The extended Friday the 13th Effect in the US stock returns

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Abstract: *The classical Friday the 13th Effect refers to a calendar anomaly of financial markets which is generated by the fear of bad luck shared by the superstitious investors. As a result of their behavior, the returns from the supposed unlucky day of Friday the 13th are significant lower than those from the other Fridays. The superstition could also affect the returns from the trading days there are adjacent to Friday the 13th. In order to avoid the bad luck, some investors sell their stocks a trading day before and their transactions lead to a fall of the prices. Those who are reluctant to buy stocks on Friday the 13th delay such transactions to the next trading day causing prices to rise. In time, the knowledge about this pattern could induce significant changes in investors' behavior, even to those that are not superstitious. Once become aware that one trading day before Friday the 13th the stock prices are usually low, many investors would prefer to sell two or three trading days before. There also were investors that would buy stocks not one trading day after Friday the 13th, when the prices are expected to be high, but two or three trading days after. Other investors could exploit the opportunities to buy cheap on Friday the 13th or one trading day before or to sell high one trading day after and their transactions could attenuate the abnormal returns from these days. In such ways the classical form of Friday the 13th Effect could be replaced by an extended form which consists in abnormal returns for a specific time interval that starts some trading days before the supposed unlucky day and ends some trading days after. This paper explores the behavior of the stock returns of 42 companies, from seven sectors of the United States economy, in the period January 2010 – March 2019, for a time interval that starts three trading days before Friday the 13th and ends three trading days after. The results indicate, for many of them, significant low returns in some trading days before Friday the 13th and/or significant high returns some trading days after. We also found some particularities of the extended Friday the 13th Effect among the seven sectors.*

Keywords: Extended calendar anomalies, US stock returns, Friday the 13th Effect

JEL: G40, G41, G14

1. Introduction

A calendar anomaly of a financial market is characterized by an abnormal behavior of the assets prices in a specific time interval. Quite often, after a calendar effect became known among the investors, their transactions, initiated in order to speculate abnormal returns or to avoid risk, induce significant changes in the assets prices behavior (Tan et al., 1998; Dimson & Marsh, 1999; Marquering et al., 2006; Olson et al., 2010). Sometimes, such transactions lead to an enlargement of the time interval associated to the calendar anomaly. In this way, the classical form of this calendar coexists with an extended form, with a larger time interval.

In this paper we approach the extended form of Friday the 13th Effect. The classical form of this calendar anomaly was revealed by the seminal paper of Kolb & Rodriguez (1987) who concluded that, on the United States capital market, the assets returns from Fridays the 13th are significant lower than those from the other Fridays. However, their findings weren't confirmed by other studies that investigated the presence of this calendar anomaly for different periods of time (see, for example: Dyl & Maberly, 1988; Chamberlain et al., 1991).

Peltomäki & Peni (2010) proposed an extended form of the Friday the 13th Effect with a specific time interval that includes, along with this supposed unlucky day, the adjacent trading days. It is presumed that superstitious investors sell the risky assets during the trading day before Friday the 13th in order to avoid the bad luck associated. Their transactions could cause a decline of the prices in that day. The next trading day after Friday the 13th, when the pessimistic expectations disappeared, investors could buy the risky assets and their transactions lead to a rise of the prices.

The time interval that starts a trading day before Friday the 13th and ends a trading day after could also be enlarged. Once the investors, superstitious or not, became aware about the relative low prices that occurred a trading day before the supposed unlucky day, they could sell the risky assets two or three trading days before Friday the 13th. The knowledge that during the trading day before the prices are relative high could make them to buy the risky assets two or three trading days after Friday the 13th (Dumitriu & Stefanescu, 2019). There also are investors who see opportunities in the abnormal returns that occur in Friday the 13th and in the adjacent trading days. They could exploit the low prices from Friday the 13th and in the trading day before by buying cheap. They could also wait for the day after Friday the 13th to sell high (Stefanescu & Dumitriu, 2018). Such transactions would probably increase prices in Friday the 13th and in the trading day before but they could decrease prices in the trading day before.

We investigate the extended Friday the 13th Effect presence with a specific time interval that starts three trading day before Friday the 13th and ends three trading day after. We study the behavior during that time interval of the stock returns of 42 companies from seven sectors of the United States economy (Consumer Cyclical, Consumer Defensive, Energy, Financial Services, Healthcare, Industrials and Technology). This investigation covers the period January 2010 – March 2019.

The rest of this paper is organized as it follows: the second part describes the data and methodology employed to investigate the presence of the extended Friday the 13th Effect, the third part presents the empirical results and the fourth part concludes.

2. Data and Methodology

2.1. Data

In this investigation about the extended form of the Friday the 13th Effect we employ daily adjusted closed values of stocks prices of 42 from seven sectors of the United States economy (the list of these companies is presented in the Table 1). The sample of data, provided by Yahoo! Finance, covers the period January 2010 – March 2019.

[Insert Table 1 about here]

For each company we compute the logarithmic stock returns ($r_{i,t}$) as:

$$r_{j,t} = [\ln(P_{j,t}) - \ln(P_{j,t-1})] \times 100 \qquad (1)$$

where $P_{j,t}$ and $P_{j,t-1}$ are the closing values of the stock price of the company j on the days t and t-1, respectively.

The descriptive statistics of the returns, reported in the Table 2, indicate that, with two exceptions, the average returns were positive. For all 36 companies, Jarque-Bera tests indicate that returns are not normal distributed.

[Insert Table 2 about here]

We analyzed the stationarity of the stock returns using Augmented Dickey – Fuller (ADF) unit root test with two variants:
- with an intercept and no trend;
- with an intercept and trend (Dickey & Fuller, 1979; Dickey & Fuller, 1981).

The numbers of lags for these tests were chosen based on the classical Akaike Information Criteria (Akaike, 1998). The results of ADF tests, summarized in the Table 3, indicate, for all 36 companies, the stock returns stationarity.

[Insert Table 3 about here]

2.2. Methodology

In this investigation, the specific time interval of the extended Friday the 13th Effect starts three trading days before Friday the 13th and ends three trading days after:

$$\left(F13_{-3}; F13_{-2}; F13_{-1}; F13; F13_{+1}; F13_{+2}; F13_{+3}\right)$$

We try to capture the behavior of the stock returns during this time interval by employing regressions with dummy variables. First, for Friday the 13th, we define the dummy variable ($DF13_{0,t}$) as:

$$DF13_{0,t} = \begin{cases} 1, \ if\ the\ day\ t\ coincides\ with \\ a\ Friday\ the\ 13^{th} \\ 0, otherwise \end{cases} \qquad (2)$$

For the days that precede Fridays the 13th we employ a category of dummy variables ($DF13_{-k,t}$) defined as:

$$DF13_{-k,t} = \begin{cases} 1, \ if\ the\ day\ t\ is\ k\ trading\ days \\ before\ \ a\ Friday\ the\ 13^{th} \\ 0, otherwise \end{cases} \qquad (3)$$

In case of the days that follow Fridays the 13th we use another category of dummy variables ($DF13_{+k,t}$) defined by the formula:

$$DF13_{+k,t} = \begin{cases} 1, \ if\ the\ day\ t\ is\ k\ working\ days \\ after\ a\ Friday\ the\ 13^{th} \\ 0, otherwise \end{cases} \qquad (4)$$

For each company we try to detect the presence of the Fridays the 13th Effect by employing the regression:

$$r_{j,t} = \mu_0 + \sum_{k=-3}^{3} \lambda_k \times DF13_{k,t} + \varepsilon_t \qquad (5)$$

where:
- μ_0 is a constant term;
- λ_k is a coefficient specific to the dummy variable DF13-/+$_k$ reflecting the influence on the returns of kth trading days before/after a Friday the 13th ($-3 \leq k \leq 3$);
- ε_t is the error term.

For the residuals of the regression we apply Breusch-Godfrey (1980) Lagrange multiplier tests and White (1980) tests. If the results indicate the presence of the serial correlations or heteroskedasticity we have to modify the standard errors and the p-values associated to the regressions coefficients using Newey-West (1994) corrections.

3. Empirical Results

The coefficients of extended Friday the 13th Effect regression for the Consumer Cyclical Sector are reported in the Table 4. For four of the six companies (DIS, HD, LOW and NKE) we found significant negative values of the λ_{-2} coefficient. For the HD returns the λ_0 coefficient has a significant negative value, while the λ_1 coefficient has a significant positive value. In the case of LOW's returns we identified a significant positive value of the λ_3 coefficient.

[Insert Table 4 about here]

The Table 5 illustrates the coefficients of the extended Friday the 13th Effect regression for the Consumer Defensive Sector. For the BGS returns the λ_{-3} coefficient has a significant negative value. For the other five companies (KO, PG, THS, WBA and WMT) we found significant positive values of the λ_{+1} coefficient. For the WBA returns the value of the λ_{+3} coefficient is significant positive.

[Insert Table 5 about here]

The results of extended Friday the 13th Effect regression for the Energy Sector are summarized in the Table 6. For three companies (DVN, MRO and SLB) we found no significant values of any coefficient. In the case of APA returns, the λ_{-1} coefficient has a significant negative value, while the λ_{+3} coefficient has a significant positive value. We also found significant positive values of the λ_{+1} coefficient in the case of CVX and XOM.

[Insert Table 6 about here]

The Table 7 presents the coefficients of the extended Friday the 13th Effect regression for the Financial Services Sector. We found that λ_0 coefficients have significant negative values in the case of two companies (AXP and GS). For three companies (AIG, JPM and TRV) the λ_3 coefficients have significant positive values. In case of TRV stock the λ_1 coefficient is also significant positive.

[Insert Table 7 about here]

The results of the extended Friday the 13th Effect regression for the Healthcare Sector are summarized in the Table 8. The λ_{-3} coefficient has significant positive values for two companies (ABT and PFE). We found significant negative values of the λ_{-2} coefficient for three companies (LLY, MRK and PFE). In the case of MRK returns the λ_{-1} coefficient has a significant positive value. For UNH returns the λ_0 coefficient has a significant negative value. We also found a significant positive value of the λ_{+1} coefficient for the ABT returns.

[Insert Table 8 about here]

The Table 9 reports the coefficients of the extended Friday the 13th Effect regression for the Industrials Sector. The λ_{-2} coefficient has significant negative values for five companies (BA, CAT, CMI, MMM and UTX). We found significant positive values of the λ_{+1} coefficient in case of two companies (MMM and NOC). For all six companies the λ_{+3} coefficient has significant positive values.

[Insert Table 9 about here]

The coefficients of the extended Friday the 13th Effect regression for the Technology Sector are presented in the Table 10. The λ_{-2} coefficient has significant negative values for two companies (AAPL and MSFT). We found significant negative values of the λ_0 coefficient for three companies (AAPL, CSCO and IBM). In the case of IBM returns the λ_{+1} coefficient has a significant positive value. For two companies (AAPL and ADBE) the λ_{+2} coefficients have significant positive values. In the case of ADBE returns the λ_{+3} coefficient has a significant positive value.

[Insert Table 10 about here]

4. Conclusions

The study of the stock prices of the 42 companies revealed many abnormal returns in the time intervals specific to Friday the 13th Effect:

- three trading days before Friday the 13th the returns of two companies were significant higher than the average (the λ_{-3} coefficient was significant positive), while for one company the returns were significant lower than the average (the λ_{-3} coefficient was significant negative);
- two trading days before Friday the 13th the returns of fourteen companies were significant lower than the average (the λ_{-2} coefficient was significant negative);
- one trading day before Friday the 13th the returns of one company were significant higher than the average (the λ_{-1} coefficient was significant positive), while for another company the returns were significant lower than the average (the λ_{-1} coefficient was significant negative);
- on Friday the 13th the returns of seven companies were significant lower than the average (the λ_0 coefficient was significant negative);
- one trading day after Friday the 13th the returns of thirteen companies were significant higher than the average (the λ_{+1} coefficient was significant positive);
- two trading days after Friday the 13th the returns of two companies were significant higher than the average (the λ_{+2} coefficient was significant positive);
- three trading days after Friday the 13th the returns of twelve companies were significant higher than the average (the λ_{+3} coefficient was significant positive).

Such results could be viewed as evidences in favour of the extended Friday the 13th Effect presence. Some investors that want to avoid risks associated to Friday the 13th could sell their stocks before the presumed unlucky day and their transactions cause the significant low returns. The superstition over the bad luck of Friday the 13th and the knowledge about the associated calendar anomaly could be responsible for the low returns from this day. Finally, after Friday the 13th had passed and the bad luck fear had disappeared, the investors bought stocks causing the returns to increase.

The results of investigation suggest there are some particularities among the US economy sectors regarding the stock returns behaviour before, during and after Friday the 13th. We found that two trading days before Friday the 13th the returns are significant lower than the average for most of the companies from Consumer Cyclical, Healthcare and Industrials Sectors. In the case of Consumer Defensive Sector, for most of the companies the returns on one trading day after Friday the 13th are significant higher than the average. On Friday the 13th the returns are significant lower than the average for a half of the companies from the Technology Sector. From a half of the companies from the Financial Services Sector we found that returns on three trading day after Friday the 13th are significant higher than the average. In the case of Energy Sector, the abnormal returns in the time interval associated to the extended Friday the 13th Effect are, comparing to other sectors, rather seldom.

It is not easy to appreciate how long there will last the abnormal returns found in this investigation. The high or low prices usually attract investors and their transactions could make disappear the extended Friday the 13th Effect.

This study could be continued with the investigation over the presence of the extended Friday the 13th Effect in other stock markets.

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Tables

Table 1. The companies and sectors involved in the investigation

Symbol	Company Name	Sector
DIS	The Walt Disney Company	Consumer Cyclical
HD	The Home Depot, Inc.	
LOW	Lowe's Companies, Inc.	
MCD	McDonald's Corporation	
NKE	NIKE, Inc.	
SBUX	Starbucks Corporation	
BGS	B&G Foods, Inc.	Consumer Defensive
KO	The Coca-Cola Company	
PG	The Procter & Gamble Company	
THS	TreeHouse Foods, Inc.	
WBA	Walgreens Boots Alliance, Inc.	
WMT	Walmart Inc.	
APA	Apache Corporation	Energy
CVX	Chevron Corp.	
DVN	Devon Energy	
MRO	Marathon Oil Corp.	
SLB	Schlumberger Ltd.	
XOM	Exxon Mobil Corp.	
AIG	American International Group	Financial Services
AXP	American Express Company	
GS	The Goldman Sachs Group, Inc.	
JPM	JPMorgan Chase & Co.	
TRV	The Travelers Companies, Inc.	
V	Visa Inc.	
ABT	Abbott Laboratories	Healthcare
JNJ	Johnson & Johnson	
LLY	Lilly (Eli) & Co.	
MRK	Merck & Co., Inc.	

PFE	Pfizer Inc.	
UNH	United Health Group Incorporated	
BA	The Boeing Company	
CAT	Caterpillar Inc.	
CMI	Cummins Inc.	
MMM	3M Company	
NOC	Northrop Grumman Corp.	
UTX	United Technologies Corporation	Industrials
AAPL	Apple Inc.	
ADBE	Adobe Systems Inc	
CSCO	Cisco Systems, Inc.	
IBM	International Business Machines Corporation	
INTC	Intel Corporation	
MSFT	Microsoft Corporation	Technology

Table 2. Descriptive statistics of the stock returns

Symbol	Mean	Median	S.D.	Min	Max	Jarque-Bera test
DIS	0.0586	0.0771	1.31	-9.62	7.35	2700.11***
HD	0.0907	0.0784	1.25	-6.07	6.21	655.754***
LOW	0.0736	0.0724	1.53	-10.7	9.92	1522.92***
MCD	0.0603	0.0824	0.98	-4.89	7.81	2970.76***
NKE	0.0829	0.0752	1.50	-9.87	11.5	7370.52***
SBUX	0.0897	0.0897	1.51	-10.8	9.47	4240.60***
BGS	0.0612	0.0993	1.93	-11.9	20.8	18983.90***
KO	0.0369	0.0501	0.94	-8.81	5.53	4054.07***
PG	0.0359	0.0314	0.92	-6.06	8.43	3581.83***
THS	0.0218	0.0792	1.94	-43.3	11.7	9802.46***
WBA	0.0321	0.0481	1.58	-15.5	11.1	8281.11***
WMT	0.0359	0.0579	1.10	-10.7	10.3	24046.8***
APA	-0.0414	0.0123	2.18	-12.2	12.4	633.45***
CVX	0.0350	0.0632	1.34	-7.84	6.14	602.34***
DVN	-0.0313	-0.0153	2.29	-12.5	13.7	1165.87***
MRO	0.0050	0.0453	2.50	-12.3	18.9	1924.46***
SLB	-0.0083	-0.0196	1.72	-9.34	8.44	540.54***
XOM	0.0197	0.0123	1.17	-6.39	5.37	795.93***
AIG	0.0281	0.0617	1.97	-17.5	15.1	7619.43***
AXP	0.0486	0.0768	1.46	-12.9	8.64	4286.72***
GS	0.0108	0.0462	1.67	-13.7	9.12	2751.32***
JPM	0.0478	0.0351	1.61	-9.89	8.10	1339.15***
TRV	0.0534	0.0824	1.13	-7.89	6.21	1843.35***
V	0.0927	0.130	1.50	-13.6	14.0	8196.34***
ABT	0.0633	0.0658	1.18	-9.75	6.29	3090.09***
JNJ	0.0454	0.0326	0.94	-10.6	5.24	8995.90***
LLY	0.0701	0.0934	1.25	-11.1	6.34	3244.00***
MRK	0.0495	0.0345	1.21	-6.85	9.90	2417.79***
PFE	0.0511	0.0290	1.15	-5.44	6.83	672.872***
UNH	0.0961	0.102	1.43	-8.30	7.76	726.733***
BA	0.0940	0.118	1.55	-9.35	9.42	1158.88***

CAT	0.0490	0.0398	1.73	-9.67	7.80	846.636***
CMI	0.0620	0.0653	1.85	-9.77	9.93	1248.70***
MMM	0.0496	0.0792	1.18	-7.08	5.74	2017.70***
NOC	0.0816	0.106	1.26	-6.98	6.00	1027.56***
UTX	0.0360	0.0545	1.24	-9.17	5.24	1944.67***
AAPL	0.0967	0.0905	1.65	-13.2	8.50	2342.03***
ADBE	0.0448	0.0507	1.59	-17.7	14.8	18040.80***
CSCO	0.0151	0.0305	1.24	-8.64	8.49	38381.10***
IBM	0.0541	0.0627	1.53	-9.54	10.0	4592.13***
INTC	0.0680	0.0459	1.45	-12.1	9.94	1500.10***
MSFT	0.0360	0.0545	1.24	-9.17	5.24	4188.88***

Note: *** means significant at 0.01 level.

Table 3. ADF tests on the returns

Symbol	Test without constant		Test with constant	
	Number of lags	Test statistic	Number of lags	Test statistic
DIS	4	-23.614***	4	-23.767***
HD	5	-19.721***	5	-20.093***
LOW	3	-24.807***	3	-24.954***
MCD	4	22.425***	4	-22.718***
NKE	3	-26.649***	3	-26.895***
SBUX	2	-30.209***	2	-30.435***
BGS	2	-29.157***	2	-29.209***
KO	4	-22.675***	4	-22.797***
PG	3	-25.671***	3	-25.774***
THS	1	-34.988***	1	-34.987***
WBA	1	-35.511***	1	-35.526***
WMT	2	-28.471***	2	-28.530***
APA	5	-19.028***	5	-19.049***
CVX	5	-20.483***	5	-20.524***
DVN	1	-33.898***	1	-33.902***
MRO	1	-33.749***	1	-33.742***
SLB	5	-22.065***	5	-22.064***
XOM	4	-23.568***	4	-23.583***
AIG	4	-22.844***	4	-22.855***
AXP	4	-22.594***	5	-21.098***
GS	1	-33.667***	1	-33.661***
JPM	2	-28.469***	2	-28.513***
TRV	2	-28.029***	2	-28.174***
V	4	-24.089***	4	-24.432***
ABT	1	-35.285***	1	-35.433***
JNJ	3	-24.693***	3	-24.846***
LLY	2	-28.794***	2	-28.984***
MRK	1	-34.888***	1	-34.968***
PFE	1	-34.613***	1	-34.706***
UNH	3	-25.571***	3	-25.853***
BA	1	-34.203***	4	-23.378***

CAT	4	-22.547***	4	-22.591***
CMI	4	-23.978***	4	-24.039***
MMM	4	-23.409***	4	-23.538***
NOC	1	-32.727***	1	-32.915***
UTX	1	-34.434***	1	-34.470***
AAPL	3	-23.900***	3	-24.100***
ADBE	1	-35.618***	1	-35.739***
CSCO	3	-25.070***	3	-25.114***
IBM	1	-33.992***	1	-33.993***
INTC	1	-34.837***	1	-34.897***
MSFT	4	-23.604***	4	-23.775***

Note: *** means significant at 0.01 level.

Table 4. Results of the extended Friday the 13th Effect regression for the Consumer Cyclical Sector

Coefficient	DIS	HD	LOW	MCD	NKE	SBUX
μ_0	0.058** (0.028)	0.086*** (0.027)	0.071** (0.033)	0.059*** (0.021)	0.085*** (0.032)	0.085*** (0.032)
λ_{-3}	0.037 (0.334)	0.045 (0.381)	0.237 (0.603)	0.045 (0.232)	−0.112 (0.346)	0.176 (0.501)
λ_{-2}	−0.962* (0.577)	−0.469** (0.183)	−0.523** (0.243)	−0.249 (0.307)	−1.049*** (0.371)	−0.256 (0.430)
λ_{-1}	0.163 (0.345)	0.084 (0.272)	0.027 (0.339)	0.223 (0.391)	0.290 (0.375)	0.377 (0.362)
λ_0	−0.005 (0.300)	−0.425** (0.215)	−0.327 (0.206)	−0.156 (0.236)	−0.261 (0.348)	−0.145 (0.305)
λ_{+1}	0.078 (0.211)	0.418* (0.214)	0.065 (0.371)	0.158 (0.212)	0.155 (0.268)	−0.526 (0.362)
λ_{+2}	0.505 (0.386)	0.505 (0.488)	0.002 (0.211)	0.051 (0.211)	0.263 (0.278)	0.241 (0.271)
λ_{+3}	0.263 (0.273)	0.522 (0.395)	0.855* (0.454)	0.093 (0.245)	0.432 (0.433)	0.766 (0.520)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 5. Results of the extended Friday the 13th Effect regression for the Consumer Defensive Sector

Coefficient	BGS	KO	PG	THS	WBA	WMT
μ_0	0.061 (0.041)	0.034* (0.020)	0.032 (0.020)	0.026 (0.042)	0.017 (0.033)	0.034 (0.023)
λ_{-3}	−0.576* (0.317)	0.204 (0.298)	−0.049 (0.331)	−0.069 (0.411)	0.117 (0.270)	0.345 (0.312)
λ_{-2}	0.172 (0.466)	−0.341 (0.278)	−0.161 (0.117)	−0.280 (0.402)	0.335 (0.563)	−0.507 (0.385)

λ_{-1}	0.124 (0.329)	−0.209 (0.215)	0.069 (0.260)	−0.276 (0.323)	0.246 (0.434)	−0.116 (0.292)
λ_{0}	−0.178 (0.434)	−0.181 (0.165)	0.093 (0.220)	−0.383 (0.379)	−0.380 (0.396)	−0.188 (0.289)
λ_{+1}	0.644 (0.525)	0.330* (0.180)	0.492* (0.299)	0.593** (0.250)	0.965* (0.579)	0.606* (0.321)
λ_{+2}	0.382 (0.332)	0.214 (0.212)	0.011 (0.309)	0.062 (0.627)	0.173 (0.392)	0.311 (0.299)
λ_{+3}	−0.481 (0.787)	0.333 (0.341)	0.098 (0.236)	−0.281 (0.483)	0.724** (0.361)	−0.171 (0.250)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 6. Results of the extended Friday the 13th Effect regression for the Energy Sector

Coefficient	APA	CVX	DVN	MRO	SLB	XOM
μ_{0}	−0.039 (0.047)	0.032 (0.029)	−0.041 (0.049)	−0.004 (0.054)	−0.017 (0.036)	0.015 (0.025)
λ_{-3}	−0.683 (0.491)	0.169 (0.334)	0.528 (0.408)	0.322 (0.302)	0.357 (0.600)	−0.036 (0.303)
λ_{-2}	−1.076 (0.726)	−0.553 (0.417)	−0.442 (1.053)	−0.472 (0.971)	−0.494 (0.400)	−0.260 (0.396)
λ_{-1}	−0.477* (0.284)	−0.090 (0.237)	−0.517 (0.372)	0.219 (0.501)	0.039 (0.332)	−0.052 (0.252)
λ_{0}	0.251 (0.439)	−0.073 (0.325)	0.377 (0.400)	0.254 (0.425)	−0.230 (0.467)	0.048 (0.257)
λ_{+1}	0.462 (0.331)	0.618*** (0.178)	0.690 (0.540)	0.397 (0.505)	0.366 (0.423)	0.625* (0.362)
λ_{+2}	0.267 (0.531)	−0.069 (0.253)	0.151 (0.421)	−0.026 (0.437)	0.380 (0.652)	−0.097 (0.296)
λ_{+3}	0.841* (0.434)	0.472 (0.555)	0.613 (0.734)	0.552 (0.512)	0.802 (0.511)	0.379 (0.339)

Notes: Standard errors are within round brackets; *** and * mean significant at 0.01 and 0.1 levels, respectively.

Table 7. Results of the extended Friday the 13th Effect regression for the Financial Services Sector

Coefficient	AIG	AXP	GS	JPM	TRV	V
μ_{0}	0.020 (0.042)	0.048 (0.031)	0.003 (0.035)	0.045 (0.034)	0.046* (0.024)	0.082*** (0.032)
λ_{-3}	−0.044 (0.355)	0.120 (0.314)	0.539 (0.477)	0.264 (0.322)	0.098 (0.290)	0.143 (0.486)
λ_{-2}	−0.309 (0.303)	−0.301 (0.337)	−0.178 (0.397)	−0.397 (0.327)	−0.184 (0.313)	−0.127 (0.522)

λ_{-1}	0.173 (0.501)	−0.389 (0.334)	0.169 (0.563)	0.048 (0.412)	0.199 (0.249)	0.509 (0.538)
λ_{0}	−0.046 (0.483)	−0.392** (0.156)	−0.656* (0.372)	−0.537 (0.377)	−0.190 (0.281)	−0.026 (0.380)
λ_{+1}	0.489 (0.434)	0.417 (0.291)	0.469 (0.432)	0.091 (0.538)	0.606** (0.254)	0.373 (0.295)
λ_{+2}	0.352 (0.392)	0.193 (0.277)	0.023 (0.377)	0.253 (0.432)	0.019 (0.218)	0.359 (0.349)
λ_{+3}	0.590* (0.338)	0.506 (0.357)	0.763 (0.500)	0.622** (0.310)	0.531** (0.266)	0.267 (0.284)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 8. Results of the extended Friday the 13th Effect regression for the Healthcare Sector

Coefficient	ABT	JNJ	LLY	MRK	PFE	UNH
μ_{0}	0.053** (0.025)	0.044** (0.020)	0.062** (0.027)	0.044* (0.026)	0.049** (0.025)	0.096*** (0.030)
λ_{-3}	0.477* (0.268)	0.143 (0.217)	0.430 (0.421)	0.039 (0.348)	0.410* (0.222)	0.057 (0.330)
λ_{-2}	−0.351 (0.398)	−0.247 (0.284)	−0.460** (0.210)	−0.423*** (0.158)	−0.693** (0.280)	−0.598 (0.587)
λ_{-1}	0.062 (0.244)	−0.203 (0.239)	0.286 (0.316)	0.491* (0.277)	0.268 (0.394)	−0.338 (0.333)
λ_{0}	−0.024 (0.231)	−0.256 (0.241)	−0.006 (0.206)	−0.116 (0.128)	−0.129 (0.124)	−0.300** (0.127)
λ_{+1}	0.520** (0.207)	0.252 (0.286)	0.503 (0.358)	0.380 (0.340)	0.107 (0.253)	0.448 (0.418)
λ_{+2}	0.030 (0.316)	0.340 (0.335)	−0.164 (0.269)	0.132 (0.258)	0.113 (0.324)	0.300 (0.518)
λ_{+3}	0.742 (0.485)	0.127 (0.307)	0.532 (0.414)	0.327 (0.344)	0.212 (0.253)	0.399 (0.393)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 9. Results of the extended Friday the 13th Effect regression for the Industrials Sector

Coefficient	BA	CAT	CMI	MMM	NOC	UTX
μ_{0}	0.089*** (0.033)	0.043 (0.037)	0.060 (0.039)	0.045* (0.025)	0.075*** (0.027)	0.034 (0.026)
λ_{-3}	0.123 (0.456)	0.328 (0.474)	−0.044 (0.816)	−0.217 (0.360)	−0.160 (0.279)	−0.059 (0.312)
λ_{-2}	−0.899** (0.385)	−0.795** (0.326)	−1.489** (0.707)	−0.441** (0.213)	−0.602 (0.390)	−0.499* (0.280)

λ_{-1}	0.301 (0.280)	0.047 (0.569)	0.224 (0.462)	0.163 (0.370)	0.508 (0.318)	0.365 (0.430)
λ_0	−0.075 (0.324)	0.231 (0.345)	0.111 (0.531)	−0.236 (0.260)	−0.278 (0.350)	−0.383 (0.425)
λ_{+1}	0.387 (0.441)	0.266 (0.292)	0.347 (0.317)	0.503*** (0.184)	0.559** (0.282)	0.415 (0.369)
λ_{+2}	0.407 (0.320)	−0.126 (0.416)	0.126 (0.411)	0.276 (0.339)	0.279 (0.339)	0.143 (0.252)
λ_{+3}	0.449** (0.210)	0.961** (0.378)	1.053*** (0.332)	0.609** (0.307)	0.703*** (0.187)	0.322* (0.195)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 10. Results of the extended Friday the 13th Effect regression for the Technology Sector

Coefficient	AAPL	ADBE	CSCO	IBM	INTC	MSFT
μ_0	0.105*** (0.035)	0.065* (0.037)	0.048 (0.033)	0.012 (0.026)	0.048 (0.032)	0.066** (0.031)
λ_{-3}	−0.410 (0.473)	0.295 (0.478)	−0.014 (0.658)	0.006 (0.399)	−0.159 (0.539)	−0.263 (0.499)
λ_{-2}	−0.983*** (0.369)	0.019 (0.383)	−0.441 (0.449)	−0.196 (0.274)	−0.297 (0.379)	−0.423* (0.249)
λ_{-1}	−0.096 (0.402)	0.264 (0.623)	−0.612 (0.784)	−0.018 (0.323)	−0.097 (0.487)	−0.015 (0.631)
λ_0	−0.789** (0.383)	0.668 (0.727)	−0.847** (0.423)	−0.351* (0.183)	0.268 (0.552)	0.235 (0.504)
λ_{+1}	0.071 (0.554)	−0.498 (0.709)	0.551 (0.596)	0.471* (0.243)	0.391 (0.295)	0.210 (0.254)
λ_{+2}	0.687** (0.347)	0.747** (0.290)	0.382 (0.344)	0.082 (0.310)	0.229 (0.338)	0.172 (0.305)
λ_{+3}	0.272 (0.382)	1.425* (0.743)	0.491 (0.344)	0.494 (0.579)	0.559 (0.378)	0.375 (0.251)

Notes: Standard errors are within round brackets; ***, ** and * mean significant at 0.01, 0.05, and 0.1 levels, respectively.