

Should Investors on Equity Markets Be Superstitious? (Example of 7 World Stock Indexes Components)

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Abstract

The problem of efficiency of financial markets, especially the weekend effect has always fascinated scholars and practitioners due to its relationship with the financial market efficiency. The issue is significant from the point of view of assessing the portfolio management effectiveness and behavioral finance. This paper tests the hypothesis of the unfortunate dates effect upon 7 equity indexes components (CAC40, DAX, DJIA, FTSE30, FTSE MIBTEL, NIKKEI225 and SENSEX), i.e. 419 companies. For all these equities the following rates of return were analyzed: Close-close, Overnight, Open-open, Open-close. As unfortunate days, the sessions falling on the following dates were selected: 13th and 4th day of the month, Friday the 13th and Tuesday the 13th. The research proved the presence of all kinds of the “unfortunate dates” effects on analyzed markets. The effects were registered for all analyzed rates of return. The most dominating “unfortunate dates effects” resulted to be Tuesday the 13th, proceeding the 4th day of the month effect. This is the first analysis of the presence of the “unfortunate dates effect”, in which other than Close-close returns were examined and fulfils the research gap.

Keywords: market efficiency, calendar anomalies, Friday the 13th, Tuesday the 13th, unfortunate dates effect

1. Introduction

Efficient market hypothesis (EMH), introduced by Fama (Fama, 1970) belongs to the most important paradigms of the traditional financial theories. According to this hypothesis, efficient market is defined as a market with a large numbers of rational individuals, maximizing their profit and actively competing with each other undertaking the attempt to predict future market values of specific securities, and where all relevant information is freely available to investors (Latif et al., 2011). The presence of calendar anomalies has been presented extensively for the last three decades in financial markets. The most common ones are the day-of-the-week effect, monthly effect, weekend effect, holiday effects, within-the-month effect, turn-of-the month effect (Agrawal, Tandon, 1994; Boudreaux, 1995; Smirlock & Starks, 1986; Aggarwal & Rivoli, 1989; Barone, 1990; Kato et al., 1990; Gu, 2003; Schwert, 2002; Sutheebanjard & Premchaiswadi, 2010).

Another issue related to the financial market efficiency is the behavior of investors during the days considered by them to be unlucky. In Western Europe, every 13th day of the month, especially the 13th day of the month when falling on a Friday is to be believed unlucky. In turn, in Spanish-speaking countries (e.g. Spain, Uruguay, Argentina, Chile, Peru, Venezuela and Colombia), it is assumed that the date of bringing bad luck is Tuesday the 13th, what is expressed in the following Spanish proverb: *trece martes ni te cases, ni te embarques* (Tuesday the 13th, don't get married and don't travel). On the other hand, in China, an unlucky date is every fourth day of the month. Many Chinese people believe the number 4 is to be unlucky whilst considering the number 8 is a lucky one (Agarwal et al., 2014). In some Chinese dialects, the number 8 is pronounced like the word “prosperity”, while the number 4 similar to the word “death”. Apparently the Chinese vary in their definition of which numbers are lucky. Shum et al. (2012) defined both 6 and 8 as lucky, while Hirshleifer et al. (2018) considered 6, 8 and 9 to be lucky.

Statistically important difference between daily average rates of return registered on the stock market considered by investors as an unlucky date and daily average rates of return calculated for the others days of the month can be called “the unfortunate dates effect”. The number of papers dedicated to “the unfortunate dates effect” in scientific literature is rather low.

The aim of this paper is to examine the prevalence of “the unfortunate dates effect” on the markets of 7 world equity index components. The paper is divided into five parts. The first four parts analyze of “the unfortunate dates effect” that apply to the returns calculated on the basis of the following prices: (1) last session close – previous session close (close-close), (2) last session open - previous session close (overnight), (3) last session open – previous session open (open-open) and (4) last session close – last session open (open-close). All calculations will be carried out for the following two populations: (1) the 13th day of the month rates of return vs rates of return for all other sessions, (2) Friday the 13th rates of return vs rates of return for all other sessions, (3) Tuesday the 13th rates of return vs rates of return for all other sessions and (4) the 4th day of month rates of return vs rates of return for all other sessions. In the fifth part of the paper the one-session rates of return for Friday the 13th session will be compared with the one-session rates of return for all other Fridays. In turn, in the second part of the fifth part of the paper the similar analysis for rates of return for Tuesday the 13th and all other Tuesdays will be conducted. Previous researches focused on the calculation of rates of return only for the following scheme: Friday the 13th close – others Fridays’ close. The author is not aware of the papers analyzing the Friday the 13th effect with the use of rates of return different to the close-close scheme. This article attempts to fill this gap, as well as expand research for Tuesday the 13th and for the sessions falling on the 4th day of the month.

2. Literature Review

Belief in the ill-fortune that supposedly accompanies the of 13th as well as the date of Friday the 13th is widespread across the Western world and has ancient and somewhat uncertain origins (Boyle et al., 2004). Both the number 13 and Friday are characterized by long and separate histories associated with “bad luck”. It is believed that these two were combined in order to create an unfortunate date at the beginning of the 20th Century (Chaundler, 1970). In the literature there are a lot of explanations for these two lines of superstitions: Christ was crucified on Friday, and the number of people seated at the table for the Last Supper was 13. Even in developed countries, people are prone to superstitions such as daily newspapers publishing horoscopes to guide their readers. Nowadays many buildings skip the thirteenth floor, streets lack the number 13th and hospitals in many countries decline to label their operating theatres with that number (Hira et al., 1998; Reilly & Stevenson, 2000; Boyle et al., 2004; USA, Today, 2007; Kramer & Block, 2008). Of more interest is the fact that admittance to hospitals seems to cluster around unlucky days, as reported by Blacher (1983) and Scanlon et al. (1993). Fudenberg and Levine (2006) state that superstitious beliefs can persist if the probability of being exposed as untrue is sufficiently low. If there is always any chance of a bad outcome when following superstition and some chance of a good outcome when not following superstition, any person might not realize that the belief is untrue, and, persists in the superstition (Agarwal et al., 2014). Jiang et al. (2009) found that Asians exposed to lucky numbers, give higher estimates of winning a lottery and are more willing to participate in a lottery or a risky promotional game, and express greater willingness to make risky financial investments. Chong and Du (2009) estimated the value of superstition: a lucky (unlucky) number can bring good (bad) luck, and the value of superstitions can be economically significant. Psychology and anthropology researchers suggest that people rely on superstition as a way to cope with misfortune and uncertainty, and to rationalize a complex world (Vyse, 1997; Tsang, 2004; Lepori, 2009; Liu, 2013; Zhang et al., 2014; Robiyanto & Puryandani, 2015; Robiyanto et al., 2015).

Scanlon et al. (1993) founded that the number of traffic accident in UK is higher on Friday the 13th, in spite of the smaller number on cars being on the roads. Kolb and Rodriguez (1987), in one of the first studies linking superstition with the stock market, proved that in the period of 1962-1985, the average Friday 13th rates of return of CRSP Index are significantly lower than the average rates of return for all other Fridays. Later papers of Dyl and Maberly (1988), Agrawal and Tandon (1994), Coutts (1999), Lucey (2000) and Lucey (2001) conceded the reverse pattern: average returns on Fridays the 13th were higher than those on regular Fridays. Dyl and Maberly (1988) proved that in the analyzed time horizon of 1940-1987, in five out of the six analyzed periods, Friday the 13th rates of return turned out to be positive and higher compared to other Fridays and the only period when the Friday the 13th rates of return were in red compared to other Fridays rates of return, fell during the 1970s. The similar conclusion was reached in the research of Agrawal and Tandon (1994) as well as of Mills and Coutts (1995). Chamberlain et al. (1991) examining behavior of rates of return falling on Friday the 13th during the period of 1930-1985 found no stronger evidence of lower mean returns for Fridays falling on the 13th.

Fortin et al. (2014) investigated the effect of superstition on the prices of single-family homes in Great Vancouver in Canada. In neighborhoods with relatively more Chinese residents and in repeated transaction, the sales of prices of houses with street address numbers ending in “4” were 2.2% lower, while those ending in “8” were 2.5% higher than other houses. According to Agarwal et al. (2014), on a per square meter basis, units with numbers ending in “4” were discounted by 1.1%, units on floor with numbers ending in “4” were discounted by 0.5%, while units with

numbers ending in “8” commanded a 0.9% premium. There are also reports of a link between the superstition beliefs of certain time periods and the demographics of two nations: Japanese (Kaku, 1972; Kaku & Matsumoto, 1975; Kaku, 1975) and Koreans (Kim, 1979). Ng et al. (2010) studying the auction prices between 1997 and 2009 proved that the prices of license numbers including the lucky number 8 were systematically higher while prices of license numbers with the unlucky number “4”, were lower. Besides the premium for “8” could also be interpreted as conspicuous spending to signal wealth or status (Feltovith et al., 2012).

Boyle et al. (2004), analyzing daily returns of the index NZSE40, the value-weighted capital index of the 40 largest securities by market capitalization on the New Zealand Stock Exchange in the period 01.01.1967-30.11.2001 proved that the average rates of return for the Fridays the 13th were not statistically different from the rates of return for regular Fridays. The name of “the Friday the Thirteenth effect”, introduced by Kolb and Rodriguez (Kolb & Rodriguez, 1987) has been regularly used by different researchers (Chamberlain et al., 1991; Coutts, 1999; Patel 2009; Botha, 2013; Auer & Rottmann, 2013). Coutts (1999) examining the Friday the 13th effect in the UK with the use of FTSE index in the period of 59 years, proved that in most cases the rates of return registered for Friday the 13th were positive and higher compared to other Fridays rates of return, but statistical significance was not observed. Patel (2009), analyzing the period of 58 years for NASDAQ and S&P 500 index, discovered that in four out of the seven periods rates of return for Friday the 13th were positive and higher than the rates of return calculated for other Fridays.

Brown et al. (2002) and Brown and Mitchell (2008) discovered that the daily opening and closing prices tend to cluster at the number “8” in Asian Pacific and Chinese Stock markets. Hirshleifer et al. (2018) found that the superstition affected the pricing of initial public offerings in China in the period of 1991-2005. On Shanghai and Shenzhen stock exchanges, listed companies are identified by a numerical code, which is the equivalent of the US ticker. Consistent with superstition, newly listed equities with lucky listing codes (that included at least one lucky digit and no unlucky digit) initially traded at a premium dissipated within three years. Botha (2013) analyzed the Friday the 13th effect for samples from stock exchanges in Kenya, Morocco, Nigeria, South Africa and Tunisia. Auer and Rottmann (2013) investigating the presence of Friday the 13th effect for seven emerging markets in Asia (India, Indonesia, Malaysia, Philippines, South Korea, Taiwan and Thailand) during the period of July 1996-August 2013, proved that the effect was registered on the Stock Exchange in Philippines. They also found that the Friday the 13th effect had a significant influence on the stock market volatility in Indonesia and the Philippines. Chung and Darrat (2014) examined the potential effect of superstitious beliefs on stock trading in four Asian-Pacific countries with deep Chinese cultural heritage (China, Hong Kong, Singapore, and Taiwan). The regression results from daily data over 2 January 1991 to 30 December 2011 suggest that unlucky days (particularly day 4 and Friday the 13th) generally exhibit higher stock returns. Kalayaan (2016) found out that the mean returns for Friday the 13th were inferior than that of other Fridays or other days and that the Friday the 13th effect was evident during the period of June 1992 to May 2015 for the PSEI index.

Pinto (2015) by analyzing the rates of return (in the period of 1949-2001) noticed them falling on the fourth day of the month on the Tokyo Stock Exchange (TSE) and proved that the effect of bad luck numbers started to lose its power in the middle of 1980s. This can be explained by the increasing internationalization of equity investors in Japan. More foreigners, less prone to be influenced by Japanese folk beliefs, trading the TSE, diluted the strength of the Fourth Day effect. Haggard (2015) examining the stock returns impact of days with lucky numbers on Chinese equity market, demonstrated a lucky number date trading strategy for the Shenzhen market. Suganda et al. (2018) studying the influence of the scared days between daily cycles in Georgian calendar and Javanese calendar on the basis of rates of return of Jakarta Composite Index in the period of January 2009 – June 2016, found that investment decision were still influenced by superstition, leading to behavior biases. Bhattacharya et al. (2017) proved on the example of Taiwan Futures Exchange that the individual investors, but not institutional investors, submitted disproportionately more limit orders at “8” than at “4”. This imbalance, defined as superstitions index for each investors seem to be positively correlated with trading losses. Superstitious investors lose more money because of their bad market timing and stale orders.

Taking into consideration the fact that some traders try to avoid making investments during unlucky days, it seems reasonable to study the returns during trading days before and after Friday the 13th (Peltomaki & Peni, 2010; Peltomaki & Vahamaa, 2014). Stefanescu and Dumitriu (2018) on the basis of the daily rates of return for three American stock indexes: S&P 500, FJIA and NASDAQ, found no evidence for the traditional form of the Friday the 13th effect, but they concluded that the returns during two trading days before Friday the 13th tended to be higher than the average returns, while the returns during one or two trading days after, resulted to be lower than the average.

3. Methodology

The research is divided into five parts. The calculation were proceeded concerning constituents of the following world stock indexes (in brackets the number of the analyzed companies): CAC40 (39), DAX (30), DJIA (30), FTSE30 (30), FTSE MIBTEL (37), NIKKEI225 (223) and SENSEX (30), e.g. for 419 equities. In case of the indexes CAC40 and NIKKEI225 indexes, one and two of their components, respectively were removed due to the short listing period. The list of analyzed companies and the first dated included in the analysis are presented in the Table A1 and Table A2 (Appendix). The last session considered in the process of calculating rates of return was 30.06.2018.

In case of two populations, the null hypothesis H_0 and alternative hypothesis H_1 regarding equality of rates of return in two populations, can be formulated as follows:

$$\begin{aligned} H_0: E(\bar{r}_1) &= E(\bar{r}_2) \\ H_1: E(\bar{r}_1) &\neq E(\bar{r}_2) \end{aligned} \quad (1)$$

where:

\bar{r}_1 –average rate of return in the first population,

\bar{r}_2 –average rate of return in the second population.

On the basis of two independent populations of rate of returns, which sizes are equal n_1 and n_2 , respectively, the hypotheses H_0 and H_1 should be tested with the use of statistics z (Defusco et al., 2001, p. 335):

$$z = \frac{\bar{r}_1 - \bar{r}_2}{\sqrt{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)}} \quad (2)$$

where:

S_1^2 - variance of rates of return in the first population,

S_2^2 - variance of rates of return in the second population,

n_1 - number of observations in the first population,

n_2 - number of observations in the second population.

In case when the population variances are unknown and cannot be assumed that they are equal, the number of degrees of freedom will be expressed according to the following formula (Defusco et al., 2001, p. 335):

$$df = \frac{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)^2}{\frac{(S_1^2/n_1)^2}{n_1} + \frac{(S_2^2/n_2)^2}{n_2}} \quad (3)$$

In the following part of the analysis, parametric tests of Kruskal-Wallis will be implemented. The Kruskal-Wallis test statistics is given by (Vargha & Delaney, 1998):

$$H = \frac{12}{N(N+1)} \sum_{i=1}^g n_i \bar{r}_i^2 - 3(N+1) \quad (4)$$

where:

N – total number of observations across all groups,

$\bar{r}_i = \frac{\sum_{j=1}^{n_i} r_{ij}}{n_i}$ – average rank of all observations in group i ,

n_i – number of observation in group i ,

r_{ij} – the rank (among all observations) of observation j from group i ,

In all analyzed cases, the p -values will be calculated. If the p -value is less or equal to 0.05, then the hypothesis H_0 is rejected in favor of the hypothesis H_1 . Otherwise, there is no reason to reject hypothesis H_0 . $\{\displaystyle i\}$

For each of the analyzed indexes the following rates of return will be calculated:

1) Close – Close: $\frac{C_t - C_{t-1}}{C_{t-1}}$ (last session close versus previous session close),

2) Overnight: $\frac{O_t - C_{t-1}}{C_{t-1}}$ (last session open versus previous session close),

3) Open - Open: $\frac{O_t - O_{t-1}}{O_{t-1}}$ (last session open versus previous session open),

4) Open - Close: $\frac{C_t - O_t}{O_t}$ (last session close versus last session open),

where:

C_t – closing price in the period t ,

C_{t-1} – closing price in the period $t-1$,

O_t – open price in the period t ,

O_{t-1} – open price in the period $t-1$,

The daily rates of return were calculated for all companies included in the analyzed indices. Then the tests for equality of two average rates of return in two populations were exemplified in the following cases:

- 1) The first population: 13th day of the month, the second population: all remaining sessions,
- 2) The first population: Friday the 13th day of the month, the second population: all remaining sessions,
- 3) The first population: Tuesday the 13th day of the month, the second population: all remaining sessions,
- 4) The first population: 4th day of the month, the second population: all remaining sessions,
- 5) The first population: Friday the 13th day of the month, the second population: all remaining Fridays. In the second part of the fifth part, the test for equality of two average rates of return were computed under the assumption that the first group of data consists of rates of return for sessions falling on Tuesday the 13th and the second group is composed of rates of return for all remaining Tuesdays. In this part only close-close rates of return were taken into consideration.

4. Analysis of Results

4.1 CAC40 Index

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.1.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: Air Liquide (0.0474) and Sanofi (0.0064),
- b) 13th, Open-open: Arcelormittal (0.0127),
- a) 13th, Open-close: EDF (0.0437), Sanofi (0.0335),
- b) Friday the 13th, Close-close: EDF (0.0417),
- c) Friday the 13th, Open-open: Airbus (0.0068),
- d) Friday the 13th, Open-close: EDF (0.0167),
- e) Tuesday the 13th, Close-close: Orange (0.0337), Renault (0.0089), Sanofi (0.0412), Technip (0.0485)
- f) Tuesday the 13th, Open-close: Danone (0.0273), Michelin (0.0488), Orange (0.0300), Peugeot (0.0287) and Renault (0.0010),
- g) 4th, Close-close: Veolia Environment (0.0101),
- h) 4th, Open-close: Carrefour (0.0273), Veolia Environment (0.0107),
- i) Friday the 13th vs Fridays, Close-lose: EDF (0.0048),
- j) Tuesday the 13th vs Tuesdays, Close-Close: Michelin (0.0227), Orange (0.0336), Peugeot (0.0095), Renault (0.0004) and Schneider Electric (0.0293).

The results of calculating *p* values for returns of the CAC40 components with the use of the Z statistic test are presented as an example in the Table A3 (Appendix). For the Kruskal-Wallis test, as well as for other index components, the calculation were proceeded in the same way.

4.1.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: LVHM (0.0363), Solvey (0.0450),
- b) 13th, Overnight: Bouygues (0.0295),
- c) 13th, Open-open: Arcelormittal (0.0200), Nokia Oyj (0.0421), Safran (0.0247),
- d) Friday the 13th, Close-close: Sanofi (0.0075),
- e) Friday the 13th, Open-open: Arcelormittal (0.0200), Nokia Oyj (0.0421), Safran (0.0247),
- f) Tuesday the 13th, Close-close: Orange (0.0127), Renault (0.0028), Sanofi (0.0179),
- g) Tuesday the 13th, Open-close: Orange (0.0330), Peugeot (0.0467), Renault (0.0109),
- h) 4th, Close-close: Cap Gemini (0.0073), LVHM (0.0499), Peugeot (0.0468), Veolia Environment (0.0102),
- i) 4th, Open-close: Cap Gemini (0.0315), Veolia Environment (0.0190),
- j) Friday the 13th vs Fridays, Close-close: EDF (0.0262),
- k) Tuesday the 13th vs Tuesdays, Close-close: Orange (0.0475), Peugeot (0.0190), Renault (0.0048), Schneider Electric (0.0212).

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.1.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected using of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) EDF: Friday the 13th vs Fridays, Close-close,
- b) Orange: Tuesday the 13th, Close-close and Open-close, Tuesday the 13th vs Tuesdays, Close-close,
- c) Peugeot: Tuesday the 13th, Open-close and Tuesday the 13th vs Tuesdays, Close-close,
- d) Renault: Tuesday the 13th, Close-close and Open-close, Tuesday the 13th, Close-close,
- e) Sanofi: Tuesday the 13th, Close-close,
- f) Schneider Electric: Tuesday the 13th vs Tuesdays, Close-close,
- g) Veolia Environnement: 4th Close-close and Open-close.

For many analyzed companies the results obtained with the Z statistics were not confirmed by the Kruskal-Wallis test. Thus, in case of the French stock index, the effect of Tuesday the 13th was the strongest and was mainly observed for the Close-close and Open-close rates of return. This is a result that deserves attention, especially since the perception of the Tuesday the 13th as a unfortunate date is a characteristic for Spain and Hispanic countries. On the French market one could rather expect the dominance of the effect of the Friday the 13th than Tuesday the 13th.

4.2 DAX Index

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.2.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Overnight: Infineon Tech (0.0488), Muench Rueckvers (0.0230),
- b) Friday the 13th, Close-close: Continental (0.0281), Deutsche Boerse (0.0000), Vonovia (0.0217),
- c) Friday the 13th, Overnight: Deutsche Boerse (0.0053),
- d) Friday the 13th, Open-open: Deutsche Boerse (0.0000), Siemens (0.0351),
- e) Friday the 13th, Open-close: Continental (0.0450), Deutsche Boerse (0.0024), Vonovia (0.0240),
- f) Tuesday the 13th, Close-close: Daimler (0.0493), Heilderbergcement (0.0209), Infineon Tech (0.0456), Muench Rueckvers (0.0372),
- g) Tuesday the 13th, Open-close: Frasen Med. (0.0463), Heilderbergcement (0.0196),

- h) 4th, Close-close: Fresenius (0.0134), Prosieben Sat (0.0335),
- i) 4th, Overnight: Continental (0.0287),
- j) 4th, Open-open: Continental (0.0084),
- k) 4th, Open-close: Continental (0.0084),
- l) Friday the 13th vs Fridays: Continental (0.0414), Vonovia (0.0345),
- m) Tuesday the 13th vs Tuesdays: Heilderbergcement (0.0135).

4.2.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: Bay Motoren (0.0450), Thyssen Krupp (0.0182),
- b) 13th, Open-open: BASF (0.0468), Daimler (0.0278), Deutsche Bank (0.0142), Siemens (0.0170),
- c) 13th, Open-close: Bay Motoren (0.0398),
- d) Friday the 13th, Overnight: EON (0.0118),
- e) Tuesday the 13th, Close-close: Commerzbank (0.0231), Daimler (0.0239), Fresen Med (0.0477), Heilderbergcement (0.0030), Muench Rueckvers (0.0075), SAP (0.0365),
- f) Tuesday the 13th, Open-open: Lined (0.0349),
- g) Tuesday the 13th, Open-close: Heilderbergcement (0.0330),
- h) 4th, Close-close: Fresenius (0.0132),
- i) 4th, Open-open: Continental (0.0030),
- j) 4th, Open-close: Fresenius (0.0015),
- k) Tuesday the 13th vs Tuesdays: Heilderbergcement (0.0214).

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.2.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) Continental: 4th, Open-open,
- b) Daimler: Tuesday the 13th, Close-close,
- c) Fresenius: 4th, Close-close and Open-close,
- d) Heilderbergcement: Tuesday the 13th, Close-close and Open-close, 13th Tuesday vs Tuesdays, Close-close,
- e) Muench Rueckvers: Tuesday the 13th, Close-close.

The strongest effect on the German stock exchange was Tuesday the 13th, which preceded the effect of the 4th day of the month. The first effect was registered mainly for the rates of return: Close-close. On the German market, as in case of France, more expected was the dominance of the Friday the 13th effect, which was not recorded. The effect of the 4th day of the month is expected mainly in Asian markets.

4.3 DJIA Index

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.3.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: Apple (0.0106), Boeing (0.0411),
- b) 13th, Overnight: Apple (0.0063), Caterpillar (0.0282),
- c) 13th Open-open: Home Depot (0.0140),
- d) 13th, Open-Close: Boeing (0.0202), Home Depot (0.0381),

- e) Friday the 13th, Overnight: 3M (0.0494), Boeing (0.0240), JP Morgan (0.0237),
- f) Friday the 13th, Open-open: Johnson & Johnson (0.0040), Pfizer (0.0216),
- g) Tuesday the 13th, Close-close: Apple (0.0489),
- h) Tuesday the 13th, Overnight: Chevron (0.0407),
- i) Tuesday the 13th, Open-open: Caterpillar (0.0195),
- j) Tuesday the 13th, Open-close: 3M (0.0419), Du Point (0.0410), Home Depot (0.0142), Wall-Mart (0.0244),
- k) 4th, Close-close: General-Electric (0.0174), IBM (0.0381), McDonalds (0.0480),
- l) 4th, Open-open: Procter & Gamble (0.0311), United Health (0.0064), United Technologies (0.0297),
- m) 4th, Open-close: General Electric (0.0379),
- n) Tuesday the 13th vs Tuesdays, Close-close: Home Depot (0.0099).

4.3.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: 3M (0.0104), Chevron (0.0445),
- b) 13th, Overnight: 3M (0.0334), Boeing (0.0341), JP Morgan (0.0146), Verizon (0.0341),
- c) 13th, Open-open: Johnson & Johnson (0.0066), Pfizer (0.0352),
- d) 13th, Open-close: 3M (0.0379),
- e) Friday the 13th, Close-close: Apple (0.0287), Chevron (0.0140), Coca-Cola (0.0447),
- f) Friday the 13th, Overnight: Apple (0.0088),
- g) Friday the 13th, Open-open: Nike (0.0020),
- h) Friday the 13th, Open-close: Chevron (0.0056),
- i) Tuesday the 13th, Close-close: Apple (0.0333), Coca-Cola (0.0069),
- j) Tuesday the 13th, Overnight: Chevron (0.0231),
- k) Tuesday the 13th, Open-open: Caterpillar (0.0420),
- l) Tuesday the 13th, Open-close: Coca-Cola (0.0307), Home Depot (0.0241), Wall-Mart (0.0405),
- m) 4th, Close-close: Chevron (0.0315), General Electric (0.0381),
- n) 4th, Overnight: Home Depot (0.0030), Nike (0.0449), United Health (0.0210),
- o) 4th, Open-open: Microsoft (0.0188), Procter & Gamble (0.0211), United Health (0.0094), United Technologies (0.0176),
- p) 4th, Open-close: JP Morgan (0.0411),
- q) Friday the 13th vs Fridays, Close-close: 3M (0.0442),
- r) Tuesday the 13th vs Tuesdays: Coca-Cola (0.0282), Home Depot (0.0310).

4.3.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) Apple: Tuesday the 13th, Close-close,
- b) Caterpillar: Tuesday the 13th, Overnight,
- c) Chevron: Tuesday the 13th, Overnight,
- d) General Electric: 4th, Close-close,
- e) Home Depot: Tuesday the 13th, Open-close and Tuesday the 13th vs Tuesdays, Close-close,
- f) Procter & Gamble: 4th, Open-open,
- g) United Health: 4th, Open-open,

- h) United Technologies: 4th, Open-open,
- i) Wall-Mart: Tuesday the 13th, Open-close.

On the American market, the two dominant effects were observed: Tuesday the 13th as well as the 4th day of the month. The first of them is associated mainly with Spanish and Latin culture, and the second with Asian. There was no Friday the 13th effect, characteristic mainly for the European cultural circle. Tuesday the 13th effect was registered mainly for Overnight and Close-close rates of return and the 4th day of the month effect for Open-open rates of return.

4.4 FTSE30

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.4.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: GlaxoSmithKline (0.0461),
- b) 13th, Overnight: GKN (0.0449), Reckit Benckiser (0.0433),
- c) 13th, Open-open: Reckit Benckiser (0.0261),
- d) 13th, Open-close: 3I (0.0222), BAE System (0.0044),
- e) Friday the 13th, Close-close: Burberry (0.0286), Experian (0.0259),
- f) Friday the 13th, Overnight: Land Sec. (0.0307), Lloyds Banking (0.0358), Smith (0.0243), Unilever (0.0206),
- g) Friday the 13th, Open-open: BP (0.0272), Diageo (0.0031), Unilever (0.0489),
- h) Friday the 13th, Open-close: British American Tobacco (0.0142),
- i) Tuesday the 13th, Close-close: 3I (0.0088), BAE System (0.0221), Glaxo Smith Kline (0.0456), Land Sec (0.0113), Prudential (0.0286), Tate and Lyle (0.0025), Wolseley (0.0222),
- j) Tuesday the 13th, Overnight: RSA Insurance (0.0440),
- k) Tuesday the 13th, Open-open: Marks & Spencer (0.0419),
- l) Tuesday the 13th, Open-close: 3I (0.0424), BAE System (0.0003), Experian (0.0060), Glaxo Smith Kline (0.0405), Vodafone (0.0447), Wolseley (0.0219),
- m) 4th, Close-close: INTL Consolidated Airlines (0.0481), Reckit Benckiser (0.0179),
- n) 4th, Overnight: BT Group (0.0209), Man Group (0.0207), Vodafone (0.0339),
- o) 4th, Open-open: Associated British Food (0.0185), Man Group (0.0220), Tate and Lyle (0.0304),
- p) 4th, Open-close: Reckit Benckiser (0.0280),
- q) Friday the 13th vs Fridays, Close-close: British American Tobacco (0.0160),
- r) Tuesday the 13th vs Tuesdays, Close-close: 3I (0.0162), BAE System (0.0004), Experian (0.0035), Prudential (0.0319), Royal Bank of Scotland (0.0411), Vodafone (0.0443), Wolseley (0.0170).

4.4.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: British American Tobacco (0.0374), Burberry (0.0365), Experian (0.0368),
- b) 13th, Overnight: Tesco (0.0416), Unilever (0.0332),
- c) 13th, Open-open: BP (0.0349), Diageo (0.0026), Experian (0.0395), Tesco (0.0189), Unilever (0.0308),
- d) 13th, Open-close: Associated British Food (0.0492), British American Tobacco (0.0099),
- e) Friday the 13th, Close-close: Glaxo Smith Kline (0.0238),
- f) Friday the 13th, Overnight: Diageo (0.0281), Reckit Benckier (0.0291),
- g) Friday the 13th, Open-close: 3I (0.0254), BAE System (0.0096),
- h) Tuesday the 13th, Close-close: 3I (0.0211), Glaxo Smith Kline (0.0225), Land Sec. (0.0421), Prudential

- (0.0456), RSA Insurance (0.0429), Tate and Lyle (0.0098), Wolseley (0.0036),
- i) Tuesday the 13th, Open-open: Marks & Spencer (0.0442),
 - j) Tuesday the 13th, Open-close: BAE System (0.0009), Experian (0.0136), Glaxo Smith Kline (0.0241), Royal Bank Scotland (0.0352), Wolseley (0.0125),
 - k) 4th, Overnight: Lloyds Banking (0.0446), Man Group (0.0467),
 - l) 4th, Open-open: Associated British Food (0.0268), Tate and Lyle (0.0249),
 - m) Friday the 13th vs Fridays, Close-close: British American Tobacco (0.0129),
 - n) Tuesday the 13th vs Tuesdays, Close-close: BAE System (0.0010), Experian (0.0087), Glaxo Smith Kline (0.0334), Lloyds Banking (0.0249), Royal Bank of Scotland (0.0113), Wolseley (0.0081).

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.4.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) 3I: Tuesday the 13th, Close-close,
- b) Associated British Food: 4th, Open-open,
- c) BAE System: Tuesday the 13th, Open-close and Tuesday the 13th vs. Tuesdays, Close-close
- d) British American Tobacco: Friday the 13th vs Fridays, Close-close,
- e) Experian: Tuesday the 13th, Open-close and Tuesday the 13th vs Tuesdays, Close-close,
- f) Glaxo Smith Kline: Tuesday the 13th, Close-close and Open-close,
- g) Land Sec.: Tuesday the 13th, Close-close,
- h) Man Group: 4th, Overnight,
- i) Marks and Spencer: Tuesday the 13th, Open-open,
- j) Prudential: Tuesday the 13th, Close-close,
- k) Royal bank of Scotland: Tuesday the 13th vs Tuesdays, Close-close,
- l) Tate and Lyle: Tuesday the 13th, Close-close, 4th, Open-open,
- m) Wolseley: Tuesday the 13th, Close-close, Open-close and Tuesday the 13th vs Tuesdays, Close-close.

On the British market, just like on the American market, the following effects dominated: Tuesday the 13th as well as the 4th day of the month. The first one was observed most frequently for Close-close and Open-open rates of return and the second for Open-open returns. The Friday the 13th effect occurred but sporadically.

4.5 FTSE MIBTEL

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.5.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Open-open: FIAT (0.0373),
- b) 13th, Open-open: Intesa San Paolo (0.0070), Unicredit (0.0466),
- c) 13th, Open-close: Brembo (0.0310),
- d) Friday the 13th, Open-open: Ferrari (0.0036),
- e) Friday the 13th, Open-close: CHN Industrial (0.0005), FIAT (0.0094), Telecom Italia (0.0158),
- f) Tuesday the 13th, Close-close: Buzzi Unicem (0.0131), FIAT (0.0184),
- g) Tuesday the 13th, Overnight: Buzzi Unicem (0.0233), Tenaris (0.0151),
- h) Tuesday the 13th, Open-close: FIAT (0.0319), Recordati (0.0256), Salvatore Ferragamo (0.0069),
- i) 4th, Close-close: Luxottica (0.0383),

- j) 4th, Overnight: ENI (0.0223), Terna Rete (0.0145), Unione di Banche (0.0418),
- k) 4th, Open-open: CHN Industrial (0.0091),
- l) 4th, Open-close: Brembo (0.0253), Luxottica (0.0159), SNAM (0.0306), Terna Rete (0.0074),
- m) Friday the 13th vs Fridays, Close-close: CHN Industrial (0.0028), FIAT (0.0076), Telecom Italia (0.0128),
- n) Tuesday the 13th vs Tuesdays, Close-close: FIAT (0.0491), Recordati (0.0243), Salvatore Ferragamo (0.0087), Terna Rete (0.0320),

4.5.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Open-close: FIAT (0.0130), Telecom Italia (0.0390)
- b) Friday the 13th, Close-close: FIAT (0.0415),
- c) Friday the 13th, Overnight: Intesa San Paolo (0.0200), Salvatore Ferragamo (0.0347),
- d) Friday the 13th, Open-open: Brembo (0.0466), SNAM (0.0316),
- e) Friday the 13th, Open-close: FIAT (0.0443),
- f) Tuesday the 13th, Close-close: Buzzi Unicem (0.0373), ENI (0.0399), FIAT (0.0224),
- g) Tuesday the 13th, Overnight: Azymut (0.0480), Buzzi Unicem (0.0109), Tenaris (0.0114),
- h) Tuesday the 13th, Open-open: Luxottica (0.0086),
- i) Tuesday the 13th, Open-close: Recordati (0.0418),
- j) 4th, Close-close: Brembo (0.0295),
- k) 4th, Overnight: A2A (0.0116), BPER Banca (0.0270),
- l) 4th, Open-open: CHN Industrial (0.0361),
- m) 4th, Open-close: Banco Popolare (0.0485), Brembo (0.0324), Davide Campari (0.0349), Luxottica (0.0292), SNAM (0.0330), Tenaris (0.0195), Terna Rete (0.0043),
- n) Friday the 13th vs Fridays, Close-close: FIAT (0.0171), Telecom Italia (0.0470),
- o) Tuesday the 13th vs Tuesdays, Close-close: Recordati (0.0413).

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.5.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) Brembo: 4th, Open-close,
- b) Buzzi Unicem: Tuesday the 13th, Close-close, Overnight,
- c) CHN Industrial: 4th, Open-open,
- d) FIAT: Friday the 13th, Open-close, Tuesday the 13th, Close-close, Friday the 13th vs Fridays, Close-close,
- e) Luxottica: 4th, Open-close,
- f) Recordati: Tuesday the 13th, Open-close, Tuesday the 13th vs Tuesdays, Close-close,
- g) SNAM: 4th, Open-close,
- h) Telecom Italia, Friday the 13th vs Fridays, Close-close,
- i) Tenaris: Tuesday the 13th, Overnight,
- j) Terna Rete: 4th, Open-close.

On the Italian market the two most dominant effects were: 4th day of the month as well as Tuesday the 13th. The first one was registered mainly for Open-close rates of return, and the second for Close-close returns. Friday the 13th effect occurred but sporadically.

4.6 NIKKEI

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit

to draw the following conclusions:

4.6.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: Dainpn Sumi (0.0491), East Japan (0.0318), Fujitsu (0.0126), Kyocera (0.0053), Mitsumi Electr. (0.0484), NEC (0.0250), NTT Data (0.0144), Odakyu Elec. (0.0284), Resona Holdings (0.0213), Sharp (0.0271), Sotbank (0.0057), Taisei (0.0031), Takara (0.0304), TGK Insulators (0.0168), Toyota (0.0326), Trend Micro (0.0045), Yaskawa (0.0265),
- b) 13th, Overnight: Ana Holdings (0.0324), Astellas Pharmas (0.0392), Dainpn Sumi (0.0094), East Japan (0.0361), Hitach Const (0.0187), Kaima (0.0285), Kansai Elec. (0.0350), KDDI (0.0287), Softbank (0.0174), Trend Micro (0.0080), Yahoo Japan (0.0220),
- c) 13th, Open-open: Astallas Pharmas (0.0071), Daikin Ind. (0.0200), Hitach Const. (0.0202), OJI Holdings (0.0351), Softbank (0.0391), Tokyo Ele. PWR (0.0139), Trend Micro (0.0031), Yahoo Yapan (0.0013), Yokogawa (0.0386),
- d) 13th, Open-close: Citizen Watch (0.0236), Fujitsu (0.0187), Kyocera (0.0181), NH Foods (0.0418), NTT Data (0.0348), Odaky Elec. (0.0088), Oki Elec. (0.0284), Resona Holdings (0.0299), Sharp (0.0163), Taisei (0.03030), TGK Insulators (0.0223), Yamato Holdings (0.0310), Yaskawa (0.0422),
- e) Friday the 13th, Close-close: Astellas Pharmas (0.0105), Da Nip (0.0050), Daikin Ind. (0.0123), Daiwa Securities (0.0261), East Japan (0.0197), Fujitsu (0.0127), Heiwa R. (0.0292), Hitachi Const. (0.0471), Hitachi Zosen (0.0437), Kaima (0.0248), Kyocer (0.0320), Marui Group (0.0430), Meidensha (0.0164), NEC (0.0369), Nissan (0.0263), Nisshin Steel (0.0331), NTT Data (0.0008), NTT Docomo (0.0370), Osaka Gas (0.0423), Resona Holdings (0.0076), Sharp (0.0115), Softbank (0.0186), Suzuki (0.0382), Taiser (0.0150), Takara (0.0384), Toho SVC (0.0032), Toho Zinc (0.0081), Tokai Carbon (0.0232), Tokyo Dome (0.0044), Toto (0.0077), Trend Micro (0.0438),
- f) Friday the 13th, Overnight: Ana Holdings (0.0352), Astellas Pharmas (0.0259), East Japan (0.0026), Mitsui (0.0389), Mitsumi Electr. (0.0490), Nippon Paper (0.0025), Nissan (0.0478), Toshiba (0.0439),
- g) Friday the 13th, Open-open: Daikin Ind. (0.0053), Dainpn Sumi (0.0270),
- h) Friday the 13th, Open-close: AEON (0.0209), Citizen Watch (0.0363), Comsys (0.0494), Daikin Ind. (0.0017), Heiwa R. (0.0277), Hitachi (0.0481), Hitachi Zosen (0.0056), Honda (0.0278), JTEKT (0.0448), Kyocera (0.0266), Meidensha (0.0099), Mitsubishi (0.0115), Mitsubishi Est (0.0324), Mitsui Eng. (0.0301), Nippon Paper (0.0034), Nippon Sheet GLS (0.0254), Nissan (0.0145), Nisshin Steel (0.0336), NTT Data (0.0024), NTT Docomo (0.0264), Resona Holdings (0.0280), Sharp (0.0001), Softbank (0.0007), Sumitomo Elec. (0.0214), Taiheyo Cement (0.0186), Taisei (0.0041), Takara (0.0075), TGK Insulators (0.0198), Toho SVC (0.0345), Toho Zinc (0.0418), Tokyo Dome (0.0060), Toto (0.0162), Toyota Tsusho (0.0207),
- i) Tuesday the 13th, Close-close: Canon (0.0382), Credit Saison (0.0071), Daikin Ind. (0.0038), Dainpn Sumi (0.0210), Fujitsu (0.0054), JGC (0.0034), KDDI (0.0379), Kyocera (0.0061), Nitto Denko (0.0448), Nissan (0.0045), NTT (0.0239), NTT Data (0.0369), Odakyu Elec. (0.0476), OJI Holdings (0.0058), Secom (0.0011), Softbank (0.0239), Takeda (0.0009), TGK Insulators (0.0262), Tokuyama (0.0093), Tokyo Electron (0.0208), Tokyo Marine (0.0462), Tokyo Seikan (0.0219), Trend Micro (0.0355),
- j) Tuesday the 13th, Overnight: Ajinomoto (0.0254), Chubu Ele. (0.0331), Dainpn Suma (0.0206), Fujitsu (0.0393), Furukawa Elek. (0.0251), Inpex (0.0111), JGC (0.0071), Kaima (0.0259), Kansai Elec. (0.0026), Kuraray (0.0213), Nikkon (0.0387), Nippon Soda (0.0182), Nomura Holdings (0.0016), Showa Denko (0.0321), Sky Perfect (0.0357), Takeda (0.0000), Trend Micro (0.0034),
- k) Tuesday the 13th, Open-open: Bridgestone (0.0232), Denso (0.0327), Durukawa (0.0350), Fuji Film (0.0020), JGC (0.0457), Kansai Elec. (0.0463), Kyowa (0.0031), Meidensha (0.0451), Mitsubishi Elec. (0.0492), Mitsui (0.0365), Nikkon (0.0232), OJI Holdings (0.0085), Resona Holdings (0.0164), Shinsei Bank (0.0065), Sky Perfect (0.0009), Sumitomo Elec. (0.0328), Sumitomo Osaka (0.0065), Tokai Carbon (0.0235), Tokyo Ele. PWR (0.0050), Toshiba (0.0196), Toto (0.0239), Trend Micro (0.0456),
- l) Tuesday the 13th, Open-Close: Ashi Group (0.0051), Credit Saison (0.0028), Fujitsu (0.0439), Kyocera (0.0187), Mitsumi Ele. (0.0333), NH Foods (0.0270), Nitto Denko (0.0494), Screen Holdings (0.0337), Secom (0.0004), Toho SVC (0.0408), Tokuyama (0.0150), Toyo Seikan (0.0161), Trend Micro (0.0134),

- m) 4th, Close-close: Astellas Pharmas (0.0435), Honda (0.0333), Konami (0.0100), Meiji Holdings (0.0225), NEC (0.0488), Sekisui (0.0183), Taisei (0.0048), Tokyo Marine (0.0176),
- n) 4th, Overnight: Astellas Pharmas (0.0050), Canon (0.0193), Daichi Sankuyo (0.0498), Honda (0.0426), Inpex (0.0272), Konami (0.0040), Mineb Mitsumi (0.0380), Mitsui (0.0477), Sekisui (0.0038), Seven & I (0.0366), Shinsei Bank (0.0429), Sumitomo (0.0216), T&D Holdings (0.0221),
- o) 4th, Open-open: Astellas Pharmas (0.0428), Inpex (0.0071), Mitsub Logistic (0.0437), Nippon Paper (0.0168), NTN (0.0128), Sekisui (0.0141), Seven & I (0.0150), Shimizu (0.0416), Takashimaya (0.0471), Yamato Holdings (0.0073),
- p) 4th, Open-close: Hitachi Const. (0.0186), KDDI (0.0252), Taisei (0.0174), Toyobo (0.0457),
- q) Friday the 13th vs Fridays: AEON (0.0173), Citizen Watch (0.0450), Comsys (0.0347), Daikin Ind. (0.0026), Daiwa Sec. (0.0280), Dowa Holdings (0.0489), Fujitsu (0.0150), Fukuoka Fin. (0.0224), Heiwa R. (0.0286), Hitachi Zosen (0.0070), Honda (0.0190), JFE Holdings (0.0436), JTEKT (0.0306), Kyocera (0.0309), Matsui Sec. (0.0400), Mazda (0.0073), Meidensha (0.0042), Mitsubishi (0.0086), Mitsubishi Est. (0.0369), Mitsui Eng. (0.0259), Nippon Sheet GLS (0.0139), Nisshin Steel (0.0389), NTT Data (0.0012), NTT Docomo (0.00186), OKI Elec. (0.0383), Resona Holdings (0.0141), Sharp (0.0002), Softbank (0.0006), Sumco (0.0395), Sumitomo (0.0162), Sumitomo Elec. (0.0324), Taiheyo Cement (0.0130), Taisei (0.0028), Takara (0.0087), TGK Insulators (0.0098), Tokyo Dome (0.0044), Tokyo Marine (0.0456), Toto (0.0228), Toyota Tsusho (0.0153), Trend Micro (0.0345),
- r) Tuesday the 13th vs Tuesdays: Ashi Group (0.0033), Credit Saison (0.0074), Kyocera (0.0444), NH Foods (0.0296), Secom (0.0013), Teijin (0.0384), Tokuyama (0.0468), Toyo Seikan (0.0437),

4.6.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (p-value shown in parenthesis):

- a) 13th, Close-close: Astellas Pharmas (0.0061), Da Nip (0.0087), East Japan (0.0092), Fujitsu (0.0375), Heiwa R. (0.0280), Kaima (0.0203), Marui Group (0.0253), Mitsui Fudosan (0.0334), Mnisshin (0.0365), NTT Data (0.0052), NTT Docomo (0.0042), Resona Holdings (0.0198), Softbank (0.0415), Suzuki (0.0341), Taisei (0.0231), Takara (0.0297), Toho SVC (0.0367), Tokai Carbon (0.0474), Tokyo Dome (0.0136), Toshiba (0.0420), Toto (0.0182), Trend Micro (0.0368),
- b) 13th, Overnight: East Japan (0.0073), Mitsui (0.0125),
- c) 13th, Open-open: Daikin Ind. (0.0164),
- d) 13th, Open-close: Citizen Watch (0.0175), Daikin Ind. (0.0197), Dowa Holdings (0.0390), Heiwa R. (0.0405), Hitachi Zosen (0.0115), Kyocera (0.0223), Meidensha (0.0293), Mitsubishi (0.0405), Mitsubishi Est. (0.0426), Mitsui Fudosan (0.0084), Nippon Sheet GLS (0.0211), NTT Data (0.0030), NTT Docomo (0.0041), Resona Holdings (0.0095), Sharp (0.0001), Softbank (0.0023), Suzuki (0.0292), Taiheyo Cement (0.0278), Taisei (0.0017), Takara (0.0181), Tokyo Dome (0.0150), Toto (0.0108), Toyo Seikan (0.0184), Toyota Tsusho (0.0370), Trend Micro (0.0145),
- e) Friday the 13th, Close-close: Central Japan (0.0317), Dainpn Sumi (0.0394), East Japan (0.0239), Fujitsu (0.0369), NTT Data (0.0152), Odakyu Elec. (0.0230), Sharp (0.0371), Softbank (0.0232), Taisei (0.0134), Trend Micro (0.0078),
- f) Friday the 13th, Overnight: Astellas Pharmas (0.0310), Daipn Sumi (0.0387), East Japan (0.0321), Hitachi Const. (0.0223), Kansai Elec. (0.0373), Taisei (0.0480), Tokuyama (0.0192), Trend Micro (0.0324),
- g) Friday the 13th, Open-open: Astellas Pharmas (0.0054), Daikin Ind. (0.0457), Hitachi Const. (0.0416), Meijin Holdings (0.0219), OJI Holdings (0.0139), Softbank (0.0245), Tokyo Ele. PWWR (0.0204), Tokyo Gas (0.0215), Trend Micro (0.0124), Yahoo Japan (0.0112),
- h) Friday the 13th, Open-close: Citizen Watch (0.0368), Odakyu Elec. (0.0083), Oki Elec. (0.0469), Sharp (0.0153), Taisei (0.0381), Yamato Holdings (0.0485),
- i) Tuesday the 13th, Close-close: Credit Saison (0.0241), Daikin Ind. (0.0227), Dainpn Sumi (0.0255), Fujitsu (0.0136), JGC (0.0197), Kyocera (0.0044), NTT Data (0.0338), Odakyu Elec. (0.0255), Oki Elec. (0.0495), OJI Holdings (0.0315), Pioneer (0.0197), Showa Denko (0.0308), Softbank (0.0331), Takeda (0.0039), Toho SVC (0.0218), Tokuyama (0.0105), Toyo Seikan (0.0397), Trend Micro (0.0467), Yamaha (0.0479),
- j) Tuesday the 13th, Overnight: Ajinomoto (0.0276), Dainpn Sumi (0.0330), Inpex (0.0314), JGC (0.0245),

- Kansai Elec. (0.0055), Mitsubishi (0.0392), Nippon Soda (0.0267), Nomura Holdings (0.0038), Takeda (0.0003), Trend Micro (0.0123),
- k) Tuesday the 13th, Open-open: Astellas Pharmas (0.0434), Bridgestone (0.0490), Chiyoda (0.0365), Durukawa (0.0381), Fuji Film (0.0027), Komatsu (0.0380), Kyowa (0.0024), Meidensha (0.0367), Mitsubishi Elec. (0.0459), Mitsui Ord (0.0297), Nikkon (0.0291), Nomura Holdings (0.0256), OJI Holdings (0.0174), Shinsei Bank (0.0450), Showa Denko (0.0184), Sky Perfect (0.0049), Sumitomo Elec. (0.0385), Sumitomo Osaka (0.0247), Tokuyama (0.0024), Tokyo Ele. PWR (0.0094), Tosoh (0.0227),
- l) Tuesday the 13th, Open-close: Ashi Group (0.0132), Credit Saison (0.0112), Daikin Ind. (0.0219), Kyocera (0.0313), NH Foods (0.0379), Nichirei (0.0380), Screen Holdings (0.0478), Secom (0.0006), Tokuyama (0.0423), Toyo Seikan (0.0134),
- m) 4th, Close-close: Astellas Pharmas (0.0413), Fuji Heavy Ind. (0.0436), Honda (0.0333), Konami (0.0136), NEC (0.0386), Nippon Light Metal (0.0160), Taisei (0.0165), Tokyo Marine (0.0463),
- n) 4th, Overnight: Astellas Pharmas (0.0196), Konami (0.0115), Mitsubishi Motor (0.0350), Sapporo Holdings (0.0404), Sekisui (0.0092), Seven & I (0.0490),
- o) 4th, Open-open: Cobe Steel (0.0351), Eisai (0.0453), Inpex (0.0133), Mitsub Logistic (0.0180), Mitsubishi Elec. (0.0245), Mitsubishi Motor (0.0170), Mitsui Fudosan (0.0320), Nippon Paper (0.0355), NSK (0.0136), NTN (0.0053), Obayashi (0.0278), Sekisui (0.0062), Seven & I (0.0193), Shimizu (0.0130), Takashimaya (0.0261), Tobu RW (0.0453), Tokyo Fudosan (0.0155), Tokyo Ord. (0.0453), Yamato Holdings (0.0042),
- p) 4th, Open-close: Htiachi Const. (0.0177), Kyocera (0.0465), Meiji Holdings (0.0427), Nippon Light Metal (0.0261), Taisei (0.0411),
- q) Friday the 13th vs Fridays: Citizen Watch (0.0246), Comsys (0.0460), Daikin Ind. (0.0294), Dowa Holdings (0.0242), Fujitsu (0.0361), Heiwa R. (0.0496), Hitachi Zosen (0.0177), JTEKT (0.0413), Keio Ord. (0.0498), Kyocera (0.0332), Mazda (0.0358), Meidensha (0.0136), Mitsubishi (0.0308), Mitsui Fudosan (0.0145), Nippon Sheet GLS (0.0125), NTT Data (0.0017), NTT Docomo (0.0033), Resona Holdings (0.0057), Sharp (0.0001), Softbank (0.0022), Suzuki (0.0265), Taiheyo Cement (0.0207), Taisei (0.0013), Takara (0.0213), TKG Insulators (0.0362), Tokyo Dome (0.0113), Toto (0.0152), Tokyo Seikan (0.0072), Toyota Tsusho (0.0323), Trend Micro (0.0348),
- r) Tuesday the 13th vs Tuesdays: Ashi Group (0.0114), Credit Saison (0.0216), Daikin Ind. (0.0436), NH Foods (0.0443), Nichirei (0.0395), Secom (0.0025), Sumitomo Osaka (0.0482), Tokyo Seikan (0.0435).

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.6.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) 13th, Close-close: East Japan, Fujitsu, NTT Data, Resna Holdings, Sharp, Soft Bank, Taisei, Takara
- b) 13th, Overnight: East Japan,
- c) 13th, Open-open: Daikin Ind.,
- d) 13th, Open-close: Citizen Watch, Kyocera, NTT Data, Resona Holdings, Sharp, Taisei,
- e) Friday the 13th, Close-close: East Japan, Fujitsu, NTT Data, Sharp, Softbank, Taisei, Terend Micro,
- f) Friday the 13th, Overnight: Astellas Pharmas, East Japan,
- g) Friday the 13th, Open-open: Daikin Ind.,
- h) Friday the 13th, Open-close: Citizen Watch, Sharp, Taisei,
- i) Tuesday the 13th, Close-close: Advantest, Credit Saison, Daikin Ind., Dainpn Sumi, Fujitsu, JGC, Kyocera, NTT Data, Odakyu Elec., OJI Holdings, Secom, Softbank, Takeda, Tokuyama, Toyo Seikan,
- j) Tuesday the 13th, Overnight: Ajinomoto, Dainpn Sumi, JGC, Kansai Elec., Nippon Soda, Nomura Holdings, OJI Holdings, Takeda,
- k) Tuesday the 13th, Open-open: Bridgestone, Durukawa, Fuji Film, Kyowa, Meidensha, Mitsubishi Elec., Nikkon, OJI Holdings, Shinsei Bank, Sky Perfect, Sumitomo Elec., Sumitomo Osaka, Tokyo Ele PWR,
- l) Tuesday the 13th, Open-close: Ashi Group, Credit Saison, Kyocera, NH Foods, Screen Holdings, Secom, Tokuyama, Toyo Seikan,

- m) 4th, Close-close: Astellas Pharmas, Honda, Konami, NEC, Taisei, Tokyo Marine,
- n) 4th, Overnight: Astellas Pharmas, Konami, Sekisui, Seven & I,
- o) 4th, Open-open: Inpex, Mitsub Logistic, Nippon Paper, NTN, Sekisui, Seven & I, Shimizu, Takashimaya, Yamato Holdings,
- p) 4th, Open-close: Hitachi Const., Taisei,
- q) Friday the 13th vs Fridays: Citizen Watch, Comsys, Daikin Ind., Dowa Holdings, Fujitsu, Heiwa R., Hitachi Zosen, JTEKT, Kyocera, Mazda, Meidensha, Mitsubishi, Nippon Sheet GLS, NTT Data, NTT Docomo, Resona Holdings, Sharp, Softbank, Taiheyo Cement, Taisei, Takara, TKG Insulators, Tokyo Dome, Toto, Toyota Tsusho,
- r) Tuesday the 13th vs Tuesdays: Ashi Group, Credit Saison, NH Foods, Secom, Toyo Seikan.

On the Japanese stock market the appearance of all types of effects was observed, both those related to the number 13 and the number 4. Most often, the effects occurred for the following returns: Close-close (13th day of the month, Friday the 13th and Tuesday the 13th), Open-open (Tuesday the 13th and 4th day of the month) and Open-close (13th day of the month).

4.7 SENSEX

The results of testing a zero hypothesis with the use of average rates of returns for two different populations permit to draw the following conclusions:

4.7.1 Z-Statistics

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Open-open: Bharat Airtel (0.0291),
- b) Friday the 13th, Close-close: Bharat Heavy (0.0114), Gail India (0.0012), Infosys (0.0140), Vedanta (0.0136), Wipro (0.0224),
- c) Friday the 13th, Overnight: Bajaj Auto (0.0008),
- d) Friday the 13th, Open-close: Asian paints (0.0303), Bharat Heavy (0.0165), Hindalco India (0.0193), Icici Bank (0.0071), Infosys (0.0132), Tata Consultancy (0.0050), Vedanta (0.0472), Wipro (0.0133),
- e) Tuesday the 13th, Close-close: Housing Development (0.0437), Icici Bank (0.0206), Mahindra & Mahindra (0.0479), NTPC (0.0234),
- f) Tuesday the 13th, Open-open: Gail India (0.0375),
- g) Tuesday the 13th, Open-close: Icici Bank (0.0121), NTPC (0.0076),
- h) 4th, Close-close: State Bank of India (0.0125),
- i) 4th, Open-open: Asian Paints (0.0236), Bharat Heavy (0.0004),
- j) 4th, Open-close: State Bank of India (0.0296), Tata Steel (0.0300),
- k) Friday the 13th vs Fridays: Asian Paints (0.0473), Bharat Heavy (0.0184), Hindlaco India (0.0134), Icici Bank (0.0120), Infosys (0.0101), Tata Consultancy (0.0072), Vedanta (0.0475), Wipro (0.0187),
- l) Tuesday the 13th vs Tuesdays: Icici Bank (0.0064), Mahindra & Mahindra (0.0283), NTPC (0.0054),

4.7.2 Kruskal-Wallis Test

The null hypothesis regarding equality of two average rates of return was rejected for the following equities (*p-value* shown in parenthesis):

- a) 13th, Close-close: Bharat Heavy (0.0130), Bharti Airtel (0.0342), Gail India (0.0029), Infosys (0.0447), Larsen & Toubro (0.0391), State Bank of India (0.0459), Vedanta (0.0234),
- b) 13th, Overnight: Bajaj Auto (0.0258),
- c) 13th, Open-close: Bharat Heavy (0.0204), Bharti Airtel (0.0465), Hindalco India (0.0124), Icici Bank (0.0137), Infosys (0.0110), State Bank of India (0.0357), Tata Consultancy (0.0341), Wipro (0.0086),
- d) Friday the 13th, Open-open: Bharti Airtel (0.0329), Mahindra & Mahindra (0.0427), Tata Steel (0.0284),
- e) Tuesday the 13th, Close-close: Icici Bank (0.0084), NTPC (0.0336),

- f) Tuesday the 13th, Open-close: Icici Bank (0.0037), NTPC (0.0069),
- g) 4th, Close-close: State Bank of India (0.0110), Tata Motors (0.0341),
- h) 4th. Overnight: Cipla (0.0248), Dr Reddy's Laboratories (0.0050), Oil and Natural Gas (0.0100),
- i) 4th, Open-open: Asian Paints (0.0066), Bharat Heavy (0.0002), Cipla (0.0014), Maruti Suzuki (0.0183),
- j) 4th, Open-close: Hindalco India (0.0336), State Bank of India (0.0221), Tata Steel (0.0321),
- k) Friday the 13th vs Fridays, Close-close: Asian Paints (0.0435), Bharat Heavy (0.0257), Hindalco India (0.0063), Icici Bank (0.0199), Infosys (0.0083), State Bank of India (0.0392), Tata Consultancy (0.0294), Wipro (0.0130),
- l) Tuesday the 13th vs Tuesdays, Close-close: Housing Development (0.0360), Icici Bank (0.0028), NTPC (0.0052),

In all other cases, there was no reason to reject the null hypothesis in favor of the alternative hypothesis.

4.7.3 Confirmation of the Results Obtained with Z-Statistics by the Kruskal-Wallis Test

The null hypothesis was rejected with the use of two tests (the Z statistics and Kruskal-Wallis) for the following companies:

- a) Asian Paints: 4th, Open-open, Friday the 13th vs Fridays, Close-close,
- b) Bharat Heavy: 4th, Open-open, Friday the 13th vs Fridays, Close-close,
- c) Hindalco India: Friday the 13th vs Fridays, Close-close,
- d) Icici Bank: Tuesday the 13th, Close-close, Open-close, Friday the 13th vs Fridays, Close-close, Tuesday the 13th vs Tuesdays, Close-close,
- e) Infosys: Friday the 13th vs Fridays, Close-close,
- f) NTPC: Tuesday the 13th, Close-close, Open-close, Tuesday the 13th vs Tuesdays, Close-close,
- g) State Bank of India: 4th, Close-close, Open-close,
- h) Tata Consultancy: Friday the 13th vs Fridays, Close-close,
- i) Tata Steel: 4th, Open-close,
- j) Wipro: Friday the 13th vs Fridays, Close-close.

On the Indian stock market, just like on Japanese market, were registered all types of effects, related to the number 13 (Friday the 13th and Tuesday the 13th) and the number 4. The only exception is the effect of the 13th day of the month that was not present. The observed effects most often occurred for the following returns: Close-close (Friday the 13th and Tuesday the 13th), Open-open and Open-close (in both cases: 4th day of the month).

5. Conclusions

The aim of this study was to determine the prevalence of the calendar effect in case of "the unfortunate dates effect", on the example of 7 world equity indexes components. Analysis of the effects of seasonality included an examination of the rates of return calculated for four approaches:

- a) Close – close
- b) Overnight
- c) Open - open
- d) Open – close

In all these cases the statistical equality of one-session rates of return for two population were calculated for:

- a) Sessions falling on the 13th day of the month vs all other sessions (first part),
- b) Sessions falling on Friday the 13th vs all other sessions (second part),
- c) Sessions falling on Tuesday the 13th vs all other sessions (third part),
- d) Sessions falling on the 4th day of month vs all other sessions (fourth part),

In the fifth part the statistical equality of one-session rates of return for the population of Friday the 13th and the population of other Fridays were compared. The following part of the fifth part of the paper consists of the analysis of equality of rates of return for the sessions falling on Tuesday the 13th vs rates of return calculated for all remaining Tuesdays. This is the first study known to the author that takes into account other rates of return than

Close-close.

Calculations proceeded in this paper indicate the presence of “the unfortunate days effect” – the results are presented in Table 1, Table 2 and Table 3. The frequency of cases when p values were lower than 0.05 for Z statistics as well as for Kruskal-Wallis tests, was the highest for Tuesday the 13th (Close-close), followed by Tuesday the 13th (Open-close), 4th (Open-open), except CAC40 index and Friday the 13th vs Fridays (Close-close), except DAX and DJIA indexes – see Figure 1. In case of the Nikkei index “the unfortunate days effect” was registered also for the following returns: 13th day of the month (Open-close and Close-close) as well as for Tuesday the 13th (Overnight and Open-open).

Table 1. Number of “the unfortunate day effects”, calculated for the analyzed equity indexes components with the use of two statistical tests: Z statistics test and Kruskal-Wallis test (in brackets)

Index	13 th day of the month				Friday the 13 th				Tuesday the 13 th				4 th day of the month				Friday the 13 th vs	Tuesday the 13 th vs
Index	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	C-C
CAC40	2 (2)	0 (1)	1 (3)	2 (0)	1 (1)	0 (0)	1 (3)	1 (0)	4 (3)	0 (0)	0 (0)	5 (3)	1 (4)	0 (0)	0 (0)	2 (2)	1 (1)	5 (4)
DAX	0 (2)	2 (0)	0 (4)	0 (1)	3 (0)	1 (1)	2 (0)	3 (0)	4 (6)	0 (0)	0 (1)	2 (1)	2 (1)	1 (0)	1 (1)	1 (1)	2 (0)	1 (1)
DJIA	2 (2)	2 (4)	1 (2)	2 (1)	0 (3)	3 (1)	2 (1)	0 (1)	1 (2)	1 (1)	1 (1)	4 (3)	3 (2)	0 (3)	3 (4)	1 (1)	0 (1)	1 (2)
FTSE30	1 (3)	2 (2)	1 (5)	2 (2)	2 (1)	4 (2)	3 (0)	1 (2)	7 (7)	1 (0)	1 (1)	6 (5)	2 (0)	3 (2)	3 (2)	1 (0)	1 (1)	7 (6)
FTSE																		
MIBTEL	1 (0)	2 (0)	1 (0)	0 (2)	0 (1)	0 (2)	1 (2)	3 (1)	2 (3)	2 (3)	0 (1)	3 (1)	1 (1)	3 (2)	1 (1)	4 (7)	3 (2)	4 (1)
NIKKEI	17 (22)	11 (2)	9 (1)	13 (25)	31 (10)	8 (8)	2 (10)	33 (6)	23 (19)	17 (10)	22 (21)	13 (10)	8 (8)	13 (6)	10 (19)	4 (5)	40 (30)	8 (8)
SENSEX	0 (7)	0 (1)	1 (0)	0 (8)	5 (0)	1 (0)	0 (3)	8 (0)	4 (2)	0 (0)	1 (0)	2 (2)	1 (2)	0 (3)	2 (4)	2 (3)	8 (8)	3 (3)

Source: own calculation

Table 2. Number of cases when p values were lower than 0.05 at the same time for two tests: Z statistics and Kruskal-Wallis

Index	13 th day of the month				Friday the 13 th				Tuesday the 13 th				4 th day of the month				Friday the 13 th vs	Tuesday the 13 th vs
Index	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	C-C
CAC40	0	0	0	0	0	0	0	0	3	0	0	3	1	0	0	1	1	4
DAX	0	0	0	0	0	0	0	0	3	0	0	1	1	0	1	1	0	1
DJIA	0	0	0	0	0	0	0	0	1	1	1	2	1	0	3	0	0	1
FTSE30	0	0	0	0	0	0	0	0	6	0	1	4	0	1	2	0	1	4
FTSE MIBTEL	0	0	0	0	0	0	0	1	2	2	0	1	0	0	1	4	2	1
NIKKEI	8	1	1	6	7	2	1	3	15	9	13	8	6	4	9	2	25	5
SENSEX	0	0	0	0	0	0	0	0	2	0	0	2	1	0	2	2	7	2

Source: own calculation.

Considering the quotient of (1) the number of cases when the null hypothesis was rejected at the same time with the use of the Kruskal-Wallis test and Z statistic and (2) the number of companies included in the analyzed index, the percentage ratio of these two variables can be calculated (see Table 3). The highest values of the percentage ration ($\geq 10\%$) were recorded for the following indexes (see Figure 5):

- SENSEX – 23% (Friday the 13th vs Fridays, C-C)
- FTSE30 – 20% (Tuesday the 13th, C-C),
- FTSE30 – 13.3 % (Tuesday the 13th vs Tuesdays, C-C),
- FTSE30 – 13.3 % (Tuesday the 13th, O-C)
- NIKKEI225 – 11.21% (Friday the 13th vs Fridays, C-C)
- FTSE MIBTEL – 10.81% (4th, O-C)
- DJIA – 10% (4th, O-O).

Table 3. Percentage of cases for each of analyzed indexes when p values were lower than 0.05 at the same time for two kind of tests: Z statistics and Kruskal-Wallis (The results are derived from the Table 2 by dividing the number form the Table 2 by the umber of the analyzed components of each index)

Index	13 th day of the month				Friday the 13 th				Tuesday the 13 th				4 th day of the month				Friday the 13 th vs Fridays	Tuesday the 13 th vs Tuesdays
	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	OV	O-O	O-C	C-C	C-C
CAC40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.69	0.00	0.00	7.69	2.56	0.00	0.00	2.56	2.56	10.26
DAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	3.33	3.33	0.00	3.33	3.33	0.00	3.33
DJIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	3.33	6.67	3.33	0.00	10.00	0.00	0.00	3.33
FTSE30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	3.33	13.33	0.00	3.33	6.67	0.00	3.33	13.33
FTSE MIBTEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	5.41	5.41	0.00	2.70	0.00	0.00	2.70	10.81	5.41	2.70
NIKKEI	3.59	0.45	0.45	2.69	3.14	0.90	0.45	1.35	6.73	4.04	5.83	3.59	2.69	1.79	4.04	0.90	11.21	2.24
SENSEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	0.00	6.67	3.33	0.00	6.67	6.67	23.33	6.67

Source: own calculation.

Taking into account results of both tests, i.e. Kruskal-Wallis and Z statistics, the calendar effect regarding rates of return of the 13th day of the month was observed only on the Japanese market (for all calculated types of rates of return). Cultural differences between the analyzed markets would suggest the occurrence of the Tuesday the 13th effect, possibly on European markets, on which the influence of Spanish investors can be noticed. Meanwhile, as a result of the conducted research, it was proved that this effect occurs on all analyzed markets, including Asian ones. The same applies to the effect of the 4th day of the month, which should mainly be present in Asian markets. Meanwhile, it was registered in all analyzed markets. This fact entitles to the thesis about capital mobility in contemporary financial markets.

The calendar effects of returns calculated for Friday the 13th in relation to other Fridays, were observed on all exchanges except for German and American, while the calendar effects of Tuesday the 13th in relation to the other Tuesdays were registered for all analyzed equity exchanges.

Summing up the values in the individual rows of Table 3, another ranking can be created, e.g. ranking of unlucky number anomalies for all analyzed stock exchanges: DAX (26.67%), CAC40 (33.33%), DJIA (33.33%), FTSE MIBTEL (37.84%), NIKKEI 225 (56.05%), SENSEX (60.00%) and FTSE30 (63.33%). Contrary to the expectations, the unlucky day effects were not the most commonly observed on the Asian Stock Exchanges but on the British Stock Exchange. “The unfortunate dates effect” was the most frequently observed for Tuesday and 13th and then for the 4th day of the month. Taking into consideration all types of analyzed returns (Close-close, Open-open, Open-close and Overnight), the most frequent effects were registered for the following returns: Close-close and for Open-close, with the exception of the 4th day of the month effect, in which the order was changed.

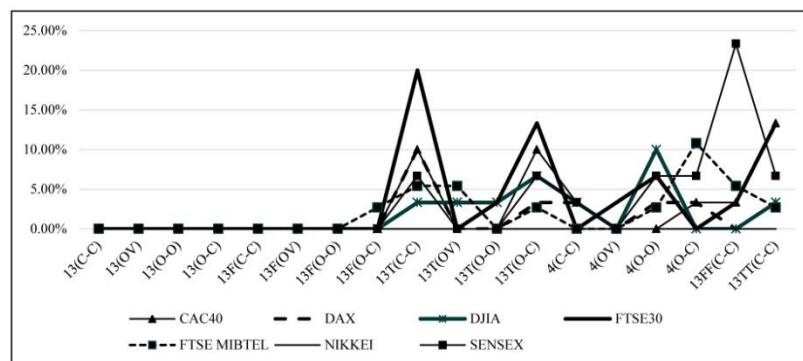


Figure 1. Frequency of cases when p values were lower than 0.05 at the same time for two kind of tests

Source: own calculation.

Results obtained in the paper regarding the Friday the 13th effect are consistent with those of Kolb and Rodriguez (1987). Notably the results do not support the outcomes reported by Agrawal and Tandon (1994), Coutts (1999) and Lucey (2000). Further research on the occurrence of “the unfortunate dates effect” in the financial markets should

cover the currency and commodity market. The conducted studies proved the occurrence of “the unlucky day effect” not only in case of Close-close returns, but also in the remaining three that is Open-close, Open-open and Overnight.

The main limitation of this research is the range of data gained from the Reuters as well as the unequal intervals of observations for different equity indexes. The outcome may be regarded as a part of the ongoing discussions on the hypothesis of financial markets efficiency, which was introduced by Fama (1970). The results of the analysis entitles to the thesis about capital mobility in contemporary financial markets.

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Appendix

Table A1. Component of the following indexes included in the analysis: CAC40, DAX, DJIA, FTSE 30, FTSE MIBTEL and SENSEX

	Date of first		Date of first		Date of first		Date of first	FTSE	Date of first		Date of first
CAC40	quotation	DAX	quotation	DJIA	quotation	FTSE30	quotation	MIBTEL	quotation	SENSEX	quotation
Accor	1985-01-07	Adidas	1995-11-17	3M	1970-01-02	3I	1998-07-27	A2A	1998-07-22	Asian Paints	1998-12-04
				American		Associated British					
Air Liquide	1985-01-07	Alianz	1991-04-05	Express	1972-01-07	Food	1998-07-28	Ansalo	2006-03-29	Bajaj Auto	2008-05-26
Airbus	1999-06-04	BASF	1991-04-05	Apple	1984-09-07	BAE System	1998-07-28	Atlanta	1998-10-16	Bharat Heavy	1993-07-19
Arcelormittal	1997-08-08	Bay Motoren	1991-04-05	Boeing	1970-01-02	BP	1998-07-28	Autogrill	1997-08-01	Bharti Airtel	2002-02-18
						British American					
AXA	1985-01-07	Bayer	1991-04-05	Caterpillar	1970-01-02	Tobacco	1998-07-17	Ayzmut	2004-07-07	Cipla	1993-07-13
BNP Paribas	1993-10-18	Beiersdorf	2000-01-03	Chevron	1970-01-02	BT Group	1998-07-27	Banca Monte	1999-06-25	Coal India	2010-11-04

								dei Paxhi			
								Banco		Dr Reddy's	
Bouygues	1985-01-07	Comerzbank	1991-04-05	Cisco	1990-03-26	Burberry	2002-07-12	Popolare	2002-06-03	Laboratories	1990-01-01
								Banco			
								Popolare di			
Cap Gemini	1987-06-22	Continental	1991-04-09	Coca Cola	1970-01-02	Compass	2001-02-02	Milano	1987-01-02	Gail India	1997-06-05
Carrefour	1985-01-07	Daimler	1991-04-05	Disney	1970-01-02	Diageo	1998-07-28	BPER Banca	1987-12-21	HDFC Bank	1995-06-01
Credit Agricole	2001-12-14	Deutsche Bank	1991-04-05	Du Pont	1970-01-02	Experian	2006-08-14	Brembo	1995-07-03	Motorcorp.	1990-01-01
		Deutsche		Exxon				Buzzi			
Danone	1985-01-07	Boerse	2016-07-18	Mobile	1970-01-02	GKN	1998-07-27	Unicem	1987-01-02	Hindalco India	1990-01-01
				General				CHN		Hindustan	
EDF	2005-11-21	Deutsche Post	2000-11-20	Electric	1962-01-02	GlaxoSmithKline	1998-07-27	Industrial	2013-09-30	Unilever	1990-01-01
				Goldman		INTL Consolidatec		Davide		Housing	
Essilor	1985-01-07	DT Telcom	1996-11-18	Sachs	1999-05-04	Airlines	2011-01-24	Campari	2001-07-06	Development	1990-01-02
Kering	1985-01-07	EON	1991-04-05	Home Depot	1981-09-22	ITV	1998-07-28	ENEL	1995-11-28	Icici Bank	1997-09-24
Klepierre	1987-01-19	Frasen Med.	1996-10-04	IBM	1962-01-02	Land Sec.	1998-07-28	ENI	1999-11-02	Infosys	1999-07-08
Lafarge	1985-01-09	Fresenius	2006-06-28	Intel	1972-01-07	Lloyds Banking	1998-07-27	Exor	2009-03-09	ITC	1990-01-01
		Heilderbergece								Larsen &	
LqOreal	1985-01-07	ment	2000-01-03	J&J	1970-01-02	Man Group	1994-10-10	Ferrari	2014-06-26	Toubro	1990-01-01
										Mahindra &	
Legrand	2006-04-07	Henkel	1991-04-08	JP Morgan	1970-01-02	Marks & Spencer	1998-07-27	FIAT	1991-01-31	Mahindra	1990-01-01
LVHM	1985-01-07	Infineon Tech	2000-03-14	Mc Donalds	1970-01-02	National Grid	1998-07-28	Generalli	1987-01-02	Maruti Suzuki	2003-07-09
								Intesa San			
Michelin	1985-01-07	Linde	1991-04-05	Merck	1970-01-02	Prudential	1998-07-27	Paolo	1987-01-02	NTPC	2004-11-05
										Oil and Natural	
Nokia Oyj	1999-08-06	Lufthansa	1991-04-05	Microsoft	1986-03-13	Reckit Benckiser	1998-07-28	Luxottica	2000-12-04	Gas	1995-08-01
						Royal Bank of				Reliance	
Orange	1997-10-20	Merck	2000-01-03	Nike	1987-08-19	Scotland	1998-07-28	Mediaset	1996-07-15	Industries	1990-01-01
Pernold		Muench								State Bank of	
Ricard	1985-01-07	Rueckvers	1994-07-26	Pfizer	1982-01-04	RSA Insurance	1998-07-28	Mediobanca	1988-05-17	India	1995-04-03
				Procter &						Sun	
Peugeot	1985-01-07	Prosieben Sat	2000-10-23	Gamble	1970-01-02	Smith Group	1998-07-28	Monclair	2013-12-16	Pharmaceutical	1995-01-02
Publicis										Tata	
Groupe	1985-01-07	RWE	1991-04-05	Travelers	2005-02-25	Tate and Lyle	1998-07-27	Prysmian	2007-05-03	Consultancy	2004-08-25
				United							
Renault	1998-06-17	SAP	1994-09-13	Health	1990-03-26	Tesco	1998-07-03	Recordati	1987-01-02	Tata Motors	1990-01-01
				United							
Safran	1985-01-07	Siemens	1989-10-24	Technologies	1970-01-02	Unilever	1998-07-27	SAIPEM	1987-01-02	Tata Power	1990-01-01
								Salvatore			
Saint Gobain	1987-01-19	Thyssen Krupp	1991-04-05	Verizon	1983-11-21	Vodafone	1998-07-28	Ferragamo	2011-06-28	Tata Steel	1990-01-01
								Semicroelect			
Sanofi	1999-03-29	Vonovia	2013-12-20	Visa	2008-03-18	Wolseley	1998-07-27	ronic	1998-06-05	Vedanta	1990-01-01
Schneider											
Electric	1985-01-07	Volkswagen	1989-01-12	Wall-Mart	1972-03-20	WPP	1998-07-28	SNAM	2001-12-06	Wipro	1993-07-13
Societe								Telecom			
General	1987-07-06							Italia	2003-08-04		
Solvay	1987-01-02							Tenaris	2002-12-17		
Technip	1998-06-17							Terna Rete	2004-06-23		
Total	1985-01-07							TOD'S	2000-11-06		
Unibail											
Rodamco	1985-01-02							Unicredit	1987-01-02		
								Unione di			
Valeo	1985-01-07							Banche	2003-07-01		
Veolia Envi-											
ronnement	2000-07-20							Unipol	1987-01-02		
Vinci	1985-01-07										
Vivendi	1985-01-07										

Source: Reuters Service.

Table A2. Components of the Nikkei 225 index included in the analysis and their first date of quotation

Company	Date	Company	Date	Company	Date	Company	Date	Company	Date	Company	Date
Advantest	1984-01-04	Fuji Electric	1984-01-04	Kuraray	1984-01-04	Nippon Soda	1984-01-04	Shizuoka Bank	1984-01-04	Tokyo Gas	1984-01-04
AEON	1984-01-04	Fuji Film	1984-01-04	Kyocera	1984-01-04	Nippon Suisan	1984-01-04	Showa Denko	1984-01-04	Tokyo Marine	2002-04-01
Ajinomoto	1984-01-04	Fuji Heavy Ind	1984-01-04	Kyowa	1984-01-04	Nippon Yusen	1984-01-04	Showa Shell	1984-01-04	Tokyo Ord	1984-05-08
Alps Electr	1984-01-04	Fujikura	1984-01-04	Marubem	1984-01-04	Nissan	1984-01-04	Sky Perfect	2007-04-02	Tokyo Tatemono	1984-01-04
						Nissen					
Amada	1984-01-04	Fujitsu	1984-01-04	Maruha Nichiro	2014-04-01	Chemical	1984-01-04	SMFG	2002-12-02	Toppan Printing	1984-01-04
Ana Holdings	1984-01-04	Fukuoka Fin	2007-04-02	Marui Group	1984-01-04	Nisshin Steel	2012-10-01	Softbank	1994-07-22	Toray Inds	1984-01-04
Aozora Bank	2006-11-14	Furukawa Elec	1984-01-04	Matsui Sec.	2001-08-01	Nisshinbo	1984-01-04	Sojitz	2003-04-01	Toshiba	1984-01-04
Asahi Glass	1984-01-04	GS Yuasa	2004-04-01	Mazda	1984-01-04	Nitto Denko	1984-01-04	Sompo Holdings	2010-04-01	Tosoh	1984-01-04
Asahi Kasei	1984-01-04	Heiwa R	1984-01-04	Meidensha	1984-01-04	Nittobo	1984-01-04	Sony	1984-01-04	Toto	1984-01-04
						Nomura					
Ashi Group	1984-01-04	Hino	1984-01-04	Meiji Holdings	2009-04-01	Holdings	1984-01-04	Sony Dinancial	2007-10-11	Toyo Seikan	1984-01-04
Astellas											
Pharmas	1984-01-04	Hitachi	1984-01-04	Minebe Mitsumi	1984-01-04	NPSTL	1984-01-04	Sumco	2005-11-17	Toyobo	1984-01-04
Bridgestone	1984-01-04	Hitachi Const	1984-01-04	Mitsub Chem	2005-10-03	NSK	1984-01-04	Sumitomo	1984-01-04	Toyota	1984-01-04
Canon	1984-01-04	Hitachi Zosen	1984-01-04	Mitsub Logistic	1984-01-04	NTN	1984-01-04	Sumitomo Chem	1984-01-04	Toyota Tsusho	1984-01-04
Casio Computer	1984-01-04	Hokuetsu Kishu	1984-01-04	Mitsub UFJ	2001-04-02	NTT	1987-02-10	Sumitomo Elec	1984-01-04	Trend Micro	1998-08-18
								Sumitomo			
Central Japan	1997-10-08	Honda	1984-01-04	Mitsubishi	1984-01-04	NTT Data	1995-04-26	Heavy	1984-01-04	Ube Ind.	1984-01-04
Chiba Bank	1984-01-05	IHI	1984-01-04	Mitsubishi Elec	1984-01-04	NTT Docomo	1998-10-22	Sumitomo M&M	1984-01-04	Unitika	1984-01-04
								Sumitomo			
Chiyoda	1984-01-04	Inpex	2006-04-03	Mitsubishi Est	1984-01-04	Obayashi	1984-01-04	Mitsui	2002-01-31	West Japan	1996-10-08
Chubu Ele	1984-01-04	Isuzu	1984-01-04	Mitsubishi Heavy	1984-01-04	Odakyu Elec	1984-01-04	Sumitomo Osaka	1984-01-04	Yahoo Japan	1997-11-04
								Sumitomo			
Chugai Pharm	1984-01-04	Itochu	1984-01-04	Mitsubishi Matls	1984-01-04	OJI Holdings	1984-01-04	Realty	1984-01-04	Yamaha	1984-01-04
		J. Front								Yamato	
Citizen Watch	1984-01-04	Retailing	2007-09-03	Mitsubishi Motor	1988-12-05	Okie Elec	1984-01-04	Suzuki	1984-01-05	Holdings	1984-01-04
Cobe Steel	1984-01-04	Japan Steel	1984-01-04	Mitsui	1984-01-04	Okuma	1984-01-04	T&D Holdings	2004-04-01	Yaskawa	1984-01-04
Comsys	2003-09-29	Japan Tobacco	1994-10-27	Mitsui Eng	1984-01-04	Olympus	1984-01-04	Taiheyo Cement	1984-01-04	Yokogawa	1984-01-04
										Yokohama	
Credit Saison	1984-01-04	JFE Holdings	2002-09-26	Mitsui Fudosan	1984-01-04	Osaka Gas	1984-01-04	Taisei	1984-01-04	Rubber	1984-01-04
				Mitsui							
Da Nip	1984-01-04	JGC	1984-01-04	Min&Smelt	1984-01-04	Pacific metals	1984-01-04	Taiyo Yuden	1984-01-04		
Dai Ichi Life	2010-04-01	JTEKT	1984-01-04	Mitsui Ord	1984-01-04	Panasonic	1984-01-04	Takara	1984-01-04		
Daichi Sankuyo	2005-09-28	JX Holdings	2010-04-01	Mitsui Osk Lines	1984-01-04	Pioneer	1984-01-04	Takashimaya	1984-01-04		
						Resona					
Daikin Ind	1984-01-04	Kaima	1984-01-04	Mitsumi Electr	1984-01-04	Holdings	2001-12-11	Takeda	1984-01-04		
Dainpn Sumi	1984-01-04	Kansai Elec	1984-01-04	Mizuho Financial	2003-03-12	Ricoh	1984-01-04	TDK	1984-01-04		
						Sapporo					
Daiwa House	1984-01-04	Kao	1984-01-04	Mnisshin	1984-01-04	Holdings	1984-01-04	Teijin	1984-01-04		
Daiwa		Kawasaki		MS&AD		Screen					
Securities	1984-01-04	Heavy	1984-01-04	Insurance	2008-04-01	Holdings	1984-01-04	Terumo	1984-01-04		
		Kawasaki									
Denka	1984-01-04	Kisen	1984-01-04	NEC	1984-01-04	Secom	1984-01-04	TGK Insulators	1984-01-04		
Denso	1984-01-04	KDDI	1993-09-03	NH Foods	1984-01-04	Sekisui	1984-01-04	Tobu RW	1984-05-08		
Dentsu	2001-11-30	Keio Ord	1984-01-04	Nichirei	1984-01-04	Setan Mitsuko	2008-04-01	Toho SVC	1984-01-04		
Dowa Holdings	1984-01-04	Keisei Electic	1984-01-04	Nikkon	1984-01-04	Seven & I	2005-09-01	Toho Zinc	1984-01-04		
				Nippon Elec							
Durukawa	1984-01-04	Kikkoman	1984-01-04	Glass	1984-01-04	Sharp	1984-01-04	Tokai Carbon	1984-01-04		
East Japan	1993-10-26	Kirin	1984-01-04	Nippon Express	1984-01-04	Shimizu	1984-01-04	Tokuyama	1984-01-04		
Ebara	1984-01-04	Komatsu	1984-01-04	Nippon Kayaku	1984-01-04	Shin Etsu	1984-01-04	Tokyo Dome	1984-01-04		
				Nippon Light							
Eisai	1984-01-04	Konami	1988-02-19	Metal	2012-10-01	Shinsei Bank	2004-02-19	Tokyo Ele PWR	1984-01-04		
Fanuc	1984-01-04	Konica Minolta	1984-01-04	Nippon Paper	2013-04-01	Shinseido	1984-01-04	Tokyo Electron	1984-01-04		
				Nippon Sheet							
Fast Retailing	1997-04-02	Kubota	1984-01-04	GLS	1984-01-04	Shiongoi	1984-01-04	Tokyo Fudosan	2013-10-01		

Source: Reuters Service.

Table A3. Example of p values calculation for returns of CAC40 components with the use of the Z statistics.
Shaded cells represent cases when p value was lower than 0.05

		3th Friday 13th Tuesday																	
		13th			13th and Friday			13th and Tuesday			4th			vs Fridays			vs Tuesdays		
Comapny Name	First date	C-C	OV	O-O	C-C	OV	O-O	C-C	OV	O-O	C-C	OV	O-O	C-C	OV	O-O	C-C	OV	O-O
Accor	1985-01-07	0.8176	0.2341	0.8137	0.4960	0.8973	0.5667	0.9144	0.7153	0.8939	0.9846	0.2881	0.8319	0.3077	0.4744	0.6617	0.2888	0.5900	0.7311
Air Liquide	1985-01-07	0.0474	0.3534	0.9459	0.0798	0.2765	0.8876	0.7006	0.1462	0.6116	0.6402	0.7891	0.8551	0.3493	0.3887	0.4256	0.7457	0.1165	0.9917
Airbus	1999-06-04	0.5301	0.9075	0.5062	0.5030	0.7954	0.1990	0.0068	0.5767	0.3244	0.4169	0.4569	0.7649	0.9741	0.4221	0.4915	0.6183	0.6491	0.6899
Arcelormittal	1997-08-08	0.6598	0.9957	0.0127	0.6507	0.2040	0.4597	0.8433	0.4058	0.3431	0.8194	0.3436	0.1573	0.3526	0.3851	0.9884	0.7210	0.4814	0.1528
AXA	1985-01-07	0.8853	0.3666	0.5850	0.5885	0.3518	0.9332	0.4302	0.3407	0.9269	0.7582	0.4397	0.6013	0.2881	0.4848	0.6346	0.2900	0.3728	0.4552
BNP Paribas	1993-10-18	0.4281	0.2760	0.5248	0.8569	0.5317	0.1435	0.2913	0.8493	0.0814	0.1026	0.3557	0.4913	0.3703	0.4241	0.3250	0.7317	0.9436	0.2972
Bouygues	1985-01-07	0.5437	0.5297	0.9214	0.8069	0.3403	0.0640	0.2860	0.8945	0.2840	0.5040	0.9226	0.2604	0.1558	0.1691	0.1748	0.7193	0.9069	0.1789
Cap Gemini	1987-06-22	0.5629	0.9424	0.7303	0.4691	0.6643	0.6611	0.7029	0.8257	0.4848	0.8482	0.5977	0.1287	0.0879	0.2412	0.3008	0.1552	0.6962	0.0876
Carrefour	1985-01-07	0.5294	0.7641	0.7750	0.6171	0.6341	0.8283	0.9174	0.6787	0.4939	0.9244	0.4048	0.3555	0.0823	0.2533	0.1798	0.0273	0.8609	0.2702
Credit Agricole	2001-12-14	0.7674	0.3151	0.2261	0.7636	0.2054	0.4955	0.5644	0.2662	0.1227	0.1488	0.1401	0.9096	0.3763	0.9323	0.9270	0.3049	0.2260	0.5464
Danone	1985-01-07	0.6532	0.5116	0.7441	0.2948	0.1867	0.8783	0.6140	0.1387	0.8595	0.2031	0.2730	0.0311	0.2486	0.4341	0.4579	0.0701	0.0886	0.0661
EDF	2005-11-21	0.0576	0.3856	0.6871	0.0437	0.0417	0.5258	0.9705	0.0167	0.1663	0.3948	0.7684	0.0845	0.2498	0.2930	0.6202	0.0622	0.0048	0.1172
Essilor	1985-01-07	0.5124	0.2766	0.3408	0.8195	0.7067	0.8502	0.8212	0.7220	0.7517	0.7904	0.2795	0.8749	0.2480	0.2165	0.1570	0.7775	0.5438	0.8467
Kering	1985-01-07	0.8184	0.5684	0.3548	0.8689	0.4721	0.1266	0.0700	0.9570	0.7239	0.6688	0.4980	0.9794	0.1810	0.2117	0.2473	0.6380	0.9819	0.7238
Klepierre	1987-01-19	0.2225	0.9598	0.6338	0.1689	0.0633	0.3510	0.4134	0.1309	0.3424	0.0811	0.1667	0.9278	0.2459	0.3680	0.4873	0.2530	0.1569	0.9936
Lafarge	1985-01-09	0.3751	0.4163	0.5914	0.0848	0.2352	0.8694	0.2133	0.1338	0.9215	0.2993	0.7420	0.5325	0.1794	0.2434	0.1909	0.5768	0.1778	0.6100
L'Oreal	1985-01-07	0.2768	0.4645	0.9482	0.4535	0.9333	0.6815	0.3449	0.7011	0.5637	0.8062	0.5638	0.5412	0.3078	0.4876	0.2845	0.3553	0.4878	0.6356
Legrand	2006-04-07	0.7616	0.0646	0.8871	0.1859	0.1855	0.7114	0.6145	0.1079	0.1320	0.3211	0.5859	0.1695	0.8774	0.4938	0.4447	0.6316	0.1255	0.1489
LVHM	1985-01-07	0.9180	0.6574	0.4420	0.6393	0.1080	0.2267	0.3905	0.2595	0.2914	0.3420	0.0986	0.4996	0.2747	0.3619	0.3141	0.4646	0.3312	0.4508
Michelin	1985-01-07	0.0927	0.5681	0.2960	0.1173	0.5619	0.9835	0.5489	0.5247	0.1855	0.7997	0.6850	0.0488	0.2785	0.4214	0.5557	0.4281	0.3877	0.0227
Nokia Oyj	1999-08-06	0.1517	0.8100	0.0640	0.0513	0.1602	0.2898	0.1501	0.5697	0.1054	0.4704	0.8393	0.3338	0.4666	0.5046	0.8286	0.7031	0.5422	0.2474
Orange	1997-10-20	0.1572	0.6050	0.9573	0.2085	0.7060	0.5699	0.9159	0.4605	0.0337	0.4100	0.4806	0.0300	0.4548	0.4751	0.2737	0.9660	0.5778	0.0336
Pernold Ricard	1985-01-07	0.1341	0.5053	0.8741	0.2029	0.9128	0.1191	0.6081	0.2466	0.6497	0.6718	0.2895	0.7982	0.3146	0.3554	0.5147	0.8138	0.2264	0.5398
Peugeot	1985-01-07	0.3661	0.5666	0.2347	0.4870	0.7181	0.2952	0.5091	0.9127	0.0799	0.4779	0.2690	0.0287	0.1175	0.2866	0.4136	0.1161	0.8724	0.0095
Publicis Groupe	1985-01-07	0.5373	0.8591	0.5863	0.4116	0.0846	0.4056	0.4488	0.1550	0.6528	0.8398	0.7099	0.5268	0.3779	0.2852	0.4049	0.7383	0.0924	0.7816
Renault	1998-06-17	0.4835	0.3948	0.1793	0.7811	0.8529	0.8671	0.8532	0.7609	0.0089	0.1864	0.3243	0.0010	0.4050	0.3494	0.3137	0.8256	0.7359	0.0004
Safran	1985-01-07	0.5401	0.5189	0.0588	0.2448	0.4941	0.8743	0.7539	0.5947	0.7708	0.8717	0.1938	0.8477	0.3275	0.2217	0.2322	0.5080	0.5474	0.6079
Saint Gobain	1987-01-19	0.6982	0.3535	0.3138	0.8359	0.4810	0.5383	0.2617	0.6729	0.3508	0.9392	0.9052	0.0845	0.6246	0.4232	0.6073	0.4210	0.6694	0.0682
Sanofi	1999-03-29	0.0064	0.1752	0.8524	0.0335	0.9616	0.4796	0.3969	0.6883	0.0412	0.1536	0.9469	0.0721	0.4221	0.3014	0.3615	0.1509	0.5909	0.0915
Schneider Electric	1985-01-07	0.9122	0.4759	0.2959	0.6722	0.8768	0.0741	0.2774	0.3095	0.2972	0.4930	0.7409	0.0696	0.6595	0.3414	0.5633	0.1388	0.3754	0.0293
Societe General	1987-07-06	0.6042	0.7231	0.2825	0.7403	0.8893	0.8267	0.7369	0.7511	0.7601	0.4995	0.7125	0.7829	0.2944	0.6740	0.6417	0.1007	0.6577	0.9133
Solvay	1987-01-02	0.4906	0.7941	0.9860	0.5240	0.5792	0.1844	0.4912	0.9733	0.0603	0.1266	0.6569	0.1359	0.1474	0.3258	0.4075	0.0551	0.8236	0.1030
Technip	1998-06-17	0.6201	0.1179	0.4561	0.5731	0.7706	0.1288	0.6984	0.2887	0.0485	0.1262	0.6300	0.4181	0.3534	0.3661	0.2179	0.8110	0.2731	0.2991
Total	1985-01-07	0.3091	0.2559	0.4527	0.7303	0.7353	0.8317	0.2628	0.8137	0.6699	0.6292	0.5167	0.2883	0.4235	0.3911	0.3350	0.9421	0.7529	0.2921
Unibail Rodamco	1985-01-02	0.4204	0.3329	0.3589	0.8267	0.4014	0.2367	0.8401	0.8670	0.8268	0.8113	0.6780	0.6132	0.2794	0.3555	0.3015	0.5205	0.8762	0.4317
Valeo	1985-01-07	0.8652	0.6443	0.8895	0.8119	0.5539	0.9822	0.4983	0.2427	0.7484	0.9890	0.8633	0.6380	0.3412	0.3859	0.3859	0.6303	0.2574	0.5073
Veolia																			
Environnement	2000-07-20	0.9324	0.5820	0.4416	0.6961	0.0642	0.7654	0.9707	0.1346	0.1888	0.2454	0.5700	0.2105	0.0101	0.6788	0.5297	0.0107	0.1029	0.1294
Vinci	1985-01-07	0.7380	0.9322	0.2796	0.5950	0.1510	0.1707	0.6252	0.4952	0.1366	0.2455	0.6959	0.1918	0.2305	0.2246	0.3762	0.9039	0.5576	0.0802
Vivendi	1985-01-07	0.8561	0.5557	0.1891	0.5391	0.3936	0.8058	0.3391	0.2994	0.7375	0.6457	0.7870	0.8659	0.2207	0.3297	0.3399	0.4280	0.3662	0.9803

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