“January anomalies on CEE stock markets”

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JANUARY ANOMALIES ON CEE STOCK MARKETS

Abstract

Numerous studies show that stock markets are often impacted by various calendar anomalies that disrupt the "random walk" behavior of stock prices. These anomalies contradict the Efficient markets theory and can be exploited to generate abnormal returns. This paper investigates the presence of two of them, namely the January effect and the January barometer, on the stock markets of 12 Central and Eastern European (CEE) countries. The paper examines the statistical significance of differences in returns recorded over the month of January and returns recorded over the other months (the January effect), as well as the statistical significance of differences between returns recorded during the remainder of year after a positive January return and after a negative January return (the January barometer). The results show, among other things, that the statistically significant January effect affects the Estonian, Lithuanian, Czech, Romanian, and Latvian stock markets. On the Romanian and Lithuanian stock markets, statistically significantly higher January returns are accompanied by statistically significantly higher January price volatility. On the other hand, we can speak of a statistically significant January barometer only in the case of the Latvian, Lithuanian, and Ukrainian stock markets. The presence of these anomalies is contrary to the Efficient market theory. It can be assumed that proper investment strategies based on these calendar anomalies should be able to generate abnormal returns.

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INTRODUCTION

The question of whether a stock market is efficient or inefficient is highly important for investors. According to Fama (1965), on an efficient market, all important information should always be reflected in asset prices. As a result, technical and fundamental analysis cannot be used to generate abnormal returns. However, as practice shows, almost no stock market fits Fama's criteria to be marked as an efficient market. One of the proofs of the stock market inefficiency are calendar anomalies.

Calendar anomalies such as the Halloween effect (Bouman & Jacobsen, 2002; Andrade et al., 2013), the Holiday effect (Lakonishok & Smidt, 1988; Mehran et al., 2012), the Weekend effect (Cross, 1973; Boudreaux et al., 2010), or the Turn of the month effect (Ariel, 1987; Liu, 2013) have been found on many stock markets around the world over different time periods.

Also, our previous research resulted in the discovery of calendar anomalies in various segments of financial markets. For example, Arendas and Chovancova (2016) identified the statistically significant Halloween effect on the Ukrainian and Polish stock markets. Arendas (2017) concluded that a statistically significant Halloween effect can be also found on the markets of agricultural commodities. Arendas and Kotlebova (2019) observed a statistically significant Turn of the month effect on the Bulgarian, Czech, Estonian, Hungarian, Lithuanian, Polish, Romanian, Russian, and Turkish stock markets.

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1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The calendar anomaly known as the January effect is based on the observation that stock markets usually tend to do very well during the month of January. Better than during the other months. The first author to describe this phenomenon was probably Wachtel (1942). Keim (1983) found out that the January effect affects small-cap companies more than mid-cap and large-cap companies, and that more than 50% of abnormal January returns can be attributed to the first trading week of January. This finding was further supported by Moller and Zilca (2008), who concluded that the January effect tends to be strong, especially during the first half of January. Al Rjoub and Alwaked (2010) confirmed the existence of the January effect also during crisis periods. According to their findings, although during crisis periods the January returns are negative, they are much less negative than returns recorded in other crisis months.

Although there is relatively wide evidence of the January effect existence, its origins are still not completely clear. There are several theories regarding the reasons for the existence of the January effect. The most popular one connects the January effect to the tax-optimizing activities of retail and institutional investors and resulting tax-loss selling season. The tax-loss selling is a phenomenon when during the last weeks of a year, investors sell stocks that recorded losses during the calendar year. This helps them to generate losses that can be used to decrease their tax base. However, in January, many investors tend to re-enter closed positions and buy the same stocks again. According to Klock and Bacon (2014), the underperforming stocks tend to record abnormal negative returns during the months of November and December and abnormal positive returns during the month of January. Also, Wachtel (1942) and Branch (1977) assumed that the January effect is caused by the December tax-loss selling. On the other hand, Keim (1983) argued that if the tax-loss selling is really the reason for the existence of the January effect, its strength should be proportional to the income tax rates. However, the January effect was stronger during the 1930s when the income tax rates were relatively low compared to later time periods with a weaker January effect.

Another theory says that the January effect is caused by the "window dressing", when portfolio managers, before the end of the year, try to sell the "losers" and buy the "winners", trying to improve the image of their funds. This theory is supported by Lakonishok et al. (1991) and Park and Moskalev (2010). However, according to Ling and Shao (2011), after the adoption of the Tax Reform Act of 1986, the January effect started transforming into a November effect.

Rozeff and Kinney (1976) believe that the January effect is caused by the fact that many companies release their financial year reports and guidance for the forthcoming year in January. As this kind of information usually has a stronger impact on small-cap companies, also the January effect impacts especially small-cap companies. And there is also Anderson et al. (2007) who attribute the January effect to psychological factors and positive impacts of the winter Holiday season.

The January barometer, also known as "the other January effect", is based on the assumption that the January market performance can somehow "predict" the performance reached over the remainder of the year. It means that a positive January return should be followed by a positive return recorded over the February – December period. The efficiency of the January barometer was investigated by Cooper et al. (2006) who discovered that on the U.S. stock market, if the January return is positive, the probability to record positive return over the following 11 months is higher than if the January return is negative. Cooper et al. (2009) also created an investment strategy of investing in stocks after a positive January and investing in t-bills after a negative January. They analyzed a 152-year period to prove that their strategy is more efficient than a simple buy & hold investment strategy. Brown and Luo (2006) further expanded the strategy, as according to them, holding the stocks only for 11 months is inefficient because the investor is unable to exploit positive January returns. Their findings show that opening a long position in stocks for 12 months is more efficient than opening it only for 11 months following a positive January.

The paper aims to investigate the presence of two calendar anomalies related to the month of January (the January effect and the January barometer) on the stock markets of the CEE region. To that end, the following hypotheses are tested:

H1: *The January returns are statistically significantly higher than the returns recorded over the RoY.*

H2: *The January volatility is statistically significantly higher than the volatility recorded over the RoY.*

H3: *The monthly returns recorded for 11 months following a positive January return are statistically significantly higher than the monthly returns recorded for 11 months following a negative January.*

H4: *The monthly returns recorded for 12 months following a positive January return are statistically significantly higher than the monthly returns recorded for 12 months following a negative January.*

The 12 investigated stock markets, with the exception of the Turkish stock market, are relatively young, they were created only during the 1990s. This is one of the reasons why the literature does not cover all their aspects as thoroughly as in the case of more matured Western European and North American stock markets. Recent studies focus on various topics such as the impacts of foreign stock markets (Ferreira, 2018; Horvath et al., 2018), the impacts of the global financial crisis (Vychytilova, 2018), the impacts of Brexit (Skrinjaric, 2019), the impacts of mergers and acquisitions (Zaremba & Plotnicki, 2016), the relations between R&D expenditures and economic competitiveness (Kiselakova et al., 2018), etc. But only relatively limited attention has been paid to the presence of calendar anomalies, including the January effect and January barometer. The January effect investigation is usually performed only in a limited number of CEE countries (Podgorski, 2018), or in relatively short time periods (Milosevic et al., 2017; Milos & Milos, 2019). The topic of the January barometer on the CEE stock markets has been neglected almost completely. This paper aims to fill this gap.

2. DATA AND METHODOLOGY

Twelve CEE stock markets are being investigated for the above two calendar anomalies. The individual stock markets are represented by their key stock indices (BET – Romania, BUX – Hungary, OMXR – Latvia, OMXT – Estonia, OMXV – Lithuania, PX – Czech Republic, RTS – Russia, SAX – Slovakia, SOFIX – Bulgaria, UX – Ukraine, WIG 20 – Poland, and XU 100 – Turkey. The monthly data were gained from Stooq databases. However, due to the different history of individual stock markets and stock indices, the investigated time periods have different lengths. The lengths, along with descriptive statistics, are presented in Table 1.

Table 1. Basic descriptive statistics – monthly returns

Source: Authors' results.

	Period	Observations	Average	Minimum	Maximum	St. dev.	Kurtosis
BET	I.2001-XII.2019	228	0.01615	–0.33913	0.34670	0.08134	6.77108
BUX	I.1992-XII.2019	336	0.01534	–0.36065	0.58678	0.08316	11.38808
OMXR	I.2001-XII.2019	228	0.01024	–0.23721	0.33958	0.06225	9.95750
OMXT	I.2001-XII.2019	228	0.01206	–0.30145	0.44822	0.06830	13.31897
OMXV	I.2001-XII.2019	228	0.01111	–0.29595	0.43444	0.06560	12.89594
PX	I.1994-XII.2019	312	0.00398	–0.27127	0.57360	0.07207	15.95873
RTS	I.1996-XII.2019	288	0.01867	–0.56158	0.55981	0.12834	5.92397
SAX	I.1996-XII.2019	288	0.00446	–0.18509	0.33748	0.05706	8.21782
SOFIX	I.2002-XII.2019	216	0.01024	–0.37894	0.28558	0.07596	8.25456
UX	I.1998-XII.2019	264	0.01441	–0.33190	0.56059	0.11638	5.92586
WIG 20	I.1992-XII.2019	336	0.01503	–0.35261	1.05889	0.11359	25.92329
XU 100	I.1991-XII.2019	348	0.03181	–0.39034	0.79784	0.13314	8.07493

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The following formula was used to calculate monthly returns. In the formula, *Rx* is the return recorded during the month X, P_x is the closing price of the month X and P_{x-1} is the closing price of the month preceding month X:

$$R_x = \frac{P_x - P_{x-1}}{P_{x-1}}. \quad (1)$$

The following formula was used to calculate monthly Hi-Lo volatilities. In the formula, V_x is Hi-Lo volatility recorded during month X, PH_x is the highest price reached during month X, PL_x is the lowest price reached during month X, and P_x is the closing price of month X:

$$V_x = \frac{PH_x - PL_x}{P_x}. \quad (2)$$

To determine whether there is a statistically significant difference in returns recorded over the month of January and over the remaining months, the two-sample t-test and the non-parametric Wilcoxon rank-sum test were used. As the *t*-test is more robust for data with a normal distribution, while the non-parametric test is more suitable for non-normally distributed data, the Jarque-Bera test is used to evaluate whether the analyzed data series are normally distributed (the results show that in all the cases, the non-parametric test is the more appropriate one, however, results of both statistical significance tests are provided as a form of cross-check). The same process is used to evaluate whether there are statistically significant differences between the January and RoY (Rest of the Year) volatilities.

The methodology to investigate the January barometer is similar. However, in this case, four data series are created. The first one contains monthly returns of 11 months following each positive January. The second one contains monthly returns of 11 months following each negative January. The third one contains monthly returns of 12 months following each positive January, and the fourth one contains monthly returns of 12 months following each negative January. Subsequently, the Jarque-Bera test, two-sample t-test, and Wilcoxon rank-sum test are used to evaluate whether there is a statistically significant difference between monthly returns recorded after a positive January and monthly returns recorded after a negative January.

The abovementioned procedures are used to evaluate the four hypotheses mentioned at the end of the Literature Review section.

3. EMPIRICAL RESULTS

3.1. The January effect

The results of the investigation of the January effect on the CEE stock markets can be seen in Table 2. The table compares average monthly returns recorded during the month of January and monthly returns recorded during the remainder of the year. It also contains the results of the Jarque-Berra normality tests for each data set. The normality tests were performed to determine which statistical significance test is more robust. For data with normal distribution, the *t*-test should be more robust, while for data with non-normal distribution, the non-parametric Wilcoxon rank-sum test should be more robust. The cases where the difference between the January and RoY returns is statistically significant at $\alpha = 0.01$, 0.05 or 0.1 are highlighted. Moreover, the result of the more robust test, based on the results of the Jarque-Berra tests, is written in bold.

The results show that the average January returns were higher than the average RoY returns in 11 out of 12 CEE region stock markets. The only exception is the Slovak stock market, represented by the SAX index. However, the differences were statistically significant only in five cases (Romania – BET, Latvia – OMXR, Estonia – OMXT, Lithuania – OMXV, and Czech Republic – PX). It can be concluded that over the investigated time periods, the strongest January effect could be seen on the Estonian stock market. Not only were the average January returns by 5.303 percentage points higher than the average RoY returns, but the differences are statistically significant at $\alpha = 0.01$.

By comparing average January and average RoY monthly returns, it can be argued that the January performance may be quite mediocre. It looks to be superior though, as the average RoY returns are negatively affected by the extremely poor performance seen during one of the remaining 11 months. However, as shown in Table 3, this is not the case when talking about Romania, Hungary,

Table 2. January effect statistical significance test results (returns)

Source: Authors' results.

	Jarque-Berra (*p*-values)	Average returns	*t*-test (*p*-values)	Wilcoxon rank sum test (*p*-values)
BET – JAN	0.66956	3.910%	0.1996	**0.057**
BET – RoY	0.00000	1.406%		
BUX – JAN	0.00000	5.341%	0.0112	**0.1829**
BUX – RoY	0.00000	1.187%		
OMXR – JAN	0.53359	2.518%	0.2756	**0.0579**
OMXR – RoY	0.00000	0.889%		
OMXT – JAN	0.00000	6.067%	0.0011	**0.0064**
OMXT – RoY	0.00000	0.764%		
OMXV – JAN	0.13518	4.092%	0.0383	**0.0062**
OMXV – RoY	0.00000	0.839%		
PX – JAN	0.00000	3.336%	0.0297	**0.073**
PX – RoY	0.00000	0.131%		
RTS – JAN	0.72713	2.194%	0.8965	**0.9296**
RTS – RoY	0.00000	1.838%		
SAX – JAN	0.57156	-0.467%	0.414	**0.3723**
SAX – RoY	0.00000	0.529%		
SOFIX – JAN	0.34998	2.329%	0.4476	**0.2096**
SOFIX – RoY	0.00000	0.905%		
PFTS – JAN	0.66054	2.802%	0.5676	**0.4527**
PFTS – RoY	0.00000	1.317%		
WIG 20 – JAN	0.00219	3.644%	0.2982	**0.3179**
WIG 20 – RoY	0.00000	1.308%		
XU 100 – JAN	0.00000	6.442%	0.1686	**0.1341**
XU 100 – RoY	0.00000	2.884%		

Table 3. Average returns by month

Source: Authors' results.

	BET	BUX	OMXR	OMXT	OMXV	PX	RTS	SAX	SOFIX	UX	WIG 20	XU 100
JAN	3.91%	5.34%	2.52%	6.07%	4.09%	3.34%	2.19%	–0.47%	2.33%	2.80%	3.64%	6.44%
FEB	2.46%	–0.30%	–1.13%	0.38%	0.18%	1.28%	4.77%	2.39%	2.27%	4.53%	1.77%	2.19%
MAR	1.64%	1.61%	–0.19%	2.06%	1.83%	0.75%	4.96%	0.54%	–1.07%	1.78%	0.12%	2.10%
APR	3.06%	3.36%	2.83%	1.26%	1.72%	0.75%	4.97%	–0.42%	1.74%	5.12%	3.47%	6.63%
MAY	–0.34%	–0.06%	–0.24%	–0.30%	0.49%	–1.30%	0.17%	–1.45%	0.91%	–0.52%	2.09%	–3.00%
JUN	0.71%	0.56%	2.30%	–0.02%	0.72%	–2.53%	2.62%	–0.10%	0.15%	–1.20%	–1.76%	4.08%
JUL	3.89%	2.94%	4.14%	0.84%	2.21%	3.17%	–1.04%	1.36%	3.01%	2.44%	3.54%	3.05%
AUG	1.41%	1.25%	1.10%	2.31%	2.64%	0.25%	–0.91%	2.58%	2.45%	–4.11%	1.98%	–1.45%
SEP	0.19%	–0.81%	0.90%	–0.47%	1.33%	–1.47%	–2.13%	–0.59%	1.35%	–1.41%	–1.75%	2.56%
OCT	0.40%	0.95%	–0.41%	–0.84%	–1.57%	–0.22%	2.18%	–0.35%	–1.33%	–0.97%	1.05%	3.81%
NOV	0.47%	0.19%	0.37%	1.36%	–1.01%	–1.35%	0.42%	0.15%	–1.35%	2.31%	0.37%	4.63%
DEC	1.60%	3.38%	0.12%	1.80%	0.69%	2.12%	4.21%	1.70%	1.83%	6.53%	3.51%	7.14%
Average	1.61%	1.53%	1.02%	1.21%	1.11%	0.40%	1.87%	0.45%	1.02%	1.44%	1.50%	3.18%
Average excluding JAN	1.41%	1.19%	0.89%	0.76%	0.84%	0.13%	1.84%	0.53%	0.90%	1.32%	1.31%	2.88%

Estonia, Lithuania, Czech Republic, and Poland. In all these five countries, the average January returns are higher than returns recorded during any other month. This can be perceived as further evidence of the January effect.

It is reasonable to expect that the significantly higher volatility should accompany significantly higher January returns. As shown in Table 4, this assumption is generally true. In 11 out of the 12 investigated stock markets, the volatility was higher during the month of January than during the RoY. However, the differences tend to be negligible. They are statistically significant only in the case of the Romanian, Hungarian, Lithuanian, Bulgarian, and Turkish stock market. On the stock markets

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Table 4. January effect statistical significance test results (volatilities)

Source: Authors' results.

	Jarque-Berra (p-values)	Average volatilities	t-test (p-values)	Wilcoxon rank sum test (p-values)
BET – JAN	0.00117	13.342%	0.0135	**0.0078**
BET – RoY	0.00000	8.852%		
BUX – JAN	0.01448	13.072%	0.0231	**0.0149**
BUX – RoY	0.00000	9.848%		
OMXR – JAN	0.01887	7.330%	0.9698	**0.5132**
OMXR – RoY	0.00000	7.274%		
OMXT – JAN	0.00022	9.098%	0.1301	**0.1364**
OMXT – RoY	0.00000	6.961%		
OMXV – JAN	0.09077	7.132%	0.5875	**0.0905**
OMXV – RoY	0.00000	6.345%		
PX – JAN	0.00004	9.282%	0.2491	**0.596**
PX – RoY	0.00000	7.854%		
RTS – JAN	0.00000	16.999%	0.8072	**0.4494**
RTS – RoY	0.00000	16.302%		
SAX – JAN	0.04619	6.570%	0.7767	**0.9418**
SAX – RoY	0.00000	6.336%		
SOFIX – JAN	0.01474	11.829%	0.0261	**0.0215**
SOFIX – RoY	0.00000	7.701%		
PFTS – JAN	0.00000	12.845%	0.6326	**0.9384**
PFTS – RoY	0.00000	13.918%		
WIG 20 – JAN	0.12549	13.397%	0.2303	**0.1482**
WIG 20 – RoY	0.00000	11.511%		
XU 100 – JAN	0.00061	18.464%	0.1249	**0.0755**
XU 100 – RoY	0.00000	15.540%		

of Latvia, Estonia, and the Czech Republic, the difference between the January volatility and RoY volatility is not statistically significant, although a statistically significant January effect is present. This is contrary to the standard economic theory, where higher returns are expected to be accompanied by higher risk.

3.2. The January barometer

Table 5 shows some basic statistics regarding the investigation of the presence of the January barometer on CEE stock markets. As can be seen, in all of the 12 investigated stock markets, with the exception of the Slovak stock market, the majority of Januaries were positive. For example, in Latvia, 16 out of 19 Januaries delivered a positive return of the OMXR stock index. On the other hand, the Slovak SAX index recorded positive returns only during 10 out of 24 Januaries.

It can be also observed that the majority of positive Januaries is followed by a positive 11-month period. For example, in the case of Romanian BET, over the last 19 years, a positive January return was recorded 13 times. And in 10 out of these 13 cases (in 76.92% of cases), a positive return recorded over the subsequent 11-month period followed. The average return recorded over the 11-month periods following a positive January was 20.84%. On the other hand, negative Januaries were followed by 11-month returns of 18.97% on average. In most of the investigated stock markets, the average returns achieved after a positive January were higher than average returns recorded after a negative January. The only exceptions are Hungary (BUX), Russia (RTS), Slovakia (SAX) and Turkey (XU 100).

As can be seen, the strategy of Brown and Luo (2006) works well, as the 12-month periods are usually able to generate higher returns than the 11-month periods. There is only one exception, once again, the Slovakian stock index SAX, which recorded an average return of 4.48% during 11-month periods and only 2.43% during 12-month periods following a positive January.

Although the numbers in Table 5 show that in some of the observed stock markets the January barometer works quite well, the overall numbers

Table 5. January barometer (basic statistics)

Source: Authors' results.

	Number of years	Positive Januaries	Positive JAN followed by a positive 11-month period		Positive JAN followed by a positive 12-month period		Average return following positive JAN (11 months)	Average return following positive JAN (12 months)	Average return following negative JAN (11 months)	Average return following negative JAN (12 months)
BET	19	13	10	76.92%	10	76.92%	20.84%	29.86%	18.97%	19.74%
BUX	28	20	10	50.00%	12	60.00%	11.73%	16.07%	24.16%	42.15%
OMXR	19	16	11	68.75%	12	68.75%	16.55%	19.60%	–14.69%	–9.94%
OMXT	19	15	11	73.33%	11	73.33%	11.08%	17.93%	8.42%	18.73%
OMXV	19	16	12	75.00%	13	75.00%	19.20%	24.52%	–24.80%	–21.04%
PX	26	20	13	65.00%	11	55.00%	4.28%	6.17%	–4.84%	–3.63%
RTS	24	13	8	61.54%	10	76.92%	17.96%	20.76%	43.63%	51.71%
SAX	24	10	6	60.00%	4	40.00%	4.48%	2.43%	8.49%	9.07%
SOFIX	18	12	8	66.67%	8	66.67%	18.78%	23.17%	8.38%	12.44%
PFTS	22	14	9	64.29%	9	64.29%	31.57%	40.79%	8.48%	13.23%
WIG 20	28	17	8	47.06%	8	47.06%	63.36%	88.86%	8.14%	15.47%
XU 100	29	20	13	65.00%	13	65.00%	35.76%	42.93%	77.28%	91.08%

can be skewed by some extreme values, like in the case of Polish WIG 20 that recorded extreme returns of more than 1,000% during 1993. As a result, monthly returns (not cumulative 11-month and 12-month returns presented in Table 5) were tested for statistical significance of differences between monthly returns recorded over 11-month and 12-month periods following positive Januaries and monthly returns recorded over 11-month and 12-month periods following negative Januaries. The results of the tests are presented in Table 6. Just like in Tables 2 and 4, the result of the more appropriate test (determined by the normality or non-normality of investigated data series) is written in bold, and the cases of statistical significance at $\alpha = 0.01$, 0.05 or 0.1 are highlighted.

As shown in Table 6, there are only several cases when the differences between monthly returns were statistically significant. In the case of the Latvian (OMXR) and Lithuanian (OMXV) stock markets, the difference for the monthly returns recorded over the 11-month periods was statistically significant at $\alpha = 0.01$. In the case of the Ukrainian stock

Table 6. January barometer statistical significance test results (monthly returns)

Source: Authors' results

	Jarque-Berra (p-values)	Average returns	t-test (p-values)	Wilcoxon rank sum test (p-values)
BET P-11	0.00000	1.619%	0.5508	**0.7612**
BET N-11	0.00000	0.946%		
BET P-12	0.00000	2.016%	0.3234	**0.6432**
BET N-12	0.00000	0.862%		
BUX P-11	0.15395	0.930%	0.3277	**0.0841**
BUX N-11	0.00000	1.831%		
BUX P-12	0.00000	1.093%	0.1273	**0.0901**
BUX N-12	0.00000	2.628%		
OMXR P-11	0.00000	1.370%	0.0097	**0.0078**
OMXR N-11	0.04691	–1.677%		
OMXR P-12	0.00000	1.476%	0.0114	**0.0065**
OMXR N-12	0.19309	–1.380%		
OMXT P-11	0.00000	0.915%	0.4888	**0.5124**
OMXT N-11	0.00000	0.197%		
OMXT P-12	0.00000	1.274%	0.7703	**0.29**
OMXT N-12	0.00000	0.948%		

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Table 6 (cont.). January barometer statistical significance test results (monthly returns)

	Jarque-Berra (p-values)	Average returns	t-test (p-values)	Wilcoxon rank sum test (p-values)
OMXV P-11	0.00000	1.540%	0.0003	**0.0032**
OMXV N-11	0.01801	–2.899%		
OMXV P-12	0.00000	1.725%	0.0009	**0.0146**
OMXV N-12	0.00449	–2.219%		
PX P-11	0.00001	0.304%	0.4089	**0.6869**
PX N-11	0.00015	–0.443%		
PX P-12	0.00002	0.397%	0.3666	**0.5827**
PX N-12	0.00002	–0.388%		
RTS P-11	0.60905	1.580%	0.723	**0.8791**
RTS N-11	0.00184	2.142%		
RTS P-12	0.07352	1.689%	0.7816	**0.8882**
RTS N-12	0.00165	2.112%		
SAX P-11	0.00000	0.605%	0.8139	**0.7451**
SAX N-11	0.20157	0.438%		
SAX P-12	0.00000	0.485%	0.8272	**0.7186**
SAX N-12	0.11251	0.337%		
SOFIX P-11	0.00000	1.387%	0.1912	**0.3258**
SOFIX N-11	0.00000	–0.059%		
SOFIX P-12	0.00000	1.588%	0.1284	**0.234**
SOFIX N-12	0.00000	–0.092%		
PFTS P-11	0.00000	2.101%	0.1733	**0.0917**
PFTS N-11	0.00001	–0.054%		
PFTS P-12	0.00000	2.339%	0.1257	**0.0663**
PFTS N-12	0.00000	0.060%		
WIG20 P-11	0.00000	1.715%	0.3959	**0.6067**
WIG20 N-11	0.00000	0.575%		
WIG20 P-12	0.00000	1.720%	0.6386	**0.8928**
WIG20 N-12	0.00000	1.110%		
XU100 P-11	0.00000	2.349%	0.2782	**0.3783**
XU100 N-11	0.00000	4.073%		
XU100 P-12	0.00000	2.582%	0.2747	**0.2811**
XU100 N-12	0.00000	4.263%		

market (UX), it was at $\alpha = 0.1$. For the 12-month period, in the case of the Latvian stock market, the difference is statistically significant at $\alpha = 0.01$, and in the case of the Lithuanian and Ukrainian stock markets, at $\alpha = 0.1$. Statistical significance was also encountered on the Hungarian stock market (BUX) at $\alpha = 0.1$; however, in this case, the returns recorded after negative Januaries were statistically significantly higher than returns recorded after positive Januaries. In the remaining stock markets, the statistical significance was not confirmed.

4. DISCUSSION

As the data show, Hypothesis H1 ("The January returns are statistically significantly higher than the returns recorded over the RoY") is valid for five out of the 12 investigated stock markets. Statistical significance was confirmed for Estonia (OMXT) and Lithuania (OMXV) at $\alpha = 0.01$, and for Czech Republic (PX), Romania (BET) and Latvia (OMXR) at $\alpha = 0.1$. The results are in line with L. R. Milos & C. M. Milos (2019), who confirmed the presence of a statistically significant January effect on the Estonian and Latvian (as well as Croatian and Bulgarian) stock markets during the 2009–2018 period.

It can also be noted that the Slovak stock market represented by the SAX index behaves differently than other CEE stock markets, as it recorded average RoY returns higher than average January returns. Also, other studies (Arendas & Chovancova, 2016; Olbrys & Majewska, 2016; Carausu et al., 2018) pointed at the specific behavior of the Slovak stock market. It is explainable by the low level of development and extremely low liquidity on the Slovak stock market.

It can be assumed that for the same stock markets, Hypothesis H2 ("The January volatility is statistically significantly higher than the volatility recorded over the RoY") should be also valid, as higher returns should be accompanied by higher volatility. However, this assumption is wrong. The January volatility was statistically significantly higher than the RoY volatility only in Romania (BET), Hungary (BUX), Lithuania (OMXV), Bulgaria (SOFIX), and Turkey (XU 100). In the case of Romania at $\alpha = 0.01$, in the case of Hungary and Bulgaria at $\alpha = 0.05$, and in the case of Lithuania and Turkey at $\alpha = 0.1$. This finding is similar to that of Arendas and Kotlebova (2019), who found that in the case of another calendar anomaly, the Turn of the month effect, abnormally positive returns were not accompanied by abnormally high volatility.

Hypothesis H3 ("The monthly returns recorded for 11 months following a positive January return are statistically significantly higher than the monthly returns recorded for 11 months following a negative January") proved valid only for the Latvian (OMXR) and Lithuanian (OMXV) stock markets at $\alpha = 0.01$, as well as for the Ukrainian (UX) stock market at $\alpha = 0.1$.

Similarly, Hypothesis H4 ("The monthly returns recorded for 12 months following a positive January return are statistically significantly higher than the monthly returns recorded for 12 months following a negative January") proved valid for the Latvian (OMXR) stock market at $\alpha = 0.01$, Lithuanian (OMXV) stock market at $\alpha = 0.05$, and for the Ukrainian (UX) stock market at $\alpha = 0.1$.

CONCLUSION

This paper focused on the presence of the January effect and January barometer on 12 stock markets of the CEE region. Unlike other authors, more countries (12) over a longer time period (up to 29 years) were investigated. It was concluded that statistically significant January effects, i.e., statistically significant differences between the January and RoY returns, were observed in the case of the Estonian, Lithuanian, Czech, Romanian, and Latvian stock markets. It was also concluded that January monthly volatilities were statistically significantly higher than the monthly volatilities observed over the RoY in the case of the Romanian, Hungarian, Lithuanian, Bulgarian and Turkish stock markets. Regarding the January barometer, it was found out that on the Latvian, Lithuanian, and Ukrainian stock markets, the monthly returns recorded over an 11-month and a 12-month period following a positive January return were statistically significantly higher than the monthly returns recorded over an 11-month and a 12-month period following a negative January return. What is interesting, on the Hungarian stock market, the differences were statistically significant too, however, the returns following negative Januaries were higher than the returns following positive Januaries. Since the existence of these calendar anomalies is a sign of inefficiency in the CEE stock markets, it can be assumed that they could be used to create investment strategies able to generate abnormal returns for investors. However, further analysis is needed to confirm this assumption and quantify the potential abnormal returns.

AUTHOR CONTRIBUTIONS

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Writing – review & editing: Peter Arendas.

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