

# Impact of the January Effect on Return Rates in the Markets of the 2004 EU Enlargement

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## Abstract

**Purpose:** The article presents the results of a study conducted for the January effect. This anomaly is best recognized in the capital markets. In this case, we find explanation of its appearance based on both fundamental analysis and heuristics used by investors. The research focuses on the markets of the European Union enlargement countries of 2004. There are three hypotheses stated in the article:

*Hypothesis 1: The January Effect occurs in the analyzed markets.*

*Hypothesis 2: The January Effect weakens over time.*

*Hypothesis 3: The January Effect weakens with the development of a market.*

**Methodology:** Three methods verified the hypotheses: tests of differences, average and median rate of return, and dynamic models paneled with the estimation of parameters and the generalized method of moments.

**Findings:** The January Effect exists in the analyzed markets. The anomaly weakens over time but, after accession to the European Union, January return rates increase significantly.

**Limitation:** The definite verification was difficult due to the available methods and data. Further research in this field is, therefore, needed.

**Originality:** The originality of the paper stems from the construction of the sample – new evidence from post-communist countries – which became the European Union members in 2004. The next important issue is the period of twenty years after the economic transformation – ten before and ten after the enlargement of the EU.

**Keywords:** January Effect, generalized method of moments, dynamic panel data models, impact of the European Union enlargement to capital markets

JEL: G4, G14

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## Introduction

The January Effect is best recognized in the capital markets. In this case, we find explanation of its appearance based on both fundamental analysis and heuristics used by investors. The research focuses on the markets of the European Union enlargement countries of 2004. Initial work on the seasonality in the distribution of rates of return goes back to the beginning of the twentieth century. Early official reports belied the existence of this phenomenon. In 1919, the Harvard committee of economic research, based on the analysis of stock prices in the years 1897–1914, concluded that there was no trend of seasonality in the distribution of returns (Wachtel, 1942). However, many researchers came to different conclusions, including Forrest (1927). The next step on the road to document the January Effect as we know was the study of Bonin and Moses (1974).

## Literature review

However, the first work which extensively documents the existence of the January Effect is that by Rozeff and Kinney (1976), as argue, among others, Moller and Zilca (2008). Subsequent work showed that the January effect refers to a greater extent of companies with small capitalization. Reinganum (1983) proved that high rates of return in January mainly result from investor activity towards smaller companies. Keim (1983) makes similar conclusions as he analyzes two anomalies: the effect of a small company and the January Effect.

Many researchers repeated Rozeff and Kinney's analysis in other markets, both developed and developing. Gultekin and Gultekin (1983) examined the January Effect in seventeen markets of developed countries, including the USA which is a point of reference for other markets. The Japanese market study by Kato and Schallheim (1985) also confirmed the January Effect. There also are many studies in emerging markets (Fountas and Segredakis, 2002). Diaconasu, Mehdian, and Stoica (2012) deny the occurrence of the anomaly on Romanian stock exchange. There also is evidence from some countries analyzed in this paper, such as Czech Republic, Slovakia, Slovenia (Tonchev and Kim, 2004).

In addition to the verification of the January Effect, a large part of literature concentrates on the search for a fundamental explanation of the anomaly. One can distinguish at least five explanations: portfolio management in order to reduce the amount of tax (Kuznets, 1933; Rozeff and Kinney, 1976; Keim, 1983; Brown et al., 1983); the practices of people managing equity portfolios (Lakonishok et al., 1991); an increased number

of reports on the condition of the companies at the turn of the year (Barry and Brown, 1984; 1985; Brauer and Chang, 1990); demand for cash (Ogden, 1990); and business cycles (Gu, 2003b). There also are explanations which assume that the January Effect is an illusory anomaly (Lakonishok, Shleifer and Vishny, 1994; Bhardwaj and Brooks, 1992; Cox and Johnson, 1998).

Other explanations suggest that the January Effect results from the demand for cash in December which creates pressure on the supply side (Angell after Wachtel, 1940; Ogden, 1990); rates of return expected by investors of companies of smaller value (Kramer, 1994); a consequence of business cycles (Gu, 2003b); increased turnover, which makes actual investor returns statistically insignificant (Ligon for Gu, 2003a; Ligon for Gu, 2003b).

Especially Gu's study (2003a) offers valuable conclusions because it demonstrates that the January Effect weakens over time.

## Methodology and sample

*Hypothesis 1: The January Effect occurs in the analyzed markets.*

*Hypothesis 2: The January Effect weakens over time.*

*Hypothesis 3: The January Effect weakens with the development of a market.*

### The sample

Conducted research verifies the existence of anomalies in the markets of countries that joined the EU in 2004. The test is divided into two sub-samples. The first group includes only Poland, which represents the largest and most developed market (Winkler-Drews, 2009; Podgórski, 2010; Kozłowski, Jackowicz and Podgórski, 2017). The second group gathers the other, namely Lithuania, Latvia, Estonia, Czech Republic, Slovakia, Slovenia, and Hungary. The construction of the sample offers an important insight into the discussion about the impact of the EU enlargement on the stock exchange (Table 1).

Of course, there is evidence from these markets about the existence of the January Effect but usually based on a very low number of stocks. For example, Dragota and Țilică (2014) based their study on the data from post-communist countries. Among them were the Czech Republic, Hungary, Latvia, Lithuania, Poland, Slovenia, and Slovakia. The result of the study denied the presence of the January Effect on 35 stock

exchanges from 65 analyzed. In comparison, the research below used a sample of 459 companies.

**Table 1.** Sample description

	Sub-sample 1	Sub-sample 2							Total
	Poland	Czech Republic	Estonia	Lithuania	Latvia	Slovakia	Slovenia	Hungary	
1994	8					1		5	6
1995	21					4		8	12
1996	25			2		5	3	11	21
1997	37		1	4		5	5	13	28
1998	73		3	4	1	5	9	15	37
1999	97		3	5	2	5	11	20	46
2000	110	10	3	5	2	5	12	23	60
2001	119	10	3	5	2	5	16	23	64
2002	125	10	3	5	2	5	17	23	65
2003	125	11	3	5	3	5	17	23	67
2004	130	11	3	5	3	5	17	26	70
2005	158	11	3	5	3	6	18	27	73
2006	170	13	4	5	3	6	18	28	77
2007	208	14	6	6	3	6	19	29	83
2008	260	15	9	6	3	6	19	30	88
2009	280	17	10	6	3	6	21	30	93
2010	302	17	10	6	3	7	21	31	95
2011	322	18	11	6	3	8	21	33	100
2012	338	19	11	6	3	8	22	34	103
2013	352	21	11	6	3	8	22	36	107

Source: own research.

## Testing method for the January Effect

The first phase of the study provided a preliminary verification of the presence of higher than normal rates of return in January. The first step analyzed the differences in the average January rates of return compared to other months. The second step examined the differences in January median rates of return compared to other months. Student's test and Satterthwaite-Welch t-test verified the averages (Peng and Tong, 2011; Schechtman and Sherman, 2007) while tests by Wilcoxon-Mann-Whitney (Martínez-Murcia et al., 2012), Kruskal-Wallis (Ruxton and Beauchamp, 2008) and van der Waerden (Ahmed et al., 2014) proved the median.

Conducting Welch-Satterthwaite t-test allowed for the elimination of possible distortions of results due to different variances of distributions. It is a modification of the t-test by adjustment of the number of degrees of freedom. Wilcoxon-Mann-Whitney test is a nonparametric test based on the rank sums. Kruskal-Wallis test is an extension of Wilcoxon-Mann-Whitney test which does not require the equality of variance. The van der Waerden test is, in turn, an expansion of the Kruskal-Wallis test, which assumes the standardization of distribution.

The estimation of dynamic panel models was the second method to verify the occurrence of the January Effect over the horizon of the analysis. The author estimated the model parameters with the generalized method of moments. To test the occurrence of anomalies, this research developed three different models which depend on the number of delayed variables introduced as regressors – from one to three periods respectively.

The author verified each of the parameters of the model for the individual statistical significance with the t-test. Each model operated with a fixed and a binary variable of January; to identify the observations from this month. In order to check the overall statistical significance of regressors, the research conducted the Wald test. The last phase of verification of the quality of statistical models was to test the choice of instruments (the Hansen test).

## The January Effect: empirical analysis

The author firstly concentrates on the largest and most developed market in the research sample – the Warsaw Stock Exchange – in four stages. The first analyzes the differences in the average and median monthly rates of return over the horizon of the analysis (Table 2). The second includes the estimation of panel models with the use of the

Table 2. Tests for differences in average and median monthly rates of return in the years 1994–2013 on the Polish market

Month	Average rate of return	Tests of the statistical significance of differences in averages			Median rate of return	Tests of the statistical significance of differences in medians		
		t-test	S-W t-test	S-W t-test		W/M-W	K-W	vdW
January	2,47%			1,18%				
February	1,14%	3,64 ***	3,64 ***	0,23%	3,28 ***	10,79 ***	10,88 ***	***
March	1,79%	1,80 *	1,80 *	0,00%	2,64 ***	6,95 ***	4,34 **	**
April	0,58%	5,02 ***	5,02 ***	-0,43%	6,37 ***	40,64 ***	31,52 ***	***
May	-1,88%	11,93 ***	11,91 ***	-1,88%	13,50 ***	182,33 ***	166,39 ***	***
June	-2,85%	14,57 ***	14,65 ***	-2,03%	14,87 ***	220,98 ***	222,30 ***	***
July	-0,88%	8,71 ***	8,73 ***	-0,66%	8,29 ***	68,68 ***	73,55 ***	***
August	-1,10%	9,04 ***	9,04 ***	-0,85%	8,76 ***	76,76 ***	83,16 ***	***
September	-2,13%	12,05 ***	12,07 ***	-1,54%	11,90 ***	141,49 ***	152,13 ***	***
October	0,04%	6,17 ***	6,17 ***	0,00%	5,31 ***	28,22 ***	34,59 ***	***
November	-1,82%	11,32 ***	11,33 ***	-1,65%	11,87 ***	140,80 ***	140,52 ***	***
December	-0,67%	8,67 ***	8,67 ***	-0,63%	8,32 ***	69,30 ***	73,79 ***	***
Feb-Dec	-0,78%	11,34 ***	11,22 ***	-0,70%	10,76 ***	115,79 ***	96,42 ***	***

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5% and 10%.

T-test – Student's t-test, S-W t-test – Satterthwaite a-Weicha t-test, W/M-W – Wilcoxon-Mann-Whitney test, K-W – test Kruskal-Wallis, vdW – van der Waerden test

Source: own research.

generalized method of moments (Table 3). The third verifies the occurrence of the phenomenon over the entire time horizon of the analysis in bulk. The fourth examines each of the years of the study separately (Tables 4 and 5).

The Table 2 compares the average and median rates of return recorded in January to average and median rates of return for each of the remaining months of the year.

The analysis of differences in the average and median monthly rates of return contained in Table 2 favors hypothesis 1a. In the light of this hypothesis, there occurs the January Effect in the markets of Central Europe. Within the twenty-year horizon of the functioning of the Warsaw Stock Exchange, investing in January gave the highest return. January, on average, provides investors with higher returns than the average of all other months together and separately. The tests show a statistically significant difference between the average rates in January and each other month. Student's t-test results fully coincide with the results of the Welch-Satterthwaite tests which are a modification of the t-test. In most cases, there was a to reject the null hypothesis in testing the significance of differences, in the case of most months at 1%, which demonstrates the strength of the phenomenon. The analysis of differences in median monthly returns once again proves that January is the month with the highest rates of return. The study of differences in median indicates the statistical significance of the results of all such tests.

An interesting phenomenon stems from the fact that March average rate of return also is at a high level. However, March average rates of return are lower by almost 0.7 percentage point from January rates. It should be noted that the tax issues – which are one of the explanations for the January Effect – cannot apply in this case because the Polish capital gains tax is settled in calendar years. The same reason excludes the argument of the revision of the composition of investment funds' portfolios. Thus, maybe the explanation lies in the monthly returns in each year.

However, the analysis of median values does not confirm March higher rates of return. The median rate of return in March is zero. Differences in median rates of return in January and each other month have statistical significance. One should remember that the database under study excludes companies with zero turnovers. Therefore, the zero median is not indicative of a lack of price fluctuations within a month but, in the end, the price at the beginning and the end of the period was equal. Another puzzling observation comes with the average rate of return analysis of October rates, which rate of return is close to zero – 0.04 percent – while the median is equal to 0.

To check the reliability of the previous findings, this study verified the presence of the January Effect with the use of dynamic panel models. The author estimated the model parameters using the generalized method of moments. The estimation appears in Table 3. Individual models differ in the number of variables and the form of delayed returns. Moreover, the author added a binary variable to each model by adopting a value of 1 for January observations and 0 for other months.

The Table 3 presents estimates of parameters of dynamic models explaining the monthly rate of return using late returns from one to three months and a binary variable coding for January. Model parameters were estimated with the generalized method of moments, while the dynamic model structure was chosen because of the possibility of the occurrence of the phenomenon of rate of return repetition. The Table does not present the results of estimates for binary variables coding each year of the analysis; these variables, however, are present in all models.

**Table 3.** Dynamic models for verifying the existence of the January Effect on the Polish market

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b><math>y_{t-1}</math></b>	0,0258*** (0,00699)	0,0238*** (0,00724)	0,0265*** (0,00716)
<b><math>y_{t-2}</math></b>		-0,0169** (0,00711)	-0,0157** (0,00716)
<b><math>y_{t-3}</math></b>			0,0224*** (0,00757)
<b>January</b>	0,0296*** (0,00303)	0,0297*** (0,00302)	0,0300*** (0,00301)
<b>Constant</b>	-0,0936*** (0,0151)	-0,112*** (0,0147)	-0,0848*** (0,0171)
<b>Number of observations</b>	42340	41960	41585
<b>Number of subjects</b>	350	350	349
<b>Aggregate statistical significance test—Chi<sup>2</sup></b>	1590***	1538***	1592***
<b>Choice of instruments Hansen test</b>	340,4	338,7	340,2

$y_{t-1}, y_{t-2}, y_{t-3}$  indicate rate of return respectively delayed by 1, 2 or 3 months, the standard errors are given in parentheses.

Source: own research.



The estimation results favor Hypothesis 1a. The anomaly is visible in each of the estimated models, as the parameter for January variable is positive and statistically significant at the 1% level. The choice of instruments for the models is correct, which confirms the Hansen test. The Chi<sup>2</sup> test indicates the total regressors' statistical significance at 1%.

The results of the first model estimation reveal the statistical significance of the rate of return delayed by one period, according to the fixed and variable January binary. In the second case, the estimated model parameters have similar values to those of the first model. The parameter for the new variable – which captures the rate of return delayed by two periods – is negative and statistically significant at the 5% level. In the third model, the estimated parameters for rates of return delayed by one or two periods, while free term and January variable are consistent with previous models. The variable delayed by three periods has a positive effect on the dependent variable and is statistically significant at the 1% level. An interesting fact is that the model (2) and (3) variable delayed by two periods negatively impacts the dependent variable.

One can have confidence in these results because of the large sample size – more than 40,000 observations of 350 companies. The results of estimation of dynamic models on the Polish market suggest that there occurs a phenomenon of short-term *persistence*, that is, a repetition of rates of return. Subsequent analyses – a comparison of January rates of return to the average of the remaining months in different years and the rates of return in individual months – will verify to what extent does the January Effect allow investors to build a successful investment strategy.

More specifically, however, this issue will be analyzed on the basis of analysis of the distribution of returns in individual years and months, gathered in Tables 4 and 5.

The Tables 4 and 5 compares the average rates of return recorded in January to rates of return for each of the remaining months of the year.

The analysis of differences in the average rates of return in January and the remaining months in each year does not confirm Hypothesis 1a. Only five times in the horizon of twenty years was January the month with the highest rates of return. The January Effect has occurred in the years 1994, 1996, 2004, 2006, and 2012. One should note that January generated negative returns six times. The statistical significance of differences in rates of return in January and other months makes clear that, in some years, there are grounds for the rejection of the null hypothesis at 1% in the test of equality of averages. Similar conclusions emerge from the analysis of differences in the median. January

Table 4. Tests for differences in average monthly rates of return in each year on the Polish market

	January	February	March	April	May	June	July	August	September	October	November	December	December n-1												
<b>2013</b>	5,97%	-0,62%	-3,47%	***	7,91%	***	0,51%	***	3,63%	**	4,42%	*	<b>9,29%</b>	***	-0,79%	***	-6,77%	***	0,64%	***					
<b>2012</b>	<b>12,04%</b>	7,01%	***	-2,14%	***	-10,40%	***	-1,04%	***	-8,27%	***	-1,39%	***	3,38%	***	1,59%	***	-0,64%	***	0,64%	***	-6,14%	***		
<b>2011</b>	-0,10%	1,31%	-0,73%	1,05%	***	-3,46%	***	-6,15%	***	-7,63%	***	-15,50%	***	-13,17%	***	<b>6,01%</b>	***	-6,05%	***	-6,14%	***	1,51%	***		
<b>2010</b>	1,49%	0,30%	*	<b>9,98%</b>	1,89%	-5,88%	***	-4,88%	***	6,09%	0,50%	3,59%	0,18%	*	0,18%	*	-2,70%	***	1,51%	***	-0,03%	**	***		
<b>2009</b>	-6,88%	-10,47%	**	13,57%	18,38%	2,18%	3,68%	10,86%	10,86%	-2,75%	10,86%	-1,91%	-1,91%		-1,91%		0,24%		-0,03%		-0,03%		-7,21%		
<b>2008</b>	-12,50%	<b>0,00%</b>	-2,26%	-7,92%	-4,79%	-16,44%	***	-4,05%	-2,33%	-9,76%	-9,76%	-25,67%	***	-7,75%	-25,67%	***	-7,75%	***	-7,21%	***	-7,21%	***	-4,21%	***	
<b>2007</b>	9,01%	0,35%	***	<b>17,51%</b>	6,46%	*	3,27%	***	-9,66%	***	-9,99%	***	-1,93%	***	1,23%	***	-16,43%	***	-4,21%	***	-4,21%	***	-2,81%	***	
<b>2006</b>	<b>15,62%</b>	7,36%	***	8,04%	***	-10,27%	***	-2,92%	***	8,90%	***	1,34%	***	8,29%	***	9,10%	***	10,83%	**	-2,81%	***	8,59%	***	***	
<b>2005</b>	0,92%	2,28%	-6,15%	***	2,18%	4,63%	3,96%	0,11%	2,48%	0,58%	4,79%	0,58%	0,58%	4,42%	***	-2,87%	***	-2,07%	***	3,11%	***	10,17%	***	8,59%	3,11%
<b>2004</b>	<b>11,04%</b>	10,59%	6,09%	***	8,81%	-2,27%	***	-1,37%	***	-0,89%	***	2,94%	***	4,42%	***	-2,87%	***	-2,07%	***	3,11%	***	10,17%	***	10,17%	***
<b>2003</b>	2,48%	0,18%	-2,14%	**	5,87%	8,28%	0,16%	<b>17,88%</b>	17,20%	-6,31%	***	6,71%	6,71%	-6,31%	***	6,71%	6,71%	-6,31%	***	6,71%	6,71%	-6,31%	***	10,17%	10,17%
<b>2002</b>	1,91%	-3,46%	***	-3,78%	***	2,26%	***	-4,95%	***	-5,71%	***	-12,34%	***	-0,96%	*	-5,88%	***	3,26%	***	3,26%	***	2,30%	2,30%	-0,29%	-0,29%
<b>2001</b>	-5,90%	-12,07%	***	-3,13%	3,15%	-3,43%	-8,42%	*	-9,46%	**	-3,59%	-6,60%	-6,60%	-6,60%	***	<b>6,89%</b>	6,89%	6,89%	6,89%	6,89%	6,89%	6,89%	6,89%	6,89%	6,89%
<b>2000</b>	0,65%	0,38%	8,55%	-4,49%	***	-2,37%	**	1,00%	1,03%	-0,96%	-0,96%	-7,18%	***	-3,46%	***	-1,33%	-1,33%	-1,33%	-1,33%	-1,33%	-1,33%	-1,33%	-1,33%	-1,33%	15,41%
<b>1999</b>	2,92%	0,94%	0,95%	6,24%	3,89%	1,38%	3,55%	***	1,93%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	5,38%	2,38%
<b>1998</b>	-5,92%	<b>11,44%</b>	-1,61%	-3,86%	-17,88%	***	-7,05%	-31,66%	***	-4,49%	-31,66%	***	-4,49%	-31,66%	***	-4,49%	-31,66%	***	-4,49%	-31,66%	***	-4,49%	-31,66%	***	-1,51%
<b>1997</b>	7,27%	<b>15,05%</b>	4,72%	1,31%	**	-5,17%	***	-6,23%	***	-4,67%	***	-4,67%	***	-4,67%	***	-4,67%	***	-4,67%	***	-4,67%	***	-4,67%	***	-4,67%	***
<b>1996</b>	<b>24,52%</b>	4,81%	***	6,66%	***	-5,26%	***	6,64%	***	7,11%	***	7,11%	***	7,11%	***	7,11%	***	7,11%	***	7,11%	***	7,11%	***	7,11%	***
<b>1995</b>	-14,73%	0,00%	0,00%	0,00%	-5,72%	6,62%	-2,18%	-0,41%	3,42%	-12,12%	1,26%	-4,56%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%
<b>1994</b>	<b>30,99%</b>	14,13%	-32,49%	-25,52%	7,89%	-30,20%	28,24%	4,10%	-20,58%	-16,14%	-3,15%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%	-3,72%

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5%, 10%.

Bold font indicates the highest rate of return. December n-1 denotes December last year.

Source: own research.

Table 5. Tests for differences in median monthly rates of return in each year on the Polish market

	January	February	March	April	May	June	July	August	September	October	November	December	December n-1
2013	3,87%	-0,31%	-1,90%	-4,94%	5,64%	-0,89%	0,70%	2,99%	3,79%	<b>8,34%</b>	0,00%	-5,22%	1,03%
2012	<b>10,29%</b>	5,65%	-2,22%	-5,85%	-8,26%	0,15%	-5,37%	-0,15%	2,72%	0,00%	0,00%	1,03%	-4,47%
2011	-0,96%	0,00%	-0,86%	0,08%	-3,02%	-5,72%	-6,90%	-14,05%	-11,47%	<b>4,59%</b>	-4,68%	-4,47%	0,80%
2010	0,49%	-0,57%	<b>9,43%</b>	0,81%	-5,72%	-5,25%	5,18%	-0,98%	2,14%	-0,83%	-2,88%	0,80%	-0,44%
2009	-4,96%	-8,89%	11,19%	<b>16,96%</b>	0,88%	2,11%	9,12%	8,49%	-3,54%	-2,62%	-0,44%	-0,44%	-4,32%
2008	-11,68%	<b>0,38%</b>	-1,72%	-6,32%	-3,20%	-14,44%	-3,44%	-2,81%	-8,05%	-24,14%	-5,97%	-4,32%	-4,34%
2007	6,98%	-1,07%	<b>12,22%</b>	5,42%	3,34%	1,81%	-9,27%	-9,53%	-2,71%	0,50%	-15,45%	-4,34%	-2,53%
2006	<b>11,28%</b>	4,72%	4,00%	7,83%	-10,33%	-1,94%	8,65%	-1,97%	5,41%	6,51%	7,01%	-2,53%	5,24%
2005	-0,82%	1,86%	-5,21%	-5,77%	2,49%	3,64%	3,77%	-1,03%	0,23%	-1,79%	4,24%	<b>5,24%</b>	1,42%
2004	7,27%	7,34%	3,33%	4,44%	-3,16%	-0,88%	-1,07%	0,74%	1,71%	-2,15%	-2,16%	1,42%	<b>7,89%</b>
2003	2,06%	0,00%	-1,47%	4,57%	6,77%	0,00%	<b>16,18%</b>	15,42%	-5,47%	3,23%	-5,18%	7,89%	-0,98%
2002	1,77%	-3,60%	-2,91%	-3,29%	2,05%	-4,36%	-9,16%	-1,50%	-2,74%	<b>2,49%</b>	1,80%	-0,98%	0,00%
2001	-5,25%	-9,53%	-2,90%	2,41%	-2,03%	-7,18%	-6,76%	-2,55%	-3,81%	<b>4,77%</b>	-1,32%	0,00%	-0,40%
2000	-2,30%	-5,23%	9,30%	-4,32%	-2,67%	-0,60%	-0,73%	0,00%	-7,62%	-3,73%	-1,44%	-0,40%	<b>15,01%</b>
1999	1,18%	-1,46%	-0,83%	4,75%	2,13%	0,84%	-3,64%	0,00%	-16,51%	4,56%	2,99%	15,01%	1,97%
1998	-5,13%	<b>11,00%</b>	-2,04%	-5,09%	-14,49%	-5,45%	-6,52%	-32,29%	-0,93%	-6,45%	4,71%	1,97%	-2,17%
1997	5,65%	<b>12,97%</b>	2,80%	-0,27%	-6,92%	-6,73%	-3,51%	7,62%	-2,72%	-13,70%	-4,81%	-2,17%	0,00%
1996	<b>23,14%</b>	2,89%	5,16%	9,73%	-6,67%	6,32%	-9,26%	7,05%	7,41%	-7,10%	-2,33%	0,00%	-4,23%
1995	-16,08%	6,06%	-5,51%	<b>26,10%</b>	-7,14%	3,77%	-5,01%	-1,96%	1,27%	-10,95%	0,00%	-4,23%	-4,53%
1994	27,17%	15,85%	-33,41%	-28,95%	11,33%	-34,49%	<b>32,65%</b>	2,81%	-20,76%	-21,42%	-0,72%	-4,53%	b/d

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5%, 10%.

Bold font indicates the highest rate of return. December n-1 denotes December last year.

Source: own research.

only three times appears with the highest median rate of return. As in the previous parts of the study, the median values are lower than the average. Thus, the results show a slight right-skewed distribution.

In addition to January, the month which generated the highest average rate of return most often was October. Rates higher than in other months occurred in October in 2001, 2002, 2011, and 2013. In the case of the analysis of differences in median rates of return, October also features the highest median values four times. Compared to other months, March stands out as well, which also generates high returns: twice the highest and three times the second-highest. In conjunction with returns in February and December, one can suspect that the January Effect is transformed into December, February, or March Effect, depending on the analyzed years. In 2012 there was the January-February Effect which allowed to generate nearly 20% rate of return and, in 2004, the string of higher returns began in December 2003 and each subsequent month generated a rate of return greater than 10%. The disappearance of the January Effect suggests that investors learn.

The issue of the relationship between January anomalies and the economic situation raised in the previous detailed analysis is not noticeable. Only an adjustment in the rates of return during the year is visible. The rates of return – both average and median – behave without distinct patterns. Nevertheless, the years 2000 and 2001 provide interesting observations. After the Internet bubble burst, when its effects reached Poland in April, the January anomaly moved to December. The financial crisis and the speculative attack of 2009 did not affect the January Effect but for the adjustment of rates of return in March and April.

An important issue is the analysis of the behavior of the rates of return before and after the Polish accession to the European Union; that is, before and after 2004. One should note that the year of accession divides the horizon of analysis in half. Moreover, in the year of accession, the sequence of higher rates of return appears until accession occurred in April, which may indicate speculative attempts in the market. This may partly confirm the observations in other markets and the widely-discussed regularity that anomalies are more common in mature than emerging markets. These results argue against Hypothesis 3a – that the institutional development of the market should neutralize the existence of the January Effect, which in the case of Poland was the accession to the European Union. To confirm this observation, it is necessary to examine other markets.

An important conclusion from the presented analysis is that the results incline to the method. The first two studies regarding the verification of anomalies in terms of a global view of the entire horizon support Hypothesis 1a. The two subsequent studies provide no such firm conclusions. Furthermore, the more we analyze in detail the existence of anomalies the less it is clear. One may, thus, suppose that the anomaly is but an illusion. Despite its prevalence in some periods, the January Effect cannot be the basis to build a sustainable investment strategy; hence the confirmation of its occurrence in certain methods and denial in other.

Similarly to the schematic description of the Polish market, the market analysis of other Central European countries is introduced by months first (Table 6), then by the results of the estimation of dynamic panel models (Table 7), and later by study of differences in average and median monthly rates of return in individual years (Tables 8 and 9).

The Table 6 compares the average and median rates of return recorded in January to rates of return for each of the remaining months of the year.

The author concludes the existence of the January Effect on the basis of the above tests. The research of differences between the average rates of return indicates that the rate of return of the first month of the year is higher than those realized in the remaining months. The ratio of the rates of return generated in January and the average for other months positively verify Hypothesis 1a. The analysis of pairs of January and other months also shows that differences in average rates of return are statistically significant.

The analysis of differences in the median further confirms the occurrence of the January Effect. The differences in median rates of return in January and other months are statistically significant. One should note that the median values are significantly lower than the average.

Apart from January, April, August, and December also generate positive returns on average. They are about 1.5 percentage point lower than the rate in January. The January Effect is visible in both analyses. The emergence of positive returns in April cannot be linked with the explanation of taxation because, in these countries, the fiscal year coincides with the calendar year.

The model tests for the first subsample to test the stability of the occurrence of the January Effect – an analysis using dynamic panel models – estimates with the use of the generalized method of moments. Table 7 presents the results of the analyses.

**Table 6.** Tests for differences in average and median monthly rates of return in the years 1996–2013 for the markets of countries other than Poland that accessed the European Union in 2004

Month	Average rate of return	Tests of the statistical significance of differences in averages			Median rate of return	Tests of the statistical significance of differences in medians		
		t-test	S-W t-test	W/M-W		K-W	vdW	
January	2,66%			1,91%				
February	-0,06%	4,19 ***	4,19 ***	-0,07%	7,21 ***	51,99 ***	42,49 ***	***
March	-0,14%	3,70 ***	3,71 ***	-0,10%	6,34 ***	40,22 ***	33,39 ***	***
April	0,69%	2,81 ***	2,81 ***	0,00%	5,56 ***	30,95 ***	25,62 ***	***
May	-1,01%	4,56 ***	4,55 ***	-0,06%	9,55 ***	91,15 ***	78,38 ***	***
June	-1,89%	6,54 ***	6,56 ***	-0,89%	9,55 ***	91,21 ***	82,11 ***	***
July	-0,06%	3,84 ***	3,85 ***	0,12%	5,15 ***	26,55 ***	24,75 ***	***
August	1,00%	2,43 **	2,44 **	0,59%	3,68 **	13,57 ***	11,85 ***	***
September	-1,25%	5,45 ***	5,45 ***	-0,28%	7,69 ***	59,08 ***	54,82 ***	***
October	-1,39%	5,17 ***	5,17 ***	0,00%	7,35 ***	54,04 ***	54,55 ***	***
November	-1,81%	6,47 ***	6,47 ***	-0,52%	8,57 ***	73,43 ***	69,95 ***	***
December	1,08%	2,33 **	2,34 **	0,35%	4,03 ***	16,21 ***	13,65 ***	***
Feb-Dec	-2,43%	1,28 ***	1,28 ***	-2,02%	2,41 **	5,79 **	4,04 **	**

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5% and 10%.

T-test – Student's t-test, S-W t-test – Satterthwaite a-Weicha t-test, W/M-W – Wilcoxon-Mann-Whitney test, K-W – test Kruskal-Wallis, vdW – van der Waerden test

Source: own research.

The Table 7 presents estimates of parameters of dynamic models explaining the monthly rate of return by late returns from one to three months, and a binary variable coding January. Model parameters were estimated with generalized method of moments, and the dynamic model structure was chosen because of the possibility of the occurrence of the phenomenon of rate of return repetition. Table does not present the results of estimates for binary variables coding for each year of the analysis, these variables, however, are present in all models.

**Table 7.** Dynamic models for verifying the existence of the January Effect on the markets of other countries than Poland which accessed the European Union in 2004

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>y<sub>t-1</sub></b>	-0,0466 (0,0327)	-0,0319 (0,0292)	-0,0196 (0,0299)
<b>y<sub>t-2</sub></b>		-0,0295** (0,0123)	-0,0203* (0,0111)
<b>y<sub>t-3</sub></b>			0,0320*** (0,00979)
<b>January</b>	0,0294*** (0,00698)	0,0295*** (0,00643)	0,0308*** (0,00637)
<b>Constant</b>	-0,00124 (0,0197)	-0,0446*** (0,0132)	-0,0434*** (0,00977)
<b>Number of observations</b>	14570	14197	13901
<b>Number of subjects</b>	107	107	107
<b>Aggregate statistical significance test –Chi<sup>2</sup></b>	503,0***	608,7***	672,9***
<b>Choice of instruments Hansen test</b>	89,99	90,02	87,00

$y_{t-1}, y_{t-2}, y_{t-3}$  indicate rate of return respectively delayed by 1, 2 or 3 months, standard errors are given in the parentheses. \*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5%, 10%.

Source: own research.

The calculation results in Table 7 positively verify Hypothesis 1a. The January Effect is visible in each of the estimated models. The January variable is statistically significant at 1%, and its estimated parameter is positive. No statistical significance of the Hansen test demonstrates the correctness of the choice of the instruments for the models. The Chi<sup>2</sup> test indicates the total regressors' statistical significance at 1%.

The results of estimating first model parameters point to the lack of statistical significance of the rate of return delayed by one period. The parameter for the January variable has a value of 0.0294 and is statistically significant. The parameters estimated for the second model outside of the January variable have negative values. They are statistically significant for the variable delayed by two periods. In the third model, the parameter for the variable delayed by one period is statistically insignificant. The parameter for the variable delayed by two periods has a value of -0.0203 and is statistically significant at 10%. In the case of the third model parameters for the January variables, the variable delayed by three periods and the constant are statistically significant at the 1% level.

Again, one can have confidence in the results because of the large sample size close to 15,000 observations for more than 100 companies. The estimation of the dynamic models on the markets of the EU enlargement in 2004 shows no phenomenon of repetition in the rates of return. Whereas the parameter for the binary January variable is positive and statistically significant, which is consistent with the hypothesis of the existence of calendar anomalies. The subsequent analysis – a comparison of the rates of return in January to the average of the remaining months in different years, and the rates of return in individual months with years – will verify to what extent the January Effect allows investors to build a successful investment strategy.

It will be possible to examine the impact of economic conditions on the January Effect more specifically after the analysis of monthly distributions of returns in individual years (Tables 8 and 9).

The Table 8 compares the average rates of return recorded in January to rates of return for each of the remaining months of the year.

The Table 9 compares the median rates of return recorded in January to rates of return for each of the remaining months of the year.

In contrast to the earlier analyses of that group of countries, the preliminary analysis of the distributions of returns in the individual months and years indicates that January does not regularly have the highest rates of return. During the seventeen-year horizon analysis, January was the month with the highest rates of return seven times. However, other months generated positive highest returns only twice. The analysis of the median confirms this regularity. Most of the differences are statistically significant at the 1% level.



**Table 8.** Tests for differences in average monthly rates of return in each year for the markets of other countries than Poland which accessed the European Union in 2004

	January	February	March	April	May	June	July	August	September	October	November	December	December n-1												
<b>2013</b>	<b>2.15%</b>	-1.16%	**	0.60%	-2.08%	***	-0.62%	*	-0.36%	*	-4.56%	***	1.10%	-0.43%	1.02%	0.09%	-0.41%	-0.37%	*						
<b>2012</b>	<b>2.82%</b>	0.61%	1.94%	-4.29%	***	-7.60%	***	-2.19%	***	-4.07%	***	1.00%	0.21%	**	-2.08%	***	-0.37%	**	-3.04%	***					
<b>2011</b>	<b>1.91%</b>	-1.39%	**	-1.39%	**	-5.25%	**	-2.62%	***	-4.64%	***	-4.47%	***	0.03%	-7.37%	***	-1.58%	***	-0.15%						
<b>2010</b>	<b>3.86%</b>	-1.88%	***	2.03%	**	-6.63%	***	-2.76%	***	-0.48%	**	0.57%	*	3.28%	*	-2.05%	***	0.30%	**	-1.04%	**				
<b>2009</b>	-2.85%	-8.57%	***	-7.48%	**	10.44%	6.57%	1.07%	11.60%	0.63%	8.07%	0.81%	-2.60%	-1.04%	-6.22%	*									
<b>2008</b>	-9.46%	-1.59%	-6.23%	-1.44%	-0.67%	-7.24%	-6.10%	-1.85%	-12.25%	-22.63%	***	-19.92%	***	-6.22%	-0.12%										
<b>2007</b>	<b>9.77%</b>	-0.58%	***	3.85%	**	5.61%	*	2.17%	***	5.24%	**	5.83%	*	1.66%	***	1.13%	***	-1.72%	***	-4.56%	***	-0.12%	***	4.29%	**
<b>2006</b>	3.85%	0.28%	*	-0.91%	*	5.09%	*	-1.61%	**	-2.24%	***	0.34%	<b>5.67%</b>	1.48%	*	0.95%	*	4.22%	4.29%	2.85%	*	4.64%	2.73%	*	
<b>2005</b>	5.97%	<b>7.33%</b>	1.08%	***	1.19%	**	-3.43%	***	0.02%	***	4.62%	2.42%	**	-3.12%	***	2.47%		-2.06%	***	2.85%	*	4.64%	2.73%	*	
<b>2004</b>	5.75%	-1.16%	***	<b>7.34%</b>	7.15%	***	-3.70%	***	-0.04%	***	1.68%	***	2.76%	**	4.51%	1.20%	*	3.75%	4.64%	2.73%	*				
<b>2003</b>	1.99%	1.68%	-0.70%	<b>6.48%</b>	3.10%	-8.84%	*	2.71%	4.56%	-0.96%	***	-3.24%	**	3.96%											
<b>2002</b>	3.75%	-1.38%	***	1.24%	0.29%	*	-2.90%	***	-2.57%	**	1.34%	3.88%	2.21%	-1.35%	*	-1.52%	5.30%	2.75%	*						
<b>2001</b>	0.37%	-2.53%	-7.27%	***	-0.20%	-1.19%	-1.58%	-2.22%	-0.99%	-2.79%	2.42%	<b>9.12%</b>	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	9.12%	
<b>2000</b>	<b>7.35%</b>	4.03%	6.50%	-6.39%	***	-3.50%	***	-1.10%	***	-2.33%	***	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	3.98%	
<b>1999</b>	-3.97%	-1.56%	-3.46%	0.30%	-1.39%	-1.57%	1.75%	3.30%	-1.60%	-4.63%	4.68%	<b>10.21%</b>	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	
<b>1998</b>	-11.44%	2.05%	0.97%	-1.15%	-11.10%	5.19%	7.59%	-14.56%	-14.99%	-1.67%	-1.42%	<b>10.21%</b>	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	10.21%	
<b>1997</b>	<b>21.58%</b>	0.57%	***	-0.16%	***	-1.19%	***	-0.10%	***	-2.17%	***	<b>9.83%</b>	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	9.83%	

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5%, 10%.

Bold font indicates the highest rate of return. December n-1 denotes December last year.

Source: own research.

**Table 9.** Tests for differences in median monthly rates of return in each year for the markets of other countries than Poland which accessed the European Union in 2004

	January	February	March	April	May	June	July	August	September	October	November	December	December n-1
<b>2013</b>	<b>2.71%</b>	-1.05%	0.85%	* -1.00%	*** 0.32%	** -0.34%	*** 0.00%	* 0.47%	*** -0.25%	*** 0.44%	** 0.00%	* 0.00%	** 0.10%
<b>2012</b>	<b>1.82%</b>	1.14%	-0.50%	** -1.78%	*** -5.94%	*** -0.57%	*** -0.71%	* 0.67%	* 0.00%	** -0.01%	** -1.42%	*** 0.10%	** -2.37%
<b>2011</b>	<b>1.69%</b>	-0.43%	** -1.82%	*** -0.99%	*** -3.00%	*** -1.22%	*** 0.00%	*** -6.95%	*** -1.10%	*** 1.12%	*** -4.74%	*** -2.37%	*** 1.35%
<b>2010</b>	0.95%	-1.77%	*** 1.40%	0.03%	** -6.08%	*** -2.11%	*** -0.25%	* 0.63%	<b>1.60%</b>	0.00%	** -0.93%	*** 1.35%	* -0.95%
<b>2009</b>	-1.50%	-6.34%	*** -4.45%	** 3.86%	<b>9.74%</b>	0.31%	0.00%	5.97%	4.71%	-0.79%	-2.13%	-0.95%	-6.13%
<b>2008</b>	-10.92%	0.00%	-5.45%	-2.64%	-1.71%	-4.99%	-5.04%	-2.17%	-13.28%	* -20.61%	*** -17.24%	*** -6.13%	<b>0.93%</b>
<b>2007</b>	<b>6.91%</b>	-0.13%	*** 3.20%	*** 5.39%	1.56%	*** 3.16%	** 2.69%	*** -1.86%	*** 0.09%	*** -3.10%	*** -3.60%	*** 0.93%	*** 4.22%
<b>2006</b>	2.14%	-0.12%	** -0.57%	** 1.97%	-3.06%	*** -1.41%	*** 2.31%	3.23%	0.59%	2.75%	2.01%	<b>4.22%</b>	0.23%
<b>2005</b>	<b>6.09%</b>	1.92%	-1.70%	*** -1.34%	*** -2.49%	*** 0.62%	*** 1.27%	* 1.45%	*** 0.00%	*** -2.08%	*** -1.04%	*** 0.23%	*** 4.45%
<b>2004</b>	5.20%	0.00%	*** <b>5.56%</b>	3.50%	** -2.95%	*** -0.23%	*** 1.16%	*** 1.75%	*** 2.11%	*** 1.84%	*** 2.66%	* 4.45%	*** 0.25%
<b>2003</b>	0.91%	0.56%	0.00%	2.51%	0.34%	-1.49%	** 1.14%	<b>5.20%</b>	1.63%	0.84%	0.84%	0.25%	-2.35%
<b>2002</b>	<b>3.43%</b>	0.27%	*** 2.66%	3.28%	0.46%	** -3.14%	*** -2.92%	*** 2.64%	0.70%	** 2.32%	2.34%	-2.35%	*** 0.18%
<b>2001</b>	1.68%	-2.68%	** -4.51%	*** -0.27%	0.43%	-1.27%	* 0.62%	0.00%	-1.62%	** 1.71%	<b>5.06%</b>	0.18%	1.87%
<b>2000</b>	<b>2.55%</b>	0.00%	** 1.91%	-2.87%	*** -3.29%	*** -2.64%	*** -1.80%	* 1.94%	* -3.32%	*** -1.71%	*** 0.72%	** 1.87%	0.22%
<b>1999</b>	1.95%	0.00%	-2.35%	* -0.18%	0.50%	-1.76%	** 1.36%	2.29%	-2.31%	** 0.00%	<b>2.86%</b>	0.22%	1.50%
<b>1998</b>	-3.44%	0.15%	3.15%	-1.25%	-5.03%	2.94%	3.11%	-13.31%	* -5.72%	0.00%	0.00%	1.50%	<b>4.18%</b>
<b>1997</b>	<b>18.66%</b>	0.53%	*** -1.30%	*** -1.19%	*** -0.58%	*** -2.54%	** 6.20%	*** 0.00%	*** 0.57%	*** -3.71%	*** -9.76%	*** 4.18%	*** <b>6.96%</b>

\*\*\*, \*\*, \* indicate, respectively, the levels of statistical significance 1%, 5%, 10%.  
**Bold font** indicates the highest rate of return.

Source: own research.

As suggested by literature and research in point 1, there appears a transformation of the January Effect to the effects of other months. It is not visible in the second subsample; thus, the changes should be seen rather as an incidental than permanent transformation of the market. In 1998, the move of the January Effect to December is visible. On the other hand, the move of the January effect to February appears in 2005, when February generated nearly a 1.5 percentage points higher rate of return than January.

A more detailed analysis of market behavior in the period of *dotcom*, *subprime*, and Greek crisis indicates that the market adjusted the rates of return. They did not, however, have a significant impact on the January Effect. The impact of the burst of the Internet bubble appears in April. The situation was similar as with the Greek crisis; the correction of returns was observed in May. The bursting housing bubble resulted in the 2008 correction of nearly 12% decline in September, 22% in October, and 20% in November.

The accession to the European Union was accompanied by similar phenomena as in Poland. Before signing the accession treaties in April 2004, the growth of rates of return on markets appeared. March and April 2004 have rates of return above 7%, with the average rate in the accession year below 3%. However, after accession, we see an adjustment in rates of return. From the moment of accession, increased occurrence of the January Effect is seen. The results provide arguments in the discussion on the impact of accession to the European Union on the strength of the January Effect. In the period after the accession, one sees nominal growth rates of return in January. This increase in returns was also evident in Poland. This is an argument in favor of the falsification of Hypothesis 3a, in the light of which the development of the market should neutralize the presence of January anomalies.

## Summary

Summarizing the results of the first two types of analyses (differences in averages and medians across the horizon and estimation of dynamic panel models) in most cases confirmed the existence of the January Effect, thereby positively verifying Hypothesis 1a. The third type of analysis relied on the study of differences in the average and median rates of return in the following structure – that is, January *versus* the average of other months of the year – does not confirm the presence of the January Effect exclusively on the Polish market. The analysis of the differences in the rates of return each month separately compared to January for each year shows that investing in order to

use the anomaly does not allow to build a sustainable and highly profitable investment strategy. The conclusions of the occurrence of the January Effect are determined by the testing methods. The fourth of the applied analyses, which can be considered the most important because it presents the stability of the phenomenon, denies the possibility of using this anomaly for profit.

The verification of Hypothesis 2a – that the January Effect wears off over time – partly gives positive results in the markets of the first and second subsample. There is a decrease in the differences between January rates of return and other months. In the case of the third subsample, there is no substantial reduction between January rates of return and the remaining months.

The analysis of individual markets indicates that, paradoxically, the strength of the anomaly grows with the growth of the institutional development on the market. After the accession to the European Union, the January Effect is significantly more visible in the research of the first and second sub-samples. This conclusion calls for more explanation as to what extent it conflicts with the earlier statement that the anomaly weakens over time. Differences in the rates of return realized in January compared to other months over the entire horizon decrease. The development of the market, at this point identified with the accession to the European Union, will re-expose the anomaly, but at lower values of differences in rates of return.

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