different motives such as diversification or by the portfolio rebalance after a grant, rather than by information. Such views are also supported by Lakonishok & Lee (2001) and Seyhun (1992) among others. The most colourful explanation is by Lakonishok & Lee (2001) that say that there are many reasons for insiders to sell shares but the main motivation to buy shares is to make profit.

Figure 1: CAARs of Sales and Purchases



Source: Authors

Conclusion

The rationale of this study consists of analysing both the profitability and the information content of insider trading on the Zagreb Stock Exchange. The event study was conducted on the notifications of insider trading during June 2010 - June 2021. The idea for the study came at the start of the Covid-19 pandemic when no one was able to predict its long-term consequences across all aspects of life. CROBEX market index significantly fell. Despite that, insiders were active on the stock market with one CEO's purchase in tourism sector at the time raising the question: did the insider have valuable information of the company's financial position thus knowing that these lower prices presented an opportunity for purchase or was the purpose of the purchase by the CEO to convey the positive information to the public on the company's prospects? The results suggest that insiders can earn abnormal returns on share purchases based on their insider knowledge and that information on insider purchases can bring additional information to outside investors. In the case of notifications of share sales by insiders however, CAARs after the event are not statistically significant and are just slightly positive thus bringing no abnormal returns for insiders and not conveying information to the public. This suggests that the market may perceive sales having a lower informational content, as motivation for sales may be other needs, such as liquidity as explained by Seyhun (1992), Lakonishok & Lee (2001), Fidrmuc, Goergen & Renneboog (2006) and Ravina & Sapienza (2010).

The contribution of this paper is that it is the first paper that systematically observes and describes all publicly available data on insider trading on the ZSE. It also brings insight as to whether insiders earn abnormal returns on the ZSE on their purchases and sales on the open-market. The findings of this paper can be used by academics and regulators for further research on other young and developing stock markets in South East Europe with similar characteristics to Croatian stock market. Additionally, the findings of this paper can be used by traders on the ZSE when developing their trading strategies.

The usage of a relatively small sample is a limitation of the study. Thus, it is recommended that future studies explore the same issue on a larger sample. However, in order to overcome this issue, this study investigated the data over a period of ten years i.e., all of the publicly available data on the ZSE. In the future, as the time passes and the ZSE becomes more mature market and new transactions are made, the study should be conducted again to observe if there are some changes to insider trading on the ZSE and to returns.

In addition, the study could be extended to trading volume, buy-and-hold methodology or it could observe whether trades made by one group of executives, for example if CFO's reveal more information about future returns than other groups of executives, for example CEOs. In that way, investors and other interested parties can get more information on the effects insider sale and purchase events on the Croatian stock market.

NOTES

¹ <https://zse.hr/hr/pravila-burze-i-drugi-akti>

² Includes only notifications where such information was published

³ The raw-returns, and not the more standard log-returns, are used to be consistent with the original “event study” (MacKinlay, 1997).

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