DOI:10.17951/h.2023.57.1.181-195

ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LVII, 1 SECTIO H 2023

PAWEŁ SEKUŁA

pawel.sekula@uni.lodz.pl
University of Łódź. Faculty of Management
68 Narutowicza St., 90-136 Łódź, Poland
ORCID ID: https://orcid.org/0000-0002-1959-8378

The Market Reaction to Stock Splits – Evidence from the Warsaw Stock Exchange

Keywords: split; Warsaw Stock Exchange; event study methodology

JEL: G12; G14; G40

How to quote this paper: Sekuła, P. (2023). The Market Reaction to Stock Splits – Evidence from the Warsaw Stock Exchange. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, Vol. 57, No. 1.

Abstract

Theoretical background: A share split is an operation that increases the total number of shares. The split is a technical operation and should not affect the market value of the company. The shareholding structure of the company remains unchanged when the shares are split. However, split studies around the world show the occurrence of abnormal returns.

Purpose of the article: The article analyses splits based on market data from 2009 to 2021. The aim of the study is to analyse the cumulative average abnormal returns (CAARs) in the periods preceding stock splits on the Warsaw Stock Exchange (WSE). CAARs are analysed in different research variants. The influence of the stock market situation and the frequency of splits on the amount of abnormal returns is examined.

Research methods: The research was carried out using event study analysis. The Market-Adjusted Return Model was used to determine abnormal returns. CAARs were calculated for each analysed event window. The statistical significance of abnormal returns was verified by the parametric *t* test and the non-parametric Corrado rank test.

Main findings: The study showed statistically significant positive abnormal returns in the 30-day period preceding the split. The hypothesis that multiple splits cause particularly high increases in the market value of companies has not been confirmed. Research on the reaction to splits depending on the state of

the stock market situation did not allow unambiguous conclusions in the case of the periods when the WSE Index (WIG) increased. Weaker reaction to planned splits in the period of worse market conditions was confirmed.

Introduction

A share split is an operation that increases the number of shares in a company. This is matched by a proportional reduction in the nominal price of each share. As a result, the share capital remains unchanged. The shareholding structure also remains unchanged. Each shareholder has the same stake in the company as before the share split.

The literature formulates three main hypotheses for the splits: optimal price/tick, signaling, and procedure/structure (He & Wan, 2012). The optimal price/tick hypothesis assumes that splits bring the share price and the relative tick size to the optimal range. The signaling hypothesis proves that splits reveal information about firms future performance. The procedure/structure hypothesis explains how a specific structure or rule can cause a specific phenomenon in relation to splits.

The split is a technical operation, therefore, should not affect the market value of the company. Under the assumption of the efficient markets hypothesis, splits should not generate any abnormal return. However, research on splits around the world shows the possibility of abnormal return (e.g. Baker et al., 1995; He & Wan, 2012). Split research is also undertaken on the Polish market. The obtained results of the analyses in some cases do not confirm the split effect (Kopaczewska, 2004; Jamróz & Koronkiewicz, 2013). Therefore, the author attempted another split analysis based on the latest market data not used in previous research.

The aim of the study is to analyse the level of cumulative average abnormal return (CAAR) in the periods preceding stock splits. The author uses a cumulative average abnormal rate of return in the study, while most other studies on the Polish market use an abnormal rate of return. Additionally, the influence of the stock market situation and the frequency of splits on the CAAR amount is examined. According to the author's knowledge, such split research has not yet been done on the Polish stock market. The study provides evidence in the discussion of the information efficiency of capital markets.

Literature review

Stock splits are the subject of a lot of research. Various corporate activities and market activity before, during and after splits are analysed. The motives of splits, splits effect on the firm value and changes in market activity around splits are examined. Fama et al. already in 1969, using event study analysis, investigated the impact of splits on the share prices in the American market (Fama et al., 1969). For example, Boehme and Danielsen tested over 6,000 splits from the CRSP database between

1950 and 2000. In the studies, they reported a positive abnormal return between the announcement date and the ex-split date (Boehme & Danielsen, 2007). There are the three main share split hypotheses in the literature: optimal price/tick, signaling, and procedure/structure (He & Wan, 2012). All these theories help illustrate the empirical findings with respect to split motives and the effect of splits on firm value. Literature emphasizes that especially the optimal price/tick and procedure/structure hypotheses are supported by abundant empirical evidence (He & Wan, 2012).

Dyl and Elliot argue that companies do not only pursue a certain level of stock prices, but they also manage a price range using splits to increase the value of the company (Dyl & Elliot, 2006). According to Angel, from 1943 to 1994, the average stock price on the NYSE remained almost unchanged (USD 31 to USD 32) when the S&P 500 index rose 15 times over this period (Angel, 1997). Lakonishok and Lev concluded that the purpose of the splits is to bring stock prices back to levels that are in line with other companies in the industry and with market averages. They argued that the greater the deviation of the stock price from the market mean, the greater the split factor (Lakonishok & Lev, 1987). The frequency of splits was also tested. In the analysed years 1967–2000, about 18% of splits were classified as frequent, while the rest were classified as infrequent (Huang et al., 2008). There is a view in literature that splits increase the number of shareholders. Mukherji et al. argue that the number of shareholders increases after the share is split (Mukherji et al., 1997). Brennan and Hughes document growing interest in the company, suggesting that splits attract analysts' attention (Brennan & Hughes, 1991). Dennis and Strickland show that the share of institutional ownership increases after splits (Dennis & Strickland, 2003). Grinblatt et al. argue that the announcement of the split generates a positive, abnormal return and may signal good news about the company's future results (Grinblatt et al., 1984). Arbel and Swanson document that the strength of the split announcement effect is greater in the case of less popular companies, characterized by a smaller number of analysts making annual profit estimates of the company (Arbel & Swanson, 1993). Huang et al. argue that splits, which are rare, can signal investors' good future performance (Huang et al., 2008). Bechmann and Raaballe found that the split effect was linked to a change in the company's dividend payout policy. When a split is announced, a significant abnormal return is observed as the total dividend amount increases (Bechmann & Raaballe, 2007). There are also studies in literature that reject the signaling hypothesis. Huang et al. examined whether splits contained information about the future profitability of companies. Little evidence was found that splits are positively linked to future profitability. Splits were negatively related to profitability, with the exception of companies paying dividends (Huang et al., 2006). According to the signaling hypothesis, companies conduct splits to reveal information about future earnings to outside investors. Splits should reduce the asymmetry of information between insiders and outsiders. For example, Easley et al. found no evidence consistent with the hypothesis that splits reduce information asymmetry (Easley et al., 2001).

Stock splits were also analysed on the Polish capital market. The results of the research in some of the analyses were quite inconclusive. Kopaczewska analysed the impact of splits on individual companies and did not observe any significant relationship (Kopaczewska, 2004). Gurgul studied splits from 1995–2005. On the day of announcing the planned splits, the average abnormal return was 2.41%. He also noted a strong reaction two days before the planned share split was made public. He did not observe any significant returns on the day of the split and in the days around (Gurgul, 2019). Fiszeder and Mstowska noted the occurrence of statistically significant positive 10 days of abnormal returns before the ex-split day. They pointed to the speculative characteristics of the growth and emphasized that the observation was possible thanks to the use of 10-day rates of return (Fiszeder & Mstowska, 2011). Słoński and Rudnicki noted positive abnormal returns for the tested splits. They found that the increase in the rates of return does not always compensate for the level of market risk. In their opinion, splits may lower the cost of equity of companies splitting shares (Słoński & Rudnicki, 2011). Jamróz and Koronkiewicz studied splits within the 2004–2012 period. The results of the analysis suggested no statistically significant responses to events despite the observation of some anomalies. According to Jamróz and Koronkiewicz, the rational behavior of investors was dominant in relation to splits (Jamróz & Koronkiewicz, 2013). Okoń and Zaremba studied splits from 1996–2015 by analysing long-term responses. They used the calendar-time portfolio approach. They did not observe any statistically significant abnormal returns (Okoń & Zaremba, 2017). Jasiniak indicated the occurrence of abnormal returns as a result of splits, but only in the case of penny stocks (Jasiniak, 2018). Podgórski and Pasierbek stated a positive market reaction to the first piece of information about the split, while the announcement of the resolution of the General Meeting of Shareholders generated corrections in share prices (Podgórski & Pasierbek, 2020).

Based on the results of the analyses, the following research hypotheses were formulated:

H1: In the period preceding the split of shares on the Warsaw Stock Exchange (WSE), CAAR was positive.

H2 The stock market situation in the period preceding the share split has an impact on CAAR.

H3: Multiple splits result in above-average CAAR.

Research methods

The research on the impact of share splits on the market value of companies was carried out for the period from 2009 to 2021. All companies listed on the WSE, both domestic and foreign, were analysed. The research period covered the years after the crisis in 2008. The study decided to omit the crisis in the financial markets due to its significant specificity and potential strong impact on the sample. In the analysed

period, there were 33 splits on the WSE. The occurrence of share splits in individual years is presented in Figure 1.

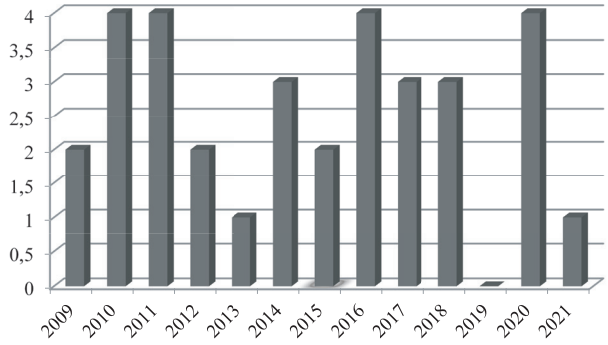

Figure 1. Stock splits on the WSE over the period 2009–2021

Source: Author's own study based on: (*Rocznik giełdowy GPW*, 2010–2022).

The research sample was, however, somewhat limited. Four splits of shares were eliminated from the study (ORZEŁ, ELKOP, SANWIL, MEWA), all from 2010. In these cases, a limited number of stock exchange transactions in the tested periods were decisive, which made it impossible to apply the research procedure. Due to the above, the research sample amounted to 29 splits carried out on the WSE in 2009–2021. The analysis was carried out in four variants which were to help better assess the market effect. In the first variant, all 29 splits were analysed. In the next variant of the test, splits were divided into two sub-periods. The first one covered the years when the stock market on the WSE was growing, and the second one covered years of decline. The increases and decreases on the WSE were measured by the changes in the Warsaw Stock Exchange Index (WIG), so the years in which the WIG was gaining meant an upward market and the ones when the WIG was losing meant a falling market. This allowed recording 16 splits in the growth period and 13 splits in the decline period. It was supposed to allow assessing whether the state of the stock exchange situation has an impact on the price effect caused by splits. Good market sentiment and stock market rises could encourage investors to react in a stronger way to the announced splits and, on the other hand, worse stock market conditions could induce investors to react in a weaker way. In addition, another test variant was used in the study. Multiple splits conducted in 2009–2021 were analysed. IFCAPIATL and RESBUD completed two splits, while ELKOP – four. One split was eliminated from the analysis due to the limited number of stock exchange transactions, which resulted in a seven-element research sample. In this case, attempts were made to look for the reasons that encourage owners and management boards to carry out splits so often. It was examined whether above-average increases in share prices before the announced split were a way for owners to raise the market valuation of companies.

The research was carried out using event study analysis. The method is currently used quite often to analyse the impact of a wide range of events on the market valuations of companies (Peterson, 1989; MacKinlay, 1997; Binder, 1998; Duso et al., 2010; Corrado, 2011). It allows you to verify the relationship between a selected event and the rate of return on company shares. In the conducted research it was assumed that the effective day (ED) is the date of the last stock exchange quotation before the split. The split dates were obtained from the *Warsaw Stock Exchange Annals*. It was assumed in the study that the period before the effective day is the estimation window.

The analysis of event study was performed using one of the methods proposed by Brown and Warner (1985). The Market-Adjusted Return Model was used in the calculations. The choice of the method was influenced by the conservatism of the model which, in the event of a significant impact of a particular company on the stock exchange index, would show a tendency to underestimate abnormal returns.

In accordance with the adopted model, abnormal return (AR) was determined as the difference between the rate of return on shares in *i*-th company realized on day *t* and the rate of return of the market portfolio, for which the WIG index was adopted as an equivalent in the study. It was decided to choose the WIG index due to the fact that it is the widest index of the WSE, therefore, the most resistant to significant influence of individual companies.

$$AR_{i,t} = R_{i,t} - R_{m,t}$$

where:
$AR_{i,t}$ – the abnormal return on the *i*-company for day *t*,
$R_{i,t}$ – the return on the *i*-company for day *t*,
$R_{m,t}$ – the return on the market index for day *t*.

In the next stage of the analysis, for each *i*-th company, the cumulative abnormal return (CAR) was determined in the event window from day t_1 to day t_2.

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t}$$

The impact of splits on the rates of return of companies' shares was assessed using the cumulative average abnormal return (CAAR), determined according to the formula below.

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR(t_1, t_2)$$

where:
N – number of splits.

The next stage of the research was to verify the statistical significance of abnormal returns. To verify the hypothesis about the presence of a statistically significant CAAR other than zero, the parametric *t* test was used (Brown & Warner, 1985), assuming the following null hypothesis:

$$H_0: E(CAAR) = 0$$

$$t_{CAAR} = \sqrt{N}\frac{CAAR}{S_{CAAR}}$$

$$S_{CAAR} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2}$$

If the null hypothesis is rejected, the CAAR will be significantly different from zero. This means that splits had a statistically significant impact on the rates of return in the analysed period.

The parametric *t* test assumes a normal distribution of variables, therefore, for individual periods in each of the variants of the tested sample, the hypothesis about the normality of the distribution of abnormal returns was verified using the Shapiro–Wilk test. The obtained test results in a number of analysed cases gave grounds for rejecting the hypothesis about the normality of the distribution of variables. Due to this, it was also decided to use a non-parametric test, which does not require the fulfilment of such restrictive assumptions. The Corrado rank test was used, the statistics of which are given by the following formula (Corrado, 1989):

$$CT = \frac{\frac{1}{N}\sum_{i=1}^{N}\left(K_{i,t} - \overline{K}\right)}{\sqrt{\frac{1}{T}\sum_{i=1}^{T}\left[\frac{1}{N}\sum_{i=1}^{N}\left(K_{i,t} - \overline{K}\right)\right]^2}}$$

where:
$K_{i,t}$ – the rank assigned to period *t*,
$\overline{K}$ – average of the ranks,
T – number of periods.

The Corrado test requires a ranking of abnormal returns for each of the periods tested. The ranking was repeated as many times as the splits were included in the study. The ranking was carried out according to the following principle, for a period of *n* days, each abnormal return corresponding to a given split was assigned ranks from 1 to *n*. For example, in the variant of testing the entire research sample, the activity was repeated 29 times for each event. Subsequently, the values of the test statistics were determined for the individual analysed periods. Assuming the null hypothesis is true, the *CT* statistics has an asymptotic normal distribution.

Results

Research on the impact of splits on the share return was carried out using the event study analysis. The method requires an event window to be defined, which is the basis for the calculation. In the study, abnormal returns were determined for six research windows. The first and longest event window was from 30 sessions before ED to ED. The long window range was decided on the basis of Fiszeder and Mstowska's research, which indicated the possibility of early market reactions to the announcement of the planned split (Fiszeder & Mstowska, 2011). Successive estimation periods were shorter, narrowing the event window. The analysis used two more research windows that occurred earlier before the ED day, and more precisely in the period from ED-30 to ED-20 and from ED-20 to ED-10. In this case, the aim was to verify the occurrence of market reactions in the earlier period, ahead of the planned date of the split of shares by several trading days.

In the first stage of the research, the normality of the distribution of abnormal returns was analysed. The Shapiro–Wilk test was carried out for four variants of the research sample and for each of the six variants of the research windows (tables with test results are included in the appendix).

In the case of the sample including all splits, the hypothesis about the normality of the distribution of returns was rejected. Similar indications were for splits in the period of the WIG index increase. In this variant, the hypothesis about the normality of the rates of return was also rejected for each of the research windows. The results of the Shapiro–Wilk test for the other two variants of the sample, in the period of decline in the WIG index and for multiple splits, were not so clear. For the sample including splits in the period of decline in the WIG index in three analysed periods, the hypothesis about the normality of the distribution was rejected, but in the next three analysed periods there was no reason to reject such a hypothesis. In the case of the split sample, the results for the five event windows indicated a normal distribution of abnormal returns. The results of the normality of returns in some cases turned out to be quite mixed, prompting the use of both parametric *t* tests and nonparametric Corrado rank tests in the analysis of abnormal returns.

The next stage of the research concerned the CAAR analysis, which was determined for four variants of the research sample with different scopes of the event window. The first analysis included all splits conducted on the WSE in 2009–2021. The obtained results are presented in Table 1.

Table 1. Cumulative average abnormal returns (CAARs) for all splits and multiple splits

All splits				Multiple splits			
Period	CAAR	*t* test	Rank test	Period	CAAR	*t* test	Rank test
ED – 30, ED	22.16	2.9334***	1.8495*	ED – 30, ED	19.71	2.3200*	-0.5548
ED – 20, ED	15.72	2.6167**	1.6546	ED – 20, ED	15.68	1.5890	-0.6571
ED – 10, ED	12.92	3.1457***	1.4898	ED – 10, ED	13.91	2.0451*	-0.6217
ED – 5, ED	6.13	2.3306**	1.6175	ED – 5, ED	6.72	1.7556	-0.3554
ED – 30, ED – 20	7.79	1.6433	-0.0357	ED – 30, ED – 20	4.40	0.3807	0.7272
ED – 20, ED – 10	5.20	1.3615	0.4811	ED – 20, ED – 10	4.61	0.5649	-0.5073

***, **, * significant at 1%, 5%, 10%, respectively
Source: Author's own study.

The CAARs value ranged from 5.20 to 22.16%, depending on the length of the event window. The higher the observed values of the rates of return were, the wider the range of the event window was, which indicated no major drops in share prices in the period before the ED. For periods including 10 days or more before the ED, the rates of return were at the double-digit level. The parametric *t*-test showed statistical significance of the results in the event windows covering the periods from 30 to 5 days before the event. The previously conducted Shapiro–Wilk tests did not confirm the normality of the distributions of the rates of return in the analysed periods, therefore, the indications of the non-parametric test were followed. The Corrado test showed statistical significance of CAAR for the longest window of the event, ranging from 30 days before the event to ED, which confirmed above-average increases in the share price in response to the announced split.

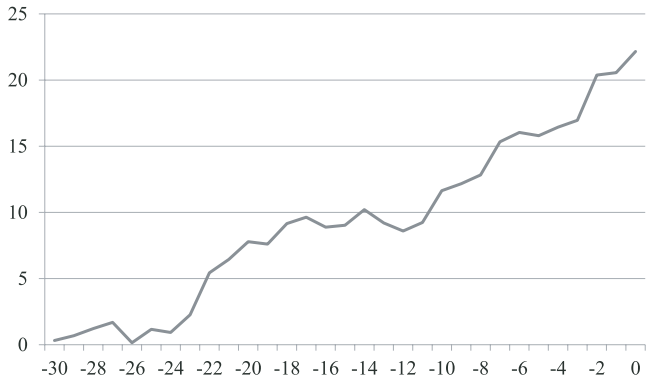

Figure 2. Average cumulative abnormal return for all splits. Trading days are numbered relative to the effective day

Source: Author's own study.

Figure 2 shows the change in the average cumulative abnormal return value for all companies that conducted splits in the period 2009–2021. The positive effects

are visible especially around the 22nd day before the planned split and they last until the day of the event. A stable long-term positive reaction is observed.

The second variant of the study covered companies that carried out multiple splits in the analysed period (Table 1). The CAARs shown in this case were at similar levels as in the sample with all splits. Statistically significant high CAARs were found for the two event windows. For the longest period (ED-30, ED), CAAR was 19.71% and for the period including 10 days before ED, CAAR was 13.91%. In the remaining periods, the reported abnormal returns were statistically insignificant. In the case of multiple splits, an increase in the market value of the companies was confirmed. However, the increase did not differ from the average response observed for all splits.

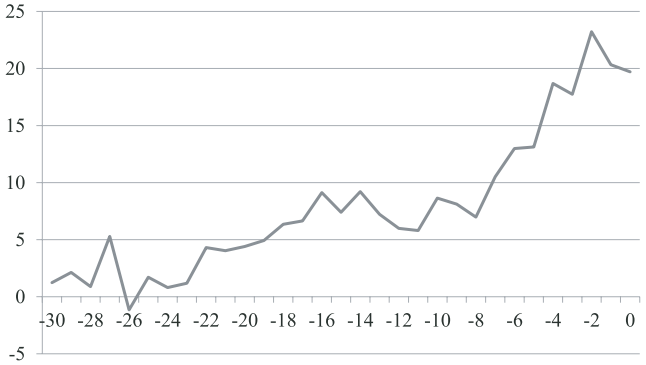

Figure 3. Average cumulative abnormal return for multiple splits. Trading days are numbered relative to the effective day

Source: Author's own study.

The data in Figure 3 shows the average cumulative abnormal return for companies that conduct multiple splits. In this case, one can also see a long-term positive relationship to the planned split, but a particularly strong reaction takes place a little later, 8 days before the event.

In the last stage of the analysis, research was carried out on the reaction of the share prices of companies to the announced splits depending on the state of the stock market situation. Splits were divided into two groups. Splits performed in the years in which the WIG index increased and in the years in which the WIG index decreased. The intention was to verify the impact of the general stock market situation on the market reactions caused by splits. The results of the analysis are presented in Table 2.

Market reactions to splits in the good market conditions were clearly stronger than in the periods when the WIG index was falling. In the years of growth of the WIG index, the abnormal returns ranged from 6.83 to 34.63% depending on the period, while in the periods of decline in WIG, abnormal returns ranged from 1.49 to 6.82%. The difference in the strength of the market reaction to the announced splits was clear. The good stock market situation was conducive to stronger increases in share

prices in the periods preceding the split. However, the reported rates of return were in most cases not confirmed as statistically significant. For CAARs in the periods of WIG growth, statistical significance was demonstrated in a parametric test for four event windows. Earlier studies did not confirm the normality of the distributions, which prompted us to follow the indications of the non-parametric test.

Table 2. Cumulative average abnormal returns (CAARs) for splits in periods of WIG growth and splits in periods of WIG decline

Splits in periods of WIG growth				Splits in periods of WIG decline			
Period	CAAR	*t* test	Rank test	Period	CAAR	*t* test	Rank test
ED – 30, ED	34.63	2.7407**	0.9390	ED – 30, ED	6.82	1.7083	1.9481*
ED – 20, ED	23.95	0.5903**	0.6217	ED – 20, ED	5.59	1.4907	1.9245*
ED – 10, ED	19.66	2.9116**	0.3884	ED – 10, ED	4.62	1.6967	1.8487*
ED – 5, ED	9.32	2.1862**	0.9232	ED – 5, ED	2.19	0.9222	1.4482
ED – 30, ED – 20	12.91	1.7422	-0.1665	ED – 30, ED – 20	1.49	0.2892	0.0986
ED – 20, ED – 10	6.83	1.0603	0.4575	ED – 20, ED – 10	3.20	0.9404	0.5520

***, **, * significant at 1%, 5%, 10%, respectively

Source: Author's own study.

The Corrado test showed no significance of the abnormal returns. In the case of CAARs achieved in the periods of WIG decline, the statistical significance of the rate of return for the longest window of the event (ED – 30, ED) was confirmed. The study showed the difference in the strength of the reaction to the spilt depending on the state of the stock market situation. The results of the difference in reaction could not be accepted as binding, since only the abnormal returns in the period of decline in the WIG index were statistically significant.

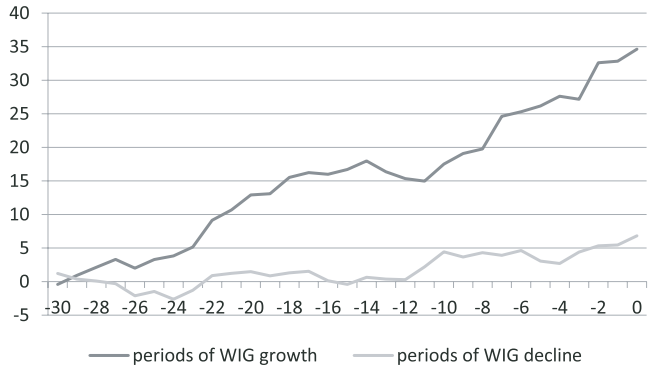

Figure 4. Average cumulative abnormal return for splits in periods of WIG growth and splits in periods of WIG decline. Trading days are numbered relative to the effective day

Source: Author's own study.

The average cumulative abnormal return presented in Figure 4 for companies conducting splits in the period of decline in the WIG index confirms the earlier observations. There is a positive reaction to the planned split, but clear increases take place a bit later than in the previously tested variants. The increase takes place about 10 days before the event.

Discussions

Summarizing the results of the research, it can be stated that the announcement of splits resulted in an increase in share prices on the WSE in the analysed period. Statistically significant positive cumulative mean abnormal returns were recorded for the longest event windows (30-day). The results were similar to the studies by Fiszeder and Mstowska, who recorded positive abnormal rates of return in the period preceding the splits, but it was for a shorter 10-day event window (Fiszeder & Mstowska, 2011). The conclusions of the analysis clearly differed from the studies by Kopaczewska or Jamróz and Koronkiewicz, in which the presence of the price effect caused by the split of shares was not confirmed (Kopaczewska, 2004; Jamróz & Koronkiewicz, 2013). However, it should be emphasized that these studies covered a different period and different methods of analysis were used. Differences in testing may have resulted in differences in abnormal returns.

Multiple splits also generated statistically significant CAARs, but they were slightly lower than those recorded for the entire research sample. Thus, the supposition that frequent splits may trigger particularly high increases in the value of companies has not been confirmed. Research on the reaction to splits depending on the stock market situation did not allow any unambiguous conclusions in the case of the periods when the WIG index increased. On the other hand, a weaker response to the announced splits in the period of the stock market downturn was confirmed, as demonstrated by significantly lower abnormal returns. According to the author's knowledge, such split research on the Polish market has not been carried out yet and there is no comparison in domestic literature.

The limited sample size caused some research problems. In the analysis, only a small number of rates of return were statistically significant. A similar situation occurred in other studies, for example in the analysis of events on the Polish stock market (Gurgul, 2019).

Conclusions

The research included stock splits carried out on the WSE in 2009–2021. Event study analysis was used as a research method. The CAAR was determined for each analysis period. For the longest window of events, including all splits, a statistically

significant positive CAAR was noted. In the remaining periods, positive abnormal returns were also determined, but they were not statistically significant. Based on the test results, it was concluded that there is no reason to reject the H1 hypothesis of positive abnormal returns in the period preceding the share split. The analysis also verified the research hypothesis H2 about the influence of the stock market situation on the number of abnormal returns. CAARs were determined for the periods of WIG index increase and WIG index decline. In this case, the rates of return in the periods of WIG growth were clearly higher than in the period of decline in WIG. However, a statistically significant CAAR occurred only for the longest window in the period of WIG decline. It only allowed to state that during the economic downturn in the period preceding the splits, the CAARs generated are lower than the average values determined for the entire sample. The analysis of multiple splits did not confirm the occurrence of above-average high CAARs, the determined rates of return were similar as in the case of the entire research sample. This was the basis for rejecting the H3 hypothesis about high rates of return of multiple splits.

The study showed statistically significant positive abnormal returns in the 30-day period preceding the split. The results undermine the information effectiveness of the Polish stock market and provide evidence for opponents of the efficient market hypothesis (e.g. Sekuła, 2016, 2017). The results of the analysis are a contribution to the study of splits on the stock market in Poland. For the first time, the impact of the stock market situation and the frequency of splits on the amount of abnormal returns was examined. In addition, statistically significant positive rates of return in the period preceding the split were confirmed for the new research period not tested before. This may confirm the persistence of abnormal returns.

Concluding, it is necessary to emphasize the problems in conducting the research resulting from the limited size of the sample. This should lead to the continuation of research with an increased number of observations.

References

Angel, J.J. (1997). Tick size, share prices, and stock splits. *Journal of Finance*, *52*(2), 655–681. **doi:10.1111/j.1540-6261.1997.tb04817.x**

Arbel, A., & Swanson, G. (1993). The role of information in stock splits announcement effects. *Quarterly Journal of Business and Economics*, *32*(2), 14–25.

Baker, H.K., Phillips, A.L., & Powell, G.E. (1995). The stock distribution puzzle: A synthesis of the literature on stock splits and stock dividends. *Financial Practice and Education*, *5*(1), 24–37.

Bechmann, K.L., & Raaballe, J. (2007). The differences between stock splits and stock dividends: Evidence on the retained earnings hypothesis. *Journal of Business and Accounting*, *34*(3–4), 574–604. **doi:10.1111/j.1468-5957.2007.02041.x**

Binder, J. (1998). The event study methodology since 1969. *Review of Quantitative Finance and Accounting*, *11*, 111–137. **doi:10.1023/A:1008295500105**

Boehme, R.D., & Danielsen, B.R. (2007). Stock-split post-announcement returns: Underreaction or market friction? *Financial Review*, *42*(4), 485–506. **doi:10.1111/j.1540-6288.2007.00180.x**

Brennan, M.J., & Hughes, P. (1991). Stock prices and the supply of information. *Journal of Finance*, *46*(5), 1665–1692. **doi:10.1111/j.1540-6261.1991.tb04639.x**

Brown, S.J., & Warner, J.B. (1985). Using daily stock returns The case of event studies. *Journal of Financial Economics*, *14*(1), 3–31. **doi:10.1016/0304-405X(85)90042-X**

Corrado, C.J. (1989). A nonparametric test for abnormal security-price performance in event studies. *Journal of Financial Economics*, *23*(2), 385–395. **doi:10.1016/0304-405X(89)90064-0**

Corrado, C.J. (2011). Event studies: A methodology review. *Accounting & Finance*, *51*(1), 207–234. **doi:10.1111/j.1467-629X.2010.00375.x**

Dennis, P., & Strickland, D. (2003). The effect of stock splits on liquidity and excess returns: Evidence from shareholder ownership composition. *Journal of Financial Research*, *26*(3), 355–370. **doi:10.1111/1475-6803.00063**

Duso, T., Gugler, K., & Yurtoglu, B. (2010). Is the event study methodology useful for merger analysis? A comparison of stock market and accounting data. *International Review of Law and Economics*, *30*(2), 186–192. **doi:0.1016/j.irle.2010.02.001**

Dyl, E.A., & Elliot, W.B. (2006). The share price puzzle. *Journal of Business*, *79*(4), 2045–2066. **doi:10.1086/503656**

Easley, D., O'Hara, M., & Saar, G. (2001). How stock splits affect trading: A microstructure approach. *Journal of Financial and Quantitative Analysis*, *36*(1), 25–51. **doi:10.2307/2676196**

Fama, E.F., Fisher, L., Jensen, M., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review*, *10*(1), 1–21. **doi:10.2307/2525569**

Fiszeder, P., & Mstowska, E. (2011). Analiza wpływu splitów akcji na stopy zwrotu spółek notowanych na GPW w Warszawie. *Prace i Materiały Wydziału Zarządzania Uniwersytetu Gdańskiego*, *4/8*, 203–210.

Grinblatt, M., Masulis, R., & Titman, S. (1984). The valuation effects of stock splits and stock dividends. *Journal of Financial Economics*, *13*(4), 461–490. **doi:10.1016/0304-405X(84)90011-4**

Gurgul, H. (2019). *Analiza zdarzeń na rynkach akcji. Wpływ informacji na ceny papierów wartościowych*. Warszawa: Wyd. Nieoczywiste.

He, Y., & Wan, J. (2012). Stock split decisions: A synthesis of theory and evidence. *Journal of Applied Finance*, *22*(2), 1–19.

Huang, G., Liano, K., Manakyan, H., & Pan, M. (2008). The information content of multiple stock splits. *Financial Review*, *43*(4), 543–567. **doi:10.1111/j.1540-6288.2008.00205.x**

Huang, G., Liano, K., & Pan, M. (2006). Do stock splits signal future profitability? *Review of Quantitative Finance and Accounting*, *26*(4), 347–367. **doi:10.1007/s11156-006-7437-z**

Jamróz, P., & Koronkiewicz, G. (2013). Stock market reaction to the announcements and executions of stock-split and reverse stock-splits. *Optimum Studia Ekonomiczne*, *5*(65), 34–50. **doi:10.15290/ose.2013.05.65.03**

Jasiniak, M. (2018). W poszukiwaniu optymalnego przedziału cenowego akcji – zachowania inwestorów giełdowych wobec splitów na przykładzie GPW. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *531*, 190–200. **doi:10.15611/pn.2018.531.17**

Kopaczewska, K. (2004). Wpływ splitów na kursy akcji notowanych na Warszawskiej Giełdzie Papierów Wartościowych. In T. Bernat (Ed.), *Rynek kapitałowy – mechanizm, funkcjonowanie, podmioty* (pp. 203–214). Szczecin: PTE.

Lakonishok, J., & Lev, B. (1987). Stock splits and stock dividends: Why, who, and when. *Journal of Finance*, *42*(4), 913–932. **doi:10.1111/j.1540-6261.1987.tb03919.x**

MacKinlay, A.C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, *35*(1), 13–39.

Mukherji, S., Kim, Y., & Walker, M. (1997). The effect of stock splits on the ownership structure of firms. *Journal of Corporate Finance*, *3*(2), 167–188. **doi:10.1016/S0929-1199(96)00014-4**

Okoń, Sz., & Zaremba, A. (2017). Długoterminowe reakcje cenowe na podziały akcji na Giełdzie Papierów Wartościowych w Warszawie. *Finanse, Rynki Finansowe, Ubezpieczenia*, *2*(86), 111–122. **doi:10.18276/frfu.2017.86-09**

Peterson, P.P. (1989). Event studies: A review of issues and methodology. *Quarterly Journal of Business and Economics*, *28*(3), 36–66.

Podgórski, B., & Pasierbek, K. (2020). The "magic action" of stock splits: Evidence from the Warsaw Stock Exchange 2003–2017. *Central European Management Journal*, *28*(1), 66–80. **doi:10.7206/cemj.2658-0845.16**

Rocznik giełdowy GPW. (2010–2022). Retrieved from https://www.gpw.pl/biblioteka-gpw-lista?gpwlc_id=10

Sekuła, P. (2016). Strategia wartości – test na GPW w Warszawie. *Annales Universitatis Mariae Curie-Skłodowska, Sectio H – Oeconomia*, *50*(4), 413–421. **doi:10.17951/h.2016.50.4.413**

Sekuła, P. (2017). Nastrój inwestorów i stopy zwrotu WIG. *Annales Universitatis Mariae Curie-Skłodowska, Sectio H – Oeconomia*, *51*(5), 283–291. **doi:10.17951/h.2017.51.5.283**

Słoński, T., & Rudnicki, J. (2011). Wpływ podziału akcji na stopę zwrotu z inwestycji w akcje. *Finanse, Rynki Finansowe, Ubezpieczenia*, *37*, 323–334.

Appendix

Table 1. Verification of the normality of abnormal returns for all splits and multiple splits

Period	All splits	Multiple splits
	Shapiro–Wilk test	
ED – 30, ED	0.6799***	0.9222
ED – 20, ED	0.7867***	0.9876
ED – 10, ED	0.7670***	0.9635
ED – 5, ED	0.8550***	0.9808
ED – 30, ED – 20	0.8134***	0.8209*
ED – 20, ED – 10	0.8208***	0.9626

***, **, * significant at 1%, 5%, 10%, respectively

Source: Author's own study.

Table 2. Verification of the normality of abnormal returns for splits in periods of WIG growth and splits in periods of WIG decline

Period	Splits in periods of WIG growth	Splits in periods of WIG decline
	Shapiro–Wilk test	
ED – 30, ED	0.7568***	0.8449**
ED – 20, ED	0.8417**	0.9556
ED – 10, ED	0.7944***	0.9628
ED – 5, ED	0.8852**	0.9265
ED – 30, ED – 20	0.8404***	0.7900***
ED – 20, ED – 10	0.8367***	0.8710*

***, **, * significant at 1%, 5%, 10%, respectively

Source: Author's own study.