Folia Oeconomica
Acta Universitatis Lodziensis
ISSN 0208-6018 e-ISSN 2353-7663
www.czasopisma.uni.lodz.pl/foe/
5(350) 2020

DOI: http://dx.doi.org/10.18778/0208-6018.350.02

Marek Szymański
University of Łódź, Faculty of Economics and Sociology
Department of Capital Markets and Investments, marek.szymanski@uni.lodz.pl

Grzegorz Wojtalik
University of Łódź, Faculty of Economics and Sociology
Department of Capital Markets and Investments, grzegorz.wojtalik@uni.lodz.pl

Calendar Effects in the Stock Markets of Central European Countries

Abstract: The efficient market hypothesis suggests that there are no opportunities to gain above-normal profits using available information, because it is all reflected in the prices. However, calendar anomalies are found to contradict the efficient market hypothesis and enable investors to predict prices during specific days. Based on a review of papers on market efficiency and market anomalies, this paper examines and compares calendar effects known as 'the month-of-the year effect' and 'the day-of-the-week effect' between the stock markets of three Central European countries: Poland, Hungary and the Czech Republic. The study has revealed the presence of calendar anomalies in the indexes representing small-cap stocks listed on the Polish stock market and, to some extent, in the indexes used in the Hungarian and Czech stock markets.

Keywords: capital market, seasonal anomalies, calendar effects, market efficiency, January effect

JEL: G14, G41, C58

1. Introduction

Market efficiency is one of the founding concepts of modern financial theory. According to the efficient market hypothesis (EMH), stock returns in an efficient market reflect all information available to investors, so in the long run they cannot beat the market to earn above-average returns (Fama, 1970: 383–417). However, some studies, for example, Gultkein (1983), Reinganum, Shapiro (1987: 281–295), have shown irregularities in the behaviour of stock prices which the EMH fails to explain and which the economic literature calls "anomalies". The probability of such anomalies occurring and their relative unpredictability largely determine the efficiency of investors' strategies, so it seems important to find the answer to the following question about the nature of calendar anomalies: Are they temporary irregularities or, perhaps, a sign of market inefficiencies?

In this paper, calendar anomalies known as the month-of-the-year effect and the day-of-the week effect are analysed and compared among the stock markets of three Central European countries: Poland, Hungary and the Czech Republic. One of the purposes of statistical analysis is to establish whether introducing control variables, such as: S&P500 index quotes, prices of gold, yields on 10-year Treasury bonds (YTM) and USD/PLN, USD/CZK and USD/HUF exchange rates, into regression models will offset or amplify the effect of the identified anomalies.

There are several features of our research that distinguish it from other studies. Firstly, we compare calendar anomalies among different emerging market countries. Most studies on market efficiency focus on developed economies, some emerging markets have also been tested for calendar anomalies, however, very few papers compare calendar anomalies among different emerging market countries. Secondly, we investigate how the financial crisis in 2007 impacted the occurrence of calendar anomalies. Thirdly, we introduce control variables to the testing of calendar effects. Last but not least, we explore whether calendar anomalies are still present in the markets, because some literature suggests that in recent years calendar effects have become less prominent and may be disappearing.

The paper is organised as follows. Section one gives an overview of the selected calendar anomalies and explains the efficient market hypothesis. Section two describes the research sample. Section three presents the research methodology, and in section four (last) the research results and conclusions are discussed.

2. An efficient market and calendar anomalies – literature review

A definition of the efficient market has been presented by Fama (1970: 383) and Damodaran (2002: 115). An efficient market means that each new piece of information reaches all investors, spurs them to action and changes stock prices at the same time. A market is informationally efficient if prices always incorporate all available information. Accordingly, there are no opportunities for above-average gains and investors' efforts to find tips that might give them advantage over other market players are doomed to be futile.

The key assumption of the efficient market hypothesis, i.e. that above-average returns cannot be earned in the long run, is challenged by stock market anomalies. The word 'anomaly' is understood in the economic literature as a deviation from the expected result, an exception to the rule. Two representative definitions of stock market anomalies describe them as:

1) situations allowing investors to earn positive, above-average returns (Fama, French, 1996: 55; Peters, 1997: 36);
2) instances when investment strategies or techniques yield returns challenging the fundamentals of the efficient market theory (Jones, 1996: 282).

Among the best known stock market anomalies are seasonal (calendar) anomalies, defined as inconsistencies between actual stock returns and the EMH. Widely known are monthly anomalies in stock returns, which according to the efficient market hypothesis should not be regular, let alone predictable. Most studies investigating monthly anomalies focus on the January effect, i.e. a tendency for stock returns to be, on average, positive and higher in January than in the other months (Mahdian, Perry, 2002: 141).

The likely occurrence of the January effect was first reported by Wachtel (1942), who studied the impacts of seasonality on the US DJIA index in the period from 1927 to 1942.

Studies on the US stock market found a relationship between companies' capitalisation rates and the occurrence of the January effect, and associated most rises in capital markets in that month with changing prices of small-cap stocks. They also observed that most above-average returns on investments in small cap-companies were earned in January, as a consequence of which the phenomenon has become known as 'the small-company effect' (Hull, Mazachek, Ockree, 1998: 8–20).

However, Gu (2003) found the January effect to be present also in the stocks of high-cap companies and M. Gultkein (1983) demonstrated its presence in the stock markets of 15 different countries.

Different explanations of the January effect have been put forward. One of them attributes it to investors' efforts to reduce their annual gains at the year-end, and thereby tax liabilities, by selling the underperforming stocks. Then, in January, investors readily seize opportunities to purchase low-priced stocks and so their prices go up (Szyszka, 2009: 166).

Research shows, however, that the January effect is also present in countries without income tax, such as Japan (Kato, Schallheim, 1985: 243–260), and in countries where the end of the tax year and the calendar year fall on different dates coincide, for instance, in the UK and Australia (Reinganum, Shapiro, 1987: 281–295). This casts serious doubts on whether the hypothesis contributing the January effect to investors selling off in December for tax reasons holds for the stock markets of these countries. Globalisation processes and strong linkages between capital markets seem to be a more probable explanation.

Another interesting explanation of the January effect refers to the fact that the portfolio managers' compensation depends on the performance of their portfolios measured against a suitably selected benchmark index. Because better performance means higher fees, managers shed the worst-performing stocks at the year-end to maximise them. Then, in January next year, they replenish their portfolios with the stocks of risky companies, offering higher expected rates of return.

The explanation of the January effect that Kinney and Rozeff came up with attributes it to the effect of new information disclosed by companies in late December on investors' buying and selling decisions in January, and consequently on the prices of stocks (Kinney, Rozeff, 1976: 379–402).

Another interesting calendar anomaly has to do with the observation that on some trading days stock returns are consistently and repetitively different than on other days. Early on it was called the day-of-the-week effect but then the term the weekend effect became more popular. Studies of the US stock market revealed that Monday stock returns were, on average, lower than on other days (Higgins, Howton, Perfect, 2000: 19). Accordingly, the regularity was called the Monday effect, but new studies showed that Monday was not unique in that respect.

French, who compared the daily stock returns for companies comprising the S&P500 index in the years 1953 through 1977 (French, 1980: 57), found them to be higher on Mondays and Fridays. The regularity was correspondingly called 'the effect of the weekend'. Having studied the S&P500 and DJIA companies, Smirlock and Starks (1986: 197) concluded that the reason for negative rates of return on Mondays was related to falls in stock prices between the afternoon trading session on Friday and the commencement of trading on a Monday morning, but they failed to reach consensus over what was the cause of the phenomenon. Abnormal stock returns have been observed not only on Mondays and Fridays, but also on other days of the week.

Calendar anomalies have been studied also in the Polish capital market. Keller (2015: 69–79) studied the effect-of-the-day in the Polish stock market. In the analysis, he verified negatively the occurrence of the effect of weekdays, although small market-cap companies show certain tendencies in terms of the effect-of-the-week. His analysis showed large inconsistencies of the results, both in the case of the correlation analysis and the regression analysis. Grotowski (2008: 55–75) studied four calendar anomalies in the Polish stock market. He did not find evidence for the holiday effect and end-of-month effect, however, his analysis shows that there is the Thursday effect and Friday effect. He also found the January effect to be present in small- and medium-cap companies. The January rate of return was about 4% higher than the rates of return for the remaining months. Ślepaczuk (2006: 1–12) presented basic anomalies of the capital market, described both in the Polish and world literature. Fiszeder and Kożuchowska (2013: 217–229) used permutational tests and GARCH models. The results indicated the occurrence of the turn-of-the-month effect, no seasonal fluctuations and very weak weekly fluctuations. Although significantly positive rates of return were observed on Mondays, and significantly lower on Wednesdays, it was only for the WIG20 index, and only at the significance level of 0.1. However, none of these authors has convincingly answered the following question: "Are there calendar anomalies on the Warsaw Stock Exchange?".

Among authors who have investigated calendar anomalies in emerging stock markets are Tonchev and Kim (2006: 1035–1043). They studied the Czech Republic, Slovakia and Slovenia to investigate whether calendar effects are present in the newly developing financial markets. Out of the five calendar effects examined (the day of the week effect, the January effect, the half-month effect, the turn of the month effect, and the holiday effect), very weak evidence has been found for these calendar effects in the three countries, and the effects have different characteristics in different stock markets.

Calendar anomalies were tested after the 2007 crisis. Jayaraman, Murugananandan and Santhi (2017: 26–30) tested anomalies in Brazil, Russia, India and China in three sub-periods: the pre-financial crisis period (2000–2007), the financial crisis period (2008–2009) and the post-crisis period (2010–2016). Regression results show that after the crisis BRIC capital markets reached the efficient stage where day of the week trading rules lose the ground to earn the abnormal return. This could be attributed to changes in the capital markets regulations and vigilance of the stock market.

Gajdošová, Heryán and Tufan (2011) analysed the day of the week effect in the European emerging markets (Czech, Hungarian, Polish, Slovak and Turkish stock markets) in the period from 2005 to 2010. The results show that anomalies appeared only during the financial crisis. Moreover, Marquering, Nisser and Valla (2006) point to strong evidence that the weekend effect and the January effect disappeared after the information about the occurrence of those anomalies had been published.

Calendar effects have attracted a large number of scholars, but results have often been mixed. The EMH, particularly in its semi-strong and strong forms, is often strongly criticised (Rossi, 2015). Despite the existence of great empirical and theoretical research papers, there is no clear picture whether calendar anomalies exist on a given stock exchange, if they are constant in time, and what circumstances influence them. The bulk of studies on market efficiency focus on the US market and markets in developed countries. Some of the emerging markets have also been tested for the presence of calendar anomalies. However, very few papers compare calendar anomalies among different emerging market countries. It is also worth investigating how the financial crisis in 2007 impacted the occurrence of calendar anomalies. The crisis had a different impact on emerging markets and developed countries. Even among emerging countries there were differences. For example, in the Czech Republic and Hungary there was a negative economic growth rate, whereas in Poland economic growth remained positive. Some literature, for example, Marquering, Nisser and Valla (2006), suggests that in recent years calendar effects have become less prominent and may be disappearing. The reason for this may be found in the crisis itself or perhaps in new regulations introduced to the economies after the crisis. The main research question in our paper is whether the best know anomalies (the month-of-the-year effect and the day-of-the week effect) still occur in markets after the crisis of 2007 or if they have become less prominent or have disappeared. In our research, we also have introduced control variables to the testing of calendar effects to check whether the detected anomalies disappear or gain significance if control variables are included.

3. Research sample

Indexes: WIG, mWIG40, sWIG80 (Warsaw), PX (Prague) and BUX (Budapest) were analysed for the presence of the day-of-the-week effect and the month-of-the-year effect. WIG and BUX are total return indexes, which means they take into consideration the price fluctuations of the components of the index as well as dividends that companies pay. PX, mWIG40 and sWIG80 are price indexes, which means they calculate only the changes in the price of the index components. We used daily returns (around 2600 observations) and monthly returns (126 observations) from a period spanning from 1 January 2008 to 30 June 2018. The historical WIG, mWIG40 and sWIG80 prices were sourced from http://www.biznesradar.pl and https://www.gpw.pl (accessed on 1 July 2018), and PX and BUX prices from https://stooq.pl (accessed on 1 July 2018). Descriptive statistics and the number of observations for each index are reported in Table 1. For control variables, we also used daily returns (around 2600 observations) and monthly returns (126 observations) from a period spanning from 1 January 2008 to 30 June 2018. The data were derived from https://stooq.pl (accessed on 1 July 2018).

4. Research method

In the study, we analysed the Polish, Czech and Hungarian capital markets and compared for the presence of two calendar anomalies: the month-of-the-year effect and the day-of-the-week effect. The focus of the analysis was on the following stock indexes:

1) the Warsaw Stock Exchange (WSE) – WIG – Total Return index, mWIG40 and sWIG80 – both Price Return indexes,
2) the main index of the Prague Stock Exchange – PX – a Price Return index,
3) the main index of the Budapest Stock Exchange – BUX – a Total Return index.

The statistical analysis of both anomalies was carried out using mainly linear regression models, and additionally non-parametric testing.

For the linear regression, we calculated logarithmic rates of return, then assessed the probability of calendar effects being present by estimating parameters of regression models. Our approach is similar to that of French (1980), Junkus (1986), Grotowski (2008), Gajdošová, Heryán and Tufan (2011). The index prices were converted into logarithmic rates of return using the following formula:

$$r_t = \ln\left(\frac{P_t}{P_{t-1}}\right),$$

where r_t – the logarithmic rate of return, P_t – the index price at the end of the trading day t, P_{t-1} – the index price at the end of the trading day $t-1$. The testing for the day-of-the-week effect involved the use of the following model:

$$r_t = \gamma r_{t-1} + \sum_{i=1}^{5} \beta_i d_t^i + \varepsilon_t,$$

where r_{t-1} is the logarithmic rate of return on the previous day, d_t^i is a dummy variable, representing consecutive trading days (Monday through Friday) and taking the value of "1" when t is Monday and "0" for the other four days. Hence, d_t^1 stands for Monday, d_t^2 for Tuesday, etc. The model was estimated using the ordinary least squares method (OLS). The model employed to determine whether the month-of-the-year effect was present in the selected stock markets was as follows:

$$r_t = \gamma r_{t-1} + \sum_{i=1}^{12} \beta_i d_t^i + \varepsilon_t,$$

where d_t^i is a dummy variable representing consecutive months of the year (January through December) and taking the value of "1" when t is January and "0" for each consecutive month. Hence, d_t^1 denotes January, d_t^2 February, etc. This model, too, was estimated by the OLS.

Testing for the presence of a calendar effect basically comes down to estimating the statistical significance of the β_i coefficient for a given dummy variable.

To be estimable by the OLS method, a model has to meet a number of restrictive assumptions about the distribution of random term ε_t, including the absence of autocorrelation. Because the autocorrelation of the time series of daily stock returns is a frequent problem in statistical analysis, an independent variable represented by a one period lagged-return was introduced as a precaution.

Both the day-of-the-week effect and the month-of-the-year effect were subjected to the Kruskal-Wallis test, a non-parametric alternative to one-way ANOVA enabling the comparison of three or more samples. The Kruskal-Wallis test is applied when ANOVA assumptions are not met or when the nature of variables prevents its use.

In modelling economic phenomena, the model's robustness is a critical piece of information, because models that are insufficiently robust may misrepresent the mechanisms underlying the phenomenon under consideration and lead to incorrect conclusions and decisions. The robustness of both models used in the study was checked against four control variables:

1) X_1 – the US stock index S&P500,
2) X_2 – the exchange rate between the domestic currency and the US dollar, the exchange rates are: USD/PLN, USD/CZK and USD/HUF,
3) X_3 – the yield on 10-year Treasury bonds in each country,
4) X_4 – gold futures price (New York Mercantile Exchange and Commodity Exchange – Comex).

5. Research results

The linear regression results for the day-of-the-week effect are shown in Tables 2–6 consisting of five panels each. Tables 7–11 show the linear regression results for the month-of-the-year effect. In these tables, Panel I contains the values of β_i coefficients for models without control variables and Panels II–V for models with X_1, X_2, X_3 and X_4 control variables, respectively. Table 12 presents the Kruskal-Wallis test statistics for both effects.

The values of β_i coefficients on particular days of the week calculated for the WIG and mWIG40 indexes are not statistically significant, but in the case of the sWIG80 they are significant for Monday and Friday (p-value = 0.012 and 0.027 respectively). Monday returns on this index are, on average, lower than on other trading days, and on Fridays they are higher. The significance of the β_i coefficients for the sWIG80 does not change after the inclusion of the control variables ($\alpha = 0.05$).

All three WSE indexes are statistically significantly influenced by the S&P500 index and the USD/PLN exchange rate. Their effect is positive (S&P500) and negative when the Polish currency is depreciating (USD/PLN). The analysis also shows that the WIG and mWIG40 indexes are sensitive to changes in T-bond yields.

The average return growth rate for the PX is lower on Tuesday compared to other days of the week. The β_i coefficients for daily returns are not statistically significant, but Tuesday returns become significantly different from zero ($\alpha = 0.05$) following the inclusion of the control variables. The S&P500 and the USD/CZK exchange rate have a significant effect on the PX, like in the case of the Polish indexes. The S&P500 increases returns on the PX and a depreciating Czech koruna decreases them.

The β_i coefficients for variables representing individual daily returns on the Hungarian stock exchange are not statistically significant either, but the inclusion of the control variables causes the β_i coefficient for 'Monday' to become statistically significant ($\alpha = 0.1$). The Monday returns on the BUX are, on average, higher than those noted on other trading days. Interestingly, of all indexes studied, only the BUX is statistically significantly influenced by all control variables ($\alpha = 0.001$).

Overall, the analysis does not provide grounds to conclude that the day of the week effect is present in the main indexes of the analysed stock markets, with the exception of the sWIG80, which generates statistically significantly lower returns on Mondays and higher on Fridays. Statistically different returns on the PX and the BUX (both made up of fewer companies than the Polish WIG) occur on Tuesday (PX) and Monday (BUX). The effect of the S&P500 and domestic currencies/USD exchange rates on the analysed indexes is considerable.

The linear regression results for the month-of-the-year effect are shown in Tables 7–11, which also consist of five panels each. The β_i coefficients in Panel I were calculated for each month's returns without the control variables. Their effect is accounted for in the statistics presented in Panels II–V. The monthly returns on the broadest-based Polish index, WIG, are generally not significantly different from zero, except for July when they are positive ($\alpha = 0.1$), but only until the control variables are included. The S&P500 and the USD/PLN exchange rate's effect on monthly returns is statistically significant.

Monthly returns on the mWIG40 are statistically significantly lower ($\alpha = 0.1$) in June than in other months, and this does not change after the inclusion of the control variables.

Monthly returns yielded by the sWIG80 (the small-cap companies) are significantly different from zero in January and June, and their β-coefficients remain statistically significant ($\alpha = 0.05$), even after the inclusion of the control variables. Higher returns in January are typical of the January effect. In June, stock returns are lower than in other months. The sWIG80 is statistically significantly influenced by the S&P500.

Stock returns on the Czech stock market are, on average, lower in June and September implying the presence of the month-of-the year effect. The β-coefficients for the monthly returns are significantly different from zero even after the control variables are included. The July's β_i is also statistically significant, but only until the inclusion of the control variables. As in the case of the Polish indexes, the S&P500 is the only control variable to have a statistically significant effect on the PX.

The β-coefficients on the monthly returns on the Hungarian BUX become statistically different from zero only under the influence of the control variables. January returns are, on average, higher than in other months ($\alpha = 0.05$), implying the presence of the January effect, but the conclusion may be premature because the effect is not discernible until the control variables are included. As far as the control variables are concerned, a significant effect on the BUX is exerted by the US S&P500 index and the USD/HUF exchange rate.

The foregoing analysis offers the following conclusions. The Polish sWIG80 index and, to some extent, the Hungarian BUX index exhibit the January effect. Returns generated by the Czech PX index and the Polish mWIG40 and sWIG80 indexes are, on average, lower in January than in other months. The Czech stock market is the only one to generate statistically significantly different returns in September. In all the three countries, the S&P500 index and exchange rates against the US dollar influence stock index returns (excluding the PX).

Table 12 contains the results of the Kruskal-Wallis test for the day-of-the-week and month-of-the-year effects. As it can be seen, statistically significant differences between returns were only obtained for the sWIG80 tested for the 'day-of-the-week-effect', namely between Monday and Friday, Tuesday and Friday, Wednesday and Friday. The validity of this result is indirectly supported by the regression analysis, which shows that the Monday and Friday rates of return for this index are significantly different from zero. For the other indexes, no statistically significant differences were found.

Of the three WSE indexes studied, positive returns on Fridays and negative on Mondays, pointing to the presence of the day-of-the week-effect, were only found for the sWIG80. The result was confirmed by both the linear regression analysis and non-parametric testing. A tendency for stock prices to drop between Friday and Monday was also reported by French (1980) for the US stock market. One of the explanations of this weekend effect is connected with the new information reaching investors during the weekend, however, it was not the subject of our study. The behaviour of the Polish stock market is also well explained by the results of earlier reports which attribute the presence of calendar effects to changes in small-cap returns such as Hull, Mazachek and Ockree (1998). However, the day-of-the-week-effect was not found to be present in the WIG and mWIG40, which confirms the research conducted by Patev (2003), who studied calendar anomalies for the main market indexes in the Central European stock markets. In his work, he indicates that the Polish indexes do not show effects related to the days of the week, but the significance of individual days in other markets can be indicated.

The PX yielding lower returns on Tuesdays and the BUX positive returns on Mondays partially confirmed weak presence of the day-of-the-week effect on the Prague and Budapest stock markets.

As far as the month-of-the-year effect is concerned, the sWIG80 returns were positive in January and negative in June. The presence of January effect on small market companies is consistent with Grotowski (2008). The Czech PX generated statistically significantly lower returns in February, June and September. The January effect was found in the Hungarian stock market, which generated the biggest above-normal returns in January among the studied markets.

The occurrence of the January effect in the Polish and Hungarian stock markets was reported also by Asteriou and Kavetos (2006). Their results supported the existence of seasonal effects, particularly the January effect, in Poland and Hungary, but not in the Czech Republic, stronger evidence (in terms of statistical significance) was seen for the cases of Hungary and Poland. The January effect may have two probable explanations. One assumes that investors sell off underperforming stocks in December to reduce their tax bill and buy stocks again in January. The other explanation holds that the effect may be caused by portfolio managers who shed 'loser stocks' at the year-end to maximise their fees (which depend on the performance of their portfolios) and in January readily buy riskier stocks with higher expected rates of return. The likely cause of the June anomaly (negative returns) is investors selling part of their portfolios for the summer to have more time for themselves or simply to have the money for summer holidays. Whatever the reason, the increasing supply of stock drives stock prices upwards.

The analysis of the effect of the control variables on the selected indexes shows that all of them are sensitive to the US S&P500 index and exchange rates against the US dollar, and partially to yields on 10-year Treasury bonds.

The obtained results indicate that some anomalies are still present in the stock markets of the three emerging countries in the period after the financial crisis.

6. Conclusions

This paper tested for the existence of calendar effects in the stock markets of Central European countries: Poland, Hungary and the Czech Republic. The stock markets of all the three countries analysed in the study exhibit calendar anomalies such as the day-of-the-week effect and the month-of-the-year effect in the period after the financial crisis. The day-of-the-week (Friday and Monday) was found for the sWIG80 in Poland, and to some extent for the BUX (Monday) in Hungary and the PX (Tuesday) in the Czech Republic. However, statistical significance was weaker for the Hungarian and Czech Republic stock markets. The month-of-the-year effect was found in all the three studied markets, mainly the January effect in the case of Poland and Hungary. Our conclusion requires several comments, though. Firstly, it only holds for the selected time period. Secondly, it would have been more convincing had the stocks of individual companies been used rather than stock market indexes. Lastly, the classical linear regression analysis requires a number of restrictive assumptions (e.g. concerning the presence of normal distributions, the absence of autocorrelation, etc.) to be fulfilled, therefore the authors in their upcoming paper plan to use the GARCH models.

Table 1. Descriptive statistics for daily and monthly returns in the sample period

	Daily rate of return				
	Mean	**St. Dev.**	**Min.**	**Max.**	**No. of obs.**
WIG	0.00%	1.22%	–8.29%	6.08%	2625
mWIG40	0.00%	1.09%	–9.10%	5.12%	2625
sWIG80	–0.01%	0.90%	–7.52%	4.78%	2625
BUX	0.01%	1.59%	–12.65%	13.18%	2621
PX	–0.02%	1.45%	–16.19%	12.36%	2633
	Monthly rate of return				
	Mean	**St. Dev.**	**Min.**	**Max.**	**No. of obs.**
WIG	0.12%	5.60%	–27.45%	18.84%	125
mWIG40	0.18%	5.92%	–0.3272%	19.84%	125
sWIG80	–0.10%	5.69%	–25.77%	20.98%	125
BUX	0.34%	6.73%	–33.40%	15.07%	125
PX	–0.27%	6.18%	–31.65%	17.11%	125

Source: own elaboration

Table 2. Poland, WIG index, the day-of-the-week effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.100***	5.167	.000	.100***	5.709	.000	.070***	3.659	.000	.065***	3.361	.001	.065***	3.393	.001
B_1	.046	.866	.387	.058	1.207	.227	.057	1.190	.234	.054	1.138	.255	.052	1.091	.276
B_2	.017	.328	.743	–.027	–.576	.565	–.024	–.508	.612	–.025	–.537	.591	–.026	–.552	.581
B_3	.002	.033	.974	–.013	–.271	.787	–.012	–.252	.801	–.009	–.196	.845	–.008	–.172	.863
B_4	–.010	–.193	.847	–.008	–.169	.866	–.007	–.151	.880	–.011	–.228	.820	–.011	–.231	.817
B_5	–.054	–1.010	.313	–.053	–1.098	.273	–.052	–1.089	.276	–.052	–1.081	.280	–.051	–1.066	.286
S&P500				.415***	24.867	.000	.413***	24.818	.000	.413***	24.824	.000	.413***	24.840	.000
USD/PLN							–.091***	–3.836	.000	–.082***	–3.428	.001	–.076***	–3.070	.002
YTM										–.038**	–2.350	.019	–.037**	–2.289	.022
Gold													.020	1.082	.279

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 3. Poland, mWIG40 index, the day-of-the-week effect

	I			II			III			IV			V		
	coeff.	**t-statistic**	**p-value**	**coeff.**	**t-statistic**	**p-value**	**coeff.**	**t-statistic**	**p-value**	**coeff.**	**t-statistic**	**p-value**	**coeff.**	**t-statistic**	**p-value**
γ	.187***	9.761	.000	.185***	10.370	.000	.184***	10.655	.000	.185***	10.743	.000	.184***	10.727	.000
B_1	–.011	–.236	.814	–.002	–.054	.957	.004	.087	.931	–.001	–.021	.983	–.001	–.019	.985
B_2	.036	.782	.434	.003	.074	.941	.009	.222	.824	.015	.361	.718	.015	.349	.727
B_3	.008	.180	.857	–.002	–.044	.965	.001	.025	.980	–.005	–.119	.906	–.008	–.185	.853
B_4	–.026	–.564	.573	–.025	–.569	.570	–.019	–.458	.647	–.019	–.459	.646	–.020	–.479	.632
B_5	.000	–.007	.994	.001	.012	.991	.001	.023	.982	–.003	–.064	.949	–.001	–.018	.985
S&P500				.307***	20.245	.000	.236***	15.132	.000	.232***	14.903	.000	.231***	14.814	.000
USD/PLN							–.271***	–13.329	.000	–.251***	–12.156	.000	–.255***	–11.937	.000
YTM										–.074***	–5.298	.000	–.075***	–5.359	.000
Gold													–.014	–.844	.399

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 4. Poland, sWIG80 index, the day-of-the-week effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.237***	12.502	.000	.232***	13.170	.000	.218***	11.738	.000	.218***	11.655	.000	.217***	11.600	.000
B_1	–.096**	–2.502	.012	–.088**	–2.482	.013	–.087**	–2.445	.015	–.087**	–2.447	.014	–.086**	–2.414	.016
B_2	–.037	–.977	.329	–.065*	–1.847	.065	–.066*	–1.853	.064	–.066*	–1.855	.064	–.065*	–1.847	.065
B_3	–.003	–.081	.935	–.012	–.346	.729	–.013	–.357	.721	–.012	–.353	.724	–.013	–.368	.713
B_4	.016	.428	.669	.018	.496	.620	.018	.498	.619	.018	.492	.623	.019	.535	.593
B_5	.085**	2.213	.027	.086**	2.409	.016	.087**	2.424	.015	.087**	2.424	.015	.086**	2.415	.016
S&P500				.258***	20.746	.000	.257***	20.708	.000	.257***	20.703	.000	.257***	20.676	.000
USD/PLN							–.039**	–2.248	.025	–.038**	–2.181	.029	–.041**	–2.283	.023
YTM										–.002	–.178	.858	–.002	–.200	.842
Gold													–.009	–.658	.511

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 5. Czech Republic, PX index, the day-of-the-week effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.056***	2.883	.004	.082***	4.560	.000	.085***	4.744	.000	.085***	4.741	.000	.085***	4.738	.000
B_1	–.001	–.012	.991	.016	.275	.783	.018	.302	.763	.018	.303	.762	.018	.303	.762
B_2	–.093	–1.478	.140	–.135**	–2.329	.020	–.124**	–2.150	.032	–.125**	–2.154	.031	–.125**	–2.153	.031
B_3	.061	.969	.333	.064	1.102	.271	.065	1.124	.261	.065	1.125	.261	.065	1.125	.261
B_4	.018	.291	.771	.003	.057	.955	–.004	–.068	.946	–.004	–.066	.948	–.004	–.066	.948
B_5	–.081	–1.274	.203	–.093	–1.587	.113	–.088	–1.523	.128	–.089	–1.527	.127	–.089	–1.524	.128
S&P500				.449***	21.716	.000	.412***	19.065	.000	.412***	19.060	.000	.412***	18.973	.000
USD/CZK							–.181***	–5.565	.000	–.181***	–5.563	.000	–.181***	–5.281	.000
YTM										–.001	–.180	.857	–.001	–.181	.857
Gold													.000	–.011	.991

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 6. Hungary, BUX index, the day-of-the-week effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.047**	2.415	.016	.064***	3.585	.000	.062***	3.592	.000	.039**	2.268	.023	.039**	2.253	.024
B_1	.095	1.347	.178	.108*	1.663	.096	.120*	1.948	.052	.114*	1.860	.063	.113*	1.854	.064
B_2	–.030	–.441	.659	–.079	–1.248	.212	–.077	–1.278	.201	–.083	–1.397	.163	–.085	–1.419	.156
B_3	.049	.710	.478	.033	.520	.603	.044	.737	.461	.040	.664	.507	.040	.670	.503
B_4	–.037	–.533	.594	–.042	–.672	.501	–.035	–.579	.562	–.043	–.724	.469	–.044	–.741	.459
B_5	–.013	–.181	.856	–.021	–.322	.748	–.003	–.047	.963	.010	.162	.871	.020	.325	.745
S&P500				.491***	22.007	.000	.373***	16.549	.000	.358***	15.965	.000	.353	15.733	.000
USD/HUF							–.457***	–15.975	.000	–.417***	–14.389	.000	–.441***	–14.775	.000
YTM										–.106***	–6.734	.000	–.105***	–6.660	.000
Gold													–.077***	–3.257	.001

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 7. Poland, WIG index, the month-of-the-year effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.002**	2.077	.040	.000	–.678	.499	–.001	–.815	.417	.000	–.658	.512	.000	–.532	.596
B_1	.002	.126	.900	.009	.718	.474	.012	1.023	.309	.012	1.036	.303	.008	.719	.474
B_2	–.006	–.380	.704	–.010	–.885	.378	–.011	–.969	.335	–.011	–.966	.336	–.012	–1.106	.271
B_3	.019	1.142	.256	–.002	–.198	.843	–.002	–.217	.829	–.003	–.246	.806	–.001	–.098	.922
B_4	.020	1.156	.250	.004	.368	.714	.005	.447	.656	.005	.420	.676	.005	.409	.683
B_5	–.017	–1.006	.316	–.011	–1.000	.320	–.001	–.116	.908	–.001	–.096	.924	–.002	–.176	.861
B_6	–.021	–1.214	.227	–.012	–1.021	.309	–.016	–1.438	.153	–.015	–1.384	.169	–.015	–1.335	.185
B_7	.031*	1.731	.086	.003	.275	.784	.000	–.027	.978	–.001	–.064	.949	.000	–.017	.987
B_8	.002	.095	.924	.018	1.496	.137	.021*	1.841	.068	.020*	1.720	.088	.018	1.505	.135
B_9	–.005	–.303	.763	–.002	–.131	.896	.001	.111	.912	.001	.107	.915	.001	.129	.898
B_{10}	–.005	–.305	.761	–.012	–1.040	.301	–.007	–.636	.526	–.008	–.669	.505	–.007	–.587	.558
B_{11}	–.011	–.643	.521	–.019	–1.596	.113	–.009	–.743	.459	–.009	–.752	.454	–.011	–.898	.371
B_{12}	.004	.227	.821	–.015	–1.204	.231	–.012	–1.071	.287	–.012	–1.066	.289	–.011	–.954	.342
S&P500				.010***	11.601	.000	.008***	7.370	.000	.008***	7.267	.000	.008***	7.391	.000
USD/PLN							–.003***	–3.335	.001	–.003***	–3.222	.002	–.003***	–2.721	.008
YTM										.000	–.550	.583	.000	–.322	.748
Gold													.001	1.346	.181

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 8. Poland, mWIG40 index, the month-of-the-year effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.320***	3.573	.001	.090	1.372	.173	.082	1.263	.209	.086	1.284	.202	.091	1.345	.182
B_1	.900	.495	.622	1.519	1.206	.230	1.715	1.374	.172	1.726	1.375	.172	1.543	1.196	.234
B_2	.248	.143	.887	.015	.013	.990	–.010	–.009	.993	–.013	–.011	.991	–.097	–.081	.936
B_3	1.698	.978	.330	–.219	–.180	.857	–.222	–.186	.853	–.244	–.202	.840	–.162	–.133	.894
B_4	.998	.573	.568	–.558	–.460	.646	–.512	–.427	.670	–.526	–.436	.664	–.533	–.441	.660
B_5	–.993	–.570	.570	–.610	–.507	.613	.023	.019	.985	.037	.030	.976	–.009	–.007	.994
B_6	–3.001*	–1.729	.086	–1.915	–1.591	.114	–2.171*	–1.813	.073	–2.149*	–1.783	.077	–2.121*	–1.754	.082
B_7	2.613	1.423	.158	–.284	–.219	.827	–.530	–.411	.682	–.550	–.424	.672	–.515	–.396	.693
B_8	.500	.274	.785	1.923	1.516	.132	2.133*	1.694	.093	2.082	1.628	.106	1.958	1.509	.134
B_9	.096	.053	.958	.558	.443	.659	.740	.592	.555	.736	.587	.559	.747	.593	.554
B_{10}	–1.543	–.848	.398	–2.058	–1.635	.105	–1.738	–1.384	.169	–1.763	–1.394	.166	–1.717	–1.352	.179
B_{11}	–.520	–.285	.776	–1.475	–1.168	.245	–.847	–.656	.513	–.852	–.656	.513	–.941	–.719	.474
B_{12}	.371	.204	.839	–1.427	–1.124	.263	–1.299	–1.034	.303	–1.300	–1.030	.305	–1.233	–.971	.334
S&P500				1.000***	11.106	.000	.866***	7.636	.000	.864***	7.554	.000	.871***	7.560	.000
USD/PLN							–.214*	–1.900	.060	–.210*	–1.838	.069	–.187	–1.571	.119
YTM										–.015	–.257	.797	–.009	–.149	.882
Gold													.048	.643	.521

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 9. Poland, sWIG80 index, the month-of-the-year effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.004***	4.312	.000	.002**	2.533	.013	.002**	2.386	.019	.002**	2.426	.017	.002**	2.382	.019
B_1	.028*	1.644	.103	.033**	2.578	.011	.035**	2.732	.007	.035**	2.736	.007	.036**	2.712	.008
B_2	.002	.152	.879	.004	.324	.747	.004	.325	.746	.004	.308	.758	.004	.334	.739
B_3	.012	.753	.453	–.003	–.212	.833	–.003	–.211	.834	–.003	–.248	.805	–.003	–.270	.788
B_4	.001	.053	.958	–.013	–1.021	.309	–.012	–.993	.323	–.012	–1.009	.315	–.012	–1.003	.318
B_5	–.010	–.621	.536	–.008	–.695	.488	–.003	–.217	.829	–.002	–.190	.850	–.002	–.176	.861
B_6	–.032**	–1.995	.048	–.024*	–1.930	.056	–.026**	–2.127	.036	–.025**	–2.078	.040	–.026**	–2.077	.040
B_7	.006	.372	.711	–.019	–1.429	.156	–.021	–1.616	.109	–.022	–1.634	.105	–.022	–1.636	.105
B_8	.007	.442	.659	.015	1.182	.240	.017	1.325	.188	.016	1.248	.215	.016	1.265	.209
B_9	–.004	–.239	.811	–.001	–.085	.933	.001	.045	.964	.001	.042	.967	.000	.038	.970
B_{10}	–.016	–.953	.343	–.022*	–1.700	.092	–.019	–1.476	.143	–.019	–1.501	.136	–.019	–1.507	.135
B_{11}	–.008	–.474	.636	–.017	–1.308	.194	–.011	–.847	.399	–.011	–.850	.397	–.011	–.815	.417
B_{12}	.005	.319	.750	–.011	–.837	.405	–.010	–.760	.449	–.010	–.756	.451	–.010	–.771	.443
S&P500				.008***	9.271	.000	.007***	6.304	.000	.007***	6.223	.000	.007***	6.138	.000
USD/PLN							–.002*	–1.700	.092	–.002	–1.606	.111	–.002	–1.603	.112
YTM										.000	–.484	.629	.000	–.516	.607
Gold													.000	–.247	.806

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 10. Czech Republic, PX index, the month-of-the-year effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.238**	2.590	.011	.032	.484	.629	.031	.453	.651	.024	.346	.730	.023	.336	.738
B_1	.123	.065	.948	.965	.729	.468	1.014	.760	.449	1.065	.796	.428	1.169	.852	.396
B_2	–1.570	–.832	.407	–2.323*	–1.758	.081	–2.284*	–1.718	.089	–2.356*	–1.765	.080	–2.297*	–1.701	.092
B_3	2.028	1.127	.262	–.230	–.180	.857	–.249	–.194	.846	–.296	–.230	.819	–.341	–.263	.793
B_4	2.006	1.111	.269	.363	.286	.776	.359	.281	.779	.392	.306	.760	.389	.302	.763
B_5	–2.478	–1.367	.174	–1.963	–1.547	.125	–1.855	–1.428	.156	–1.891	–1.452	.149	–1.880	–1.437	.154
B_6	–3.185*	–1.763	.081	–2.363*	–1.866	.065	–2.464*	–1.904	.060	–2.589**	–1.982	.050	–2.611**	–1.988	.049
B_7	4.125**	2.149	.034	1.037	.756	.451	1.016	.737	.463	1.181	.845	.400	1.167	.832	.407
B_8	–.308	–.161	.872	1.389	1.033	.304	1.402	1.039	.301	1.560	1.141	.256	1.617	1.171	.244
B_9	–3.436*	–1.821	.071	–3.121**	–2.364	.020	–3.118**	–2.353	.020	–3.079**	–2.318	.022	–3.104**	–2.324	.022
B_{10}	–.701	–.367	.714	–2.009	–1.497	.137	–1.939	–1.429	.156	–2.036	–1.491	.139	–2.054	–1.497	.137
B_{11}	–.938	–.496	.621	–1.885	–1.422	.158	–1.736	–1.260	.211	–1.749	–1.267	.208	–1.690	–1.210	.229
B_{12}	1.424	.753	.453	–.437	–.328	.743	–.414	–.309	.758	–.402	–.299	.765	–.442	–.327	.744
S&P500				1.013***	10.810	.000	.991***	9.112	.000	.997***	9.129	.000	.994***	9.052	.000
USD/CZK							–.051	–.413	.680	–.045	–.366	.715	–.060	–.460	.646
YTM										.018	.782	.436	.016	.681	.497
Gold													–.029	–.370	.712

* Statistical significance *α* = 0.1.
** Statistical significance *α* = 0.05.
*** Statistical significance *α* = 0.01.

Source: own elaboration

Table 11. Hungary, BUX index, the month-of-the-year effect

	I			II			III			IV			V		
	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value	coeff.	t-statistic	p-value
γ	.249***	2.723	.008	.087	1.272	.206	.082	1.227	.222	.097	1.449	.150	.095	1.414	.160
B_1	2.521	1.205	.231	3.178**	2.096	.038	3.544**	2.390	.019	3.506**	2.376	.019	3.597**	2.372	.019
B_2	–2.397	–1.195	.234	–2.478*	–1.706	.091	–2.360*	–1.668	.098	–2.226	–1.578	.117	–2.174	–1.522	.131
B_3	2.273	1.136	.258	–.203	–.138	.890	–.082	–.058	.954	.005	.003	.997	–.029	–.020	.984
B_4	3.883*	1.941	.055	2.051	1.404	.163	1.905	1.338	.184	1.713	1.205	.231	1.708	1.196	.234
B_5	–1.325	–.652	.516	–.605	–.410	.683	.002	.001	.999	.017	.012	.990	.025	.017	.986
B_6	–1.001	–.502	.617	.241	.166	.868	–.180	–.127	.899	.000	.000	1.000	–.016	–.011	.991
B_7	2.618	1.249	.214	–.025	–.016	.987	.012	.008	.993	–.118	–.079	.937	–.111	–.074	.941
B_8	–1.189	–.566	.573	.279	.182	.856	.554	.371	.711	.294	.197	.845	.359	.236	.814
B_9	–1.431	–.684	.495	–1.297	–.856	.394	–1.168	–.791	.431	–1.499	–1.008	.315	–1.518	–1.016	.312
B_{10}	.038	.018	.986	–.879	–.578	.564	–.316	–.211	.833	–.496	–.332	.740	–.519	–.346	.730
B_{11}	–1.238	–.592	.555	–1.973	–1.301	.196	–1.210	–.804	.423	–1.184	–.791	.431	–1.144	–.757	.451
B_{12}	.396	.189	.851	–1.506	–.985	.327	–1.196	–.801	.425	–1.366	–.917	.361	–1.397	–.931	.354
S&P500				1.071***	10.125	.000	.886***	7.129	.000	.864***	6.936	.000	.861***	6.864	.000
USD/HUF							–.306***	–2.656	.009	–.236*	–1.899	.060	–.245*	–1.899	.060
YTM										–.087	–1.465	.146	–.088	–1.475	.143
Gold													–.024	–.281	.780

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

Table 12. Kruskal-Wallis test

Index	Effect	p-value	
WIG	day-of-the-week	0.374	
mWIG40	day-of-the-week	0.893	
sWIG80	day-of-the-week	0.018**	Tuesday–Friday. p-value = 0.001 Monday–Friday. p-value = 0.009 Wednesday–Friday. p-value = 0.021
PX	day-of-the-week	0.309	
BUX	day-of-the-week	0.723	
WIG	month-of-the-year	0.515	
mWIG40	month-of-the-year	0.672	
sWIG80	month-of-the-year	0.372	
PX	month-of-the-year	0.109	
BUX	month-of-the-year	0.249	

* Statistical significance $\alpha = 0.1$.
** Statistical significance $\alpha = 0.05$.
*** Statistical significance $\alpha = 0.01$.

Source: own elaboration

References

Asteriou D., Kavetsos G. (2006), *Testing for the existence of the 'January effect' in transition economies*, "Applied Financial Economics Letters", no. 2, pp. 375–381, http://doi.org/10.1080/17446540600706817

Biznes Radar, http://www.biznesradar.pl/ [accessed: 1.07.2018].

Damodaran A. (2002), *Investment valuation: tools and techniques for determining the value of any asset*, John Wiley & Sons, New York.

Fama E.F. (1970), *Efficient capital markets: A review of theory and empirical work*, "Journal of Finance", vol. 25, no. 2, pp. 383–417.

Fama E.F., French K. (1996), *Multifactor explanations of asset pricing anomalies*, "Journal of Finance", vol. 51, no. 1, pp. 55–84.

Fiszeder P., Kożuchowska J. (2013), *Testowanie występowania wybranych anomalii kalendarzowych na GPW w Warszawie*, [in:] P. Tworek, A.S. Bartczak (eds.), *Zastosowanie metod ilościowych w zarządzaniu ryzykiem w działalności inwestycyjnej*, Polskie Towarzystwo Ekonomiczne Oddział Katowice, Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice, pp. 217–229.

French K. (1980), *Stock returns and the weekend effect*, "Journal of Financial Economics", vol. 8, issue 1, pp. 55–69.

Gajdošová K., Heryán T., Tufan E. (2011), *Day of the Week Effect in the European Emerging Stock markets: recent evidence from the financial Crisis Period*, "Scientific Papers of the University of Pardubice, Series D", vol. 15(19), pp. 38–51.

Grotowski M. (2008), *Efekty kalendarzowe na Giełdzie Papierów Wartościowych w Warszawie*, "Gospodarka Narodowa", no. 1–2, pp. 55–75.

Gu A. (2003), *The Declining January Effect: Evidences From The U.S. Equity Markets*, "Quarterly Review of Economics and Finance", vol. 43, no. 2, pp. 395–404.

Gultkein M. (1983), *Stock Market Seasonality: International Evidence*, "Journal of Finance and Economics", vol. 12, no. 4, pp. 469–481.
Higgins E., Howton S., Perfect S. (2000), *The impact of the day of the week effect on returns autocorrelation and cross-correlation*, "The Quarterly Journal of Business and Finance", vol. 5, no. 1, pp. 57–67.
Hull R.M., Mazachek J., Ockree K.A. (1998), *Firm size, common stock offerings announcements period returns*, "The Quarterly Journal of Business and Economics", vol. 37, no. 3, pp. 8–20.
Jayaraman A., Muruganandan S., Santhi V. (2017), *Calendar Anomalies: Before and After the Global Financial Crisis in Emerging BRIC Stock Markets*, "International Journal of Research in Humanities and Social Sciences", vol. 4(1), pp. 26–30.
Jones C.P. (1996), *Investments. Analysis and management*, John Willey & Sons, New York.
Junkus J.C. (1986), *Weekend and day of the week effects in Returns on Stock Index Futures*, "The Journal of Futures Markets", vol. 6, no. 3, pp. 397–407.
Kato K., Schallheim J.S. (1985), *Seasonal and size anomalies in the Japanese stock market*, "Journal of Financial and Quantitative Analysis", vol. 20, issue 2, pp. 243–260.
Keller J. (2015), *Efekt dni tygodnia w różnych segmentach rynku głównego GPW*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia, Rynek Kapitałowy, Wycena Przedsiębiorstw, Inwestycje", vol. 1, no. 74, pp. 69–79.
Kinney W., Rozeff M. (1976), *Capital Market Seasonality: The Case of stock returns*, "Journal of Financial Economics", vol. 3, no. 4, pp. 379–402.
Mahdian S., Perry M.J. (2002), *Anomalies in Us equity markets: a re-examination of the January effect*, "Applied Financial Economics", vol. 12, no. 2, pp. 141–145.
Marquering W., Nisser J., Valla T. (2006), *Disappearing anomalies: a dynamic analysis of the persistence of anomalies*, "Applied Financial Economics", vol. 16, no. 4, pp. 291–302, http://doi.org/10.1080/09603100500400361
Patev P., Lyroudi K., Kanaryan N. (2003), *The Day of the Week Effect in the Central European Transition Stock Markets*, Tsenov Academy of Economics Finance and Credit Working Paper no. 03–06.
Peters E.E. (1997), *Teoria chaosu a rynki kapitałowe*, WIG-Press, Warszawa.
Reinganum M., Shapiro A. (1987), *Taxes And Stock Market Seasonality: Evidence From the London Stock Exchange*, "Journal of Business", vol. 60, no. 2, pp. 281–295.
Rossi M. (2015), *The efficient market hypothesis and calendar anomalies: A literature review*, "International Journal of Managerial and Financial Accounting", vol. 7, no. 3/4, pp. 285–196, http://doi.org/10.1504/IJMFA.2015.074905
Smirlock M., Starks L. (1986), *Day of the week and intraday effects in stock returns*, "Journal of Financial Economics", vol. 17, no. 1, pp. 197–210.
Stooq, https://stooq.pl/ [accessed: 1.07.2018].
Szyszka A. (2003), *Efektywność Giełdy Papierów Wartościowych w Warszawie na tle rynków dojrzałych*, Wydawnictwo Akademii Ekonomicznej, Poznań.
Ślepaczuk R. (2006), *Anomalie rynku kapitałowego w świetle hipotezy efektywności rynku*, "e-Finanse", no. 1, pp. 1–12.
Tonchev D., Kim T. (2006), *Calendar effects in Eastern European financial markets: evidence from the Czech Republic, Slovakia and Slovenia*, "Applied Financial Economics", vol. 14, no. 14, pp. 1035–1043.
Wachtel S. (1942), *Certain observations on seasonal movements in stock prices*, "Journal of Business", vol. 15, no. 2, pp. 184–193.
Warsaw Stock Exchange, https://www.gpw.pl/ [accessed: 1.07.2018].
Zielonka P. (2011), *Giełda i psychologia. Behawioralne aspekty inwestowania na rynku papierów wartościowych*, Wydawnictwo CeDeWu, Warszawa.

Efekty kalendarzowe na giełdach papierów wartościowych państw Europy Środkowej

Streszczenie: Według hipotezy rynku efektywnego inwestorzy nie są w stanie uzyskiwać ponadprzeciętnych zysków, ponieważ w każdej chwili ceny walorów w pełni odzwierciedlają informacje dostępne na ich temat. Jednakże na rynku występuje wiele anomalii kalendarzowych, co stanowi wyjątek od hipotezy efektywnego rynku. Głównym celem tego artykułu jest analiza i porównanie anomalii kalendarzowych – efektu miesiąca w roku i efektu dnia w tygodniu – na giełdach papierów wartościowych krajów Europy Środkowej (Polska, Węgry i Czechy). W pracy przeprowadzono krytyczną analizę literatury z zakresu anomalii rynkowych. Wyniki badań nie są jednoznaczne. Na polskiej giełdzie zaobserwowano anomalie w przypadku małych firm. Anomalie sezonowe zostały również zaobserwowane do pewnego stopnia na giełdzie węgierskiej oraz czeskiej.

Słowa kluczowe: rynek kapitałowy, anomalie sezonowe, efekty kalendarzowe, efektywność rynku, efekt stycznia

JEL: G14, G41, C58

OPEN ACCESS	
	Received: 2020-01-19; verified: 2020-10-26. Accepted: 2020-11-25
COPE Member since 2018 JM13703	