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The Groundhog Day stock market anomaly

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Highlights

- The US stock market reacts to the Groundhog Day prognostications
- Returns are 2.78% higher around early spring rather than long winter "predictions"
- Findings are robust in subsamples, to calendar anomaly controls and placebo tests
- Results imply irrational optimism of superstitious investors

Abstract

This paper discovers a distinct calendar anomaly on the US stock market associated with the Groundhog Day prognostication tradition across 1928-2021. There are significant positive abnormal returns around the "prediction" of an early spring, while buy-and-hold returns around the "prediction" of a long winter are 2.78% lower. The results are robust in subsamples, to a set of placebo tests for international stock indices, and cannot be explained by January effect, the "Halloween Indicator", turn-of-the-month effect, or other seasonalities. The findings imply major and persistent irrational optimism of US investors revolving around Groundhog Day early spring prognostications.

Keywords: stock market; stock market anomaly; behavioural finance; Groundhog Day

JEL codes: G14, G41

Introduction and Literature Review

Since the 1970s, researchers in empirical finance have found a plethora of statistically significant seasonal regularities in stock returns that are at odds with the efficient market hypothesis. The over-expanding list of calendar anomalies includes, among others, Monday, Friday, January, turn-of-the-month, holiday, and "Sell in May and go away" effects (Thaler, 1987a; Thaler, 1987b; Bouman and Jacobsen, 2002). While Friday, turn-of-the-month, and holiday effects have been documented as relatively robust and consistent across emerging and developed markets (Jaffe and Westerfield, 1985; Cadsby and Ratner, 1992; Kayacetin and Lekpek, 2016), others, most notably Monday effect, other day-of-the-week, and Halloween effects, are more sporadic across countries and time periods or are a result of data mining (Jaffe and Westerfield, 1985; Dubois and Louvet, 1996; Keef et al., 2000; Dichtl and Drobetz, 2014; Zhang et al., 2017). More recent studies have shown that, consistent with the adaptive market hypothesis, calendar anomalies are slowly disappearing with time as they are arbitraged away by investors subject to increased awareness (Plastun et al., 2019; Shanaev and Ghimire, 2021).

However, the empirical behavioural finance literature highlights that calendar anomalies might be more nuanced, conditional on investor mood or sentiment, and country-specific. As such, Abu Bakar et al. (2014) use direct mood proxies from social media to find compelling evidence that Monday effect can be explained by a more pessimistic attitude of investors at the beginning of a new working week, while Teng and Yang (2018) document domestic investor sentiment plays an important role at shaping the China-specific Lunar New Year anomaly. A voluminous body of literature in a similar tradition investigates calendar anomalies associated with Islamic Middle Eastern markets, where mood, sentiment, and festive uncertainty are shown to condition abnormal returns and volatility during Ramadan (Al-Hajjeh et al., 2011; Al-Khazali, 2014) and pilgrimage to Mecca (Abbes and Abdelhedi-

Zouch, 2015; Wasiuzzaman, 2017). Furthermore, investor mood and its impact on the stock markets have been strongly associated with weather- and climate-related variables such as cloudiness, nighttime hours, and daylight-saving practices in the United States and internationally (Kamstra et al., 2000; Hirshleifer and Shumway, 2003; Kamstra et al., 2003; Garrett et al., 2005; Symeonidis et al., 2010).

This study seeks to contribute to the calendar anomalies and empirical behavioural finance literature by investigating a United States-specific stock market anomaly associated with the Groundhog Day which has not been documented in prior research. The Groundhog Day is a long-standing North American custom. Since 1887, a ceremony has been held every 2nd February at Punxsutawney, Pennsylvania. A groundhog named Phil emerges from his burrow, and a group of "inner circle" members of the Punxsutawney Groundhog Club running the event interpret whether Phil sees his shadow or not, with the verdict considered to be a prognostication of a long winter or an early spring, respectively (Yoder, 2003). While such a "prediction" is broadly accepted to be a superstition and obviously revealing no useful information with regards to either the weather (Ross et al., 2021) or, all the more so, to the stock market, the Groundhog Day is an important staple of mass culture in the United States, with approximately 40,000 people attending the annual celebrations in a small Pennsylvania town of population less than six thousand, and with even a cult 1993 film inspired by the festivity (Yoder, 2003). The Groundhog Day as a metaphor for something both repetitive and puzzling has been utilised in finance research narratives, in the context of stock market forecasting (Neal and Trzcinska, 2015), experiment design in behavioural economics (Loewenstein, 1999), and models of learning (Thaler, 2000), however no studies so far have investigated the financial implications of the tradition itself. Furthermore, superstitions have been shown to have prominent country-specific stock market effects, be it lucky numbers in China (Hirshleifer et al., 2018) or Friday the 13th on European markets (Lucey, 2000).

Therefore, as the Groundhog Day represents a unique combination of sentiment, superstition, and weather phenomena, an investigation of its relationship with the stock market is undoubtedly warranted.

The rest of the paper is structured as follows. First, the Groundhog Day track record data, the event study and dummy variable regression methodology, as well as the robustness checks are outlined. Next, the findings of the study are presented and discussed in the context of stock market anomalies and behavioural finance. The final section concludes.

Material and Methods

The study has collected the historical record of all Punxsutawney Phil Groundhog Day prognostications from 1928 until 2021, totalling 92 "predictions" (there were no regular Groundhog Day prognostications in the wartime years of 1942 and 1943). While the record is available from 1887 onwards, the S&P 500 index data is available only starting in 1928. Out of 92 observations considered, Phil has seen his shadow 74 times and has not seen it 18 times, corresponding to the respective number of long winter and early spring prognostications. While there exist many other groundhogs engaging in similar activities, for example Essex Ed and Dunkirk Dave, this study opts to use the data from Punxsutawney Phil as he is the most famous and is publicly perceived as one of the most accurate (Aaron et al., 2001), which is important for investor sentiment and mood considerations, and has the longest track record (Ross et al., 2021), thus enabling sufficient sample size and statistical power for hypothesis testing. The full sample of Phil's prognostications is available in Table 1 below.

Table 1. Punxsutawney Phil "predictions" (1928-2021).

Year	Prediction	Year	Prediction	Year	Prediction	Year	Prediction
1928	Long winter	1953	Long winter	1976	Long winter	1999	Early spring
1929	Long winter	1954	Long winter	1977	Long winter	2000	Long winter

1930	Long winter	1955	Early spring	1978	Long winter	2001	Long winter
1931	Long winter	1956	Long winter	1979	Long winter	2002	Long winter
1932	Long winter	1957	Long winter	1980	Long winter	2003	Long winter
1933	Long winter	1958	Long winter	1981	Long winter	2004	Long winter
1934	Early spring	1959	Long winter	1982	Long winter	2005	Long winter
1935	Long winter	1960	Long winter	1983	Early spring	2006	Long winter
1936	Long winter	1961	Long winter	1984	Long winter	2007	Early spring
1937	Long winter	1962	Long winter	1985	Long winter	2008	Long winter
1938	Long winter	1963	Long winter	1986	Early spring	2009	Long winter
1939	Long winter	1964	Long winter	1987	Long winter	2010	Long winter
1940	Long winter	1965	Long winter	1988	Early spring	2011	Early spring
1941	Long winter	1966	Long winter	1989	Long winter	2012	Long winter
1944	Long winter	1967	Long winter	1990	Early spring	2013	Early spring
1945	Long winter	1968	Long winter	1991	Long winter	2014	Long winter
1946	Long winter	1969	Long winter	1992	Long winter	2015	Long winter
1947	Long winter	1970	Early spring	1993	Long winter	2016	Early spring
1948	Long winter	1971	Long winter	1994	Long winter	2017	Long winter
1949	Long winter	1972	Long winter	1995	Early spring	2018	Long winter
1950	Early spring	1973	Long winter	1996	Long winter	2019	Early spring
1951	Long winter	1974	Long winter	1997	Early spring	2020	Early spring
1952	Long winter	1975	Early spring	1998	Long winter	2021	Long winter

To assess the impact of the Groundhog Day on the US stock market, this study first resorts to conventional event studies as in MacKinlay (1997), calculating buy-and-hold abnormal returns of an S&P 500 quasi-portfolio from a constant return model around the long winter and early spring prognostications (2nd February, or the next trading day after 2nd February if it is a weekend, for all years when Punxsutawney Phil issued a prognostication), assessing the statistical significance of abnormal returns and of the difference between early spring and long winter abnormal returns. All results stem from the constant return framework as there does not exist an international stock market benchmark of adequate quality and sample size to cover most of this study's estimation period (1928-2021) for market adjusted or CAPM regressions.

This study utilises [-1;1], [-10;-1], [1;10], [-10;10], [-30;-1], [1;30], and [-30;30] windows. The selection of a 30-day windows around the event is dictated by existing conventions in the literature as well as, more importantly, by the Groundhog Day lore: the legend states that a long winter prognostication results in spring arriving no earlier than in six weeks (corresponding to 30 trading days).

Next, average daily abnormal returns around the Groundhog Day are estimated via dummy variable regression models, which also allow to control for other calendar anomalies and account for a wide range of conditional heteroskedasticity effects:

$$R_t = \mu + \beta_1 GD_t + \varepsilon_t(0, \sigma^2) \tag{1}$$

$$R_t = \mu + \beta_1 GD_t + \beta_2 M_t + \beta_3 F_t + \beta_4 J_t + \beta_5 ToM_t + \beta_6 H_t + \beta_7 SiM_t + \varepsilon_t(0, \sigma^2) \tag{2}$$

$$\begin{gathered} R_t = \mu + \beta_1 GD_t + \beta_2 M_t + \beta_3 F_t + \beta_4 J_t + \beta_5 ToM_t + \beta_6 H_t + \beta_7 SiM_t + \lambda v_t^2 + \varepsilon_t(0, v_t^2) \\ v_t^\delta = \omega + \alpha(|\varepsilon_{t-1}| + \theta\varepsilon_{t-1})^\delta + \beta v_{t-1}^\delta + u_t \end{gathered} \tag{3}$$

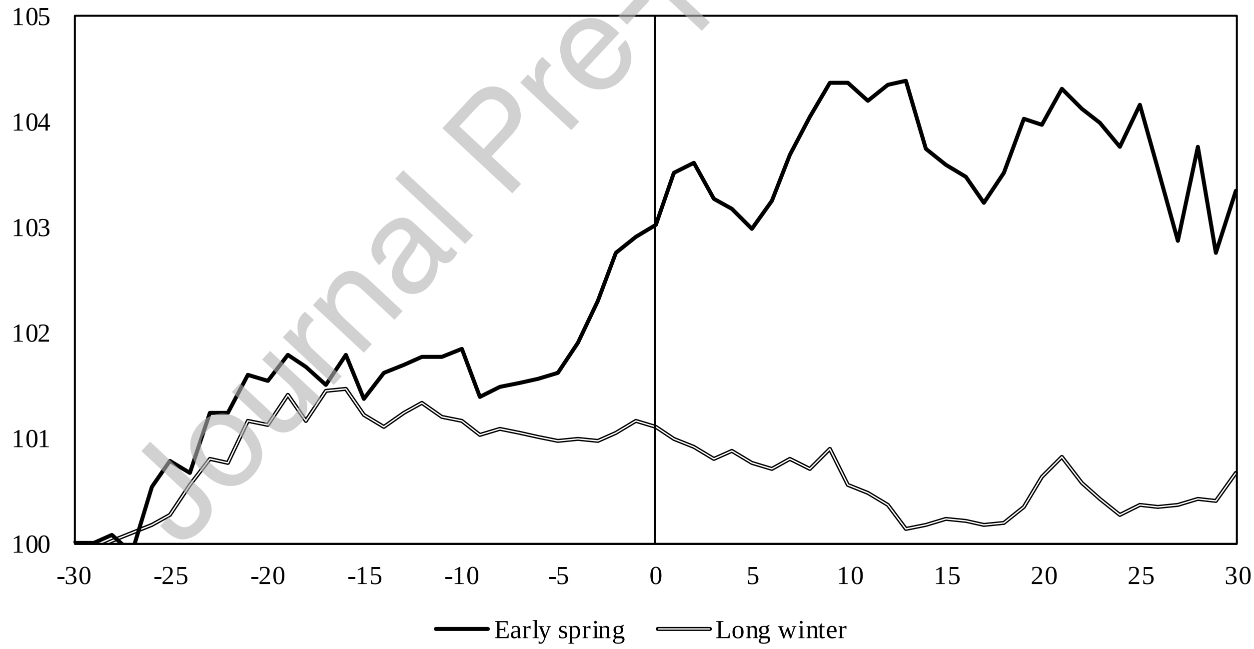
Where R_t is the return of the stock market index on day t; GD_t is the dummy variable equal to one or minus one in [-10;10] and [0;10] windows around the Groundhog Day if the prognostication implies early spring or long winter; M_t, F_t, J_t, ToM_t, H_t, and SiM_t are dummy variables controlling for Monday, Friday, January, turn-of-the-month, holiday, and Halloween ("Sell in May and go away") effects, respectively; μ is the intercept and β_i are the dummy variable coefficients, with the significance and sign of β_1 assessing the impact of Groundhog Day prognostications on the stock market. Equation 3 accounts for a generalised conditional heteroskedasticity pattern with time-varying risk premia in an APARCH-M framework as in Bollerslev et al. (1988) and Ding et al. (1993) for additional robustness.

Reflecting the disappearance of calendar anomalies highlighted in prior literature (Plastun et al., 2019; Shanaev and Ghimire, 2021), this study checks for the consistency of the findings by applying Equation 2 in 1928-1974 and 1975-2021 subsamples. Finally, to confirm the association of the obtained results with the impact of the Groundhog Day on the US-specific investor sentiment, this study runs placebo tests, estimating Equation 2 for the full history of stock market index returns for the United Kingdom, Australia, Germany, France, and Japan. Data and code for all estimations are available upon request.

Findings and Discussion

This study first visualises the buy-and-hold abnormal returns of S&P 500 quasi-portfolios around long winter and early spring prognostications (see Figure 1 below). Graphically, it is apparent that returns diverge around ten trading days prior to the Groundhog Day, with an early spring prognostication associated with stronger performance before levelling off roughly two weeks after the prognostication. This observation has dictated the choice of the [-10;10] and [0;10] windows for dummy variable regressions. Notably, long winter abnormal returns around the event day are negative, albeit quite small in magnitude. Buy-and-hold abnormal return charts for 1928-1974, 1975-2021, and 2000-2021 subsamples are available in the Appendix.

Figure 1. Buy-and-hold abnormal returns around the Groundhog Day (1928-2021).



Next, the significance of the buy-and-hold abnormal returns as well as their differences in various event window is tested. All tables report standard errors in parentheses and p-values in italics, with *, **, and *** denoting results significant at 10%, 5%, and 1%, respectively. Table 2 below shows robustly significant positive abnormal returns associated with an early spring prognostication. Statistical significance is amplified when the difference of early spring and long winter performance is considered. Long winter abnormal returns are negative in most of the windows, albeit insignificant, implying that the anomaly is associated with investor optimism after an early spring prognostication and not with investor pessimism subsequent to a long winter prognostication. Alternatively, as early spring prognostications have historically been four times less frequent, a superstitious or sentimental investor believing that Groundhog Day prognostications reveal important information would update their prior more strongly after the realisation of a rarer outcome, resulting in a naturally stronger early spring effect. Overall, the stock market appreciates by 1.85% more during the first two trading weeks after an early spring "prediction", the result statistically significant at 1% with a t-statistic higher than four. The difference remains significant over the [-30; 30] window, totalling 2.78%. A quite puzzling finding is a positive and significant anticipation effect for early spring prognostications, with the difference in abnormal returns two weeks before the announcement equalling 1.15%. It is unlikely to be a statistical artifact as similar patterns emerge in subsamples (see Appendix). Two potential explanations involve informed trading by the inner circle members or a weather-related strategy that can be utilised by rational investors aware of the superstition. The informed trading explanation is less plausible: first, such niche insider trading activity would unlikely cause material movements on a generally efficient stock market, and second, since going long on the market is less costly than going short, insiders would be more tempted to interpret Phil's prognostications in favour of the early spring, while the reverse is true historically. The alternative explanation requires honest prognostication interpretations and enough rational investors who are aware of the Groundhog Day superstition. As the visibility of Phil's shadow can depend on the cloudiness in Punxsutawney on 2nd February, a rational investor could use weather forecasts in advance to anticipate what the likely outcome would be and predict the irrational reaction of superstitious investors. Weather considerations emphasised in prior research cannot explain the results alone as cloudier weather would be associated with lower, not higher returns (Hirshleifer and Shumway, 2003). Therefore, the documented anomaly is shown to be indeed associated with the Groundhog Day.

Table 2. Buy-and-hold abnormal returns around the Groundhog Day "predictions".

Event window	[-1; 1]	[-10; -1]	[1; 10]	[-10; 10]	[-30; -1]	[1; 30]	[-30; 30]
Early spring	0.7289**	1.1030*	1.2998*	2.5384**	3.0421**	0.3026	3.4762**
	(0.3416)	(0.6237)	(0.6237)	(0.9039)	(1.0803)	(1.0803)	(1.5405)
	0.0478	*0.0949*	*0.0526*	*0.0121*	*0.0119*	*0.7828*	*0.0375*
Long winter	-0.0552	-0.0433	-0.5386	-0.6438	1.1616*	-0.4204	0.6734
	(0.2017)	(0.3682)	(0.3682)	(0.5336)	(0.6378)	(0.6378)	(0.9095)
	0.7851	*0.9067*	*0.1478*	*0.2315*	*0.0727*	*0.5119*	*0.4614*
Difference	0.7838***	1.1475**	1.8467***	3.2017***	1.8575**	0.7250	2.7816**
	(0.2346)	(0.4283)	(0.4283)	(0.6207)	(0.7419)	(0.7419)	(1.0579)
	0.0034	*0.0148*	*0.0004*	*0.0001*	*0.0216*	*0.3407*	*0.0165*

Notes: Standard errors reported in parentheses and p-values presented in italics. ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively.

Next, the daily average abnormal returns during the [-10; 10] and [0; 10] windows around the Groundhog Day are studied in a dummy variable regression framework. Table 3 below highlights that daily S&P 500 returns are 4.96 (7.03) basis points higher around (after) an early spring rather than long winter prognostication, which increases to 6.36 (7.06) basis points per day significant when controlled for other notable calendar anomalies – Monday, Friday, January, turn-of-the-month, holiday, and Halloween effects, with all results statistically significant. The findings are robust to time-varying risk premia and conditional heteroskedasticity, with APARCH-M normalised returns showing daily S&P 500 performance is (0.0355) 0.0470 conditional standard deviations higher around an early spring rather than long winter prognostication when (not) controlled for other stock market seasonality, which increases to 0.0568 and 0.0592 when only the post-prognostication window is considered. While the abnormal returns are slightly lower in 1975-2021 compared to 1928-1974, the statistical significance of the [-10; 10] result is maintained, implying that the Groundhog Day anomaly is consistent and relatively stable through time. In the [0; 10] window, the abnormal returns only become significant in the 1975-2021 subsample, showing that the Groundhog Day anomaly cannot be explained by more remote stock market behaviour and is still a relevant phenomenon.

Table 3. Groundhog Day average abnormal returns: regression estimates.

Model	Baseline results 1928-2021		APARCH-M model 1928-2021		Subsamples	
					1928-1974	1975-2021
AAR [-10;10]	0.0496**	0.0636***	0.0355**	0.0470***	0.0730*	0.0536*
	(0.0234)	(0.0243)	(0.0164)	(0.0170)	(0.0421)	(0.0299)
	0.0338	*0.0089*	*0.0304*	*0.0058*	*0.0832*	*0.0732*
AAR [0;10]	0.0703**	0.0706**	0.0568**	0.0592***	0.0506	0.0744*
	(0.0326)	(0.0330)	(0.0226)	(0.0228)	(0.0571)	(0.0395)
	0.0311	*0.0321*	*0.0119*	*0.0095*	*0.3756*	*0.0595*
Controls	no	yes	no	yes	yes	yes

Notes: Standard errors reported in parentheses and p-values presented in italics. ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively.

Finally, to eliminate the possibility of the documented effect being associated with unknown seasonal anomalies unrelated to the Groundhog Day or that the effect is subsumed by international market movements, a placebo test is performed on five stock market indices of countries that do not have such a tradition: the United Kingdom, Australia, Germany, France, and Japan (see Table 4 below). Results are insignificant in all five placebo tests for both specifications, emphasising that the anomaly is US-specific and is indeed driven by the Groundhog Day superstition and related sentiment effects.

Table 4. Placebo test: absence of Groundhog Day effects on international stock markets.

Country	UK	Australia	Germany	France	Japan
AAR [-10;10]	-0.0106	0.0269	0.0006	0.0187	-0.0287
	(0.0357)	(0.0384)	(0.0470)	(0.0469)	(0.0305)
	0.7662	*0.4828*	*0.9898*	*0.6905*	*0.3466*
AAR [0;10]	0.0022	0.0608	-0.0168	0.0154	-0.0489
	(0.0460)	(0.0484)	(0.0643)	(0.0652)	(0.0414)
	0.9611	*0.2087*	*0.7946*	*0.8138*	*0.2375*

Notes: Standard errors reported in parentheses and p-values presented in italics.

Conclusion

This study has discovered a new calendar anomaly on the United States stock market associated with the prognostications of Punxsutawney Phil on the Groundhog Day. Across 1928-2021, the S&P 500 substantially appreciated subsequent to Phil's "prediction" of an early spring, while the returns were moderately negative after he "predicted" a long winter. The difference in buy-and-hold abnormal returns two weeks after the Groundhog Day is a statistically and economically significant 1.85%, establishing the importance of the Groundhog Day superstition to investor sentiment and market performance. There is a seemingly puzzling positive anticipation effect to an early spring prognostication equalling 1.14% over the two weeks prior to the announcement that implies either informed trading or, more likely, rational investors exploiting their awareness of the superstition and weather forecasts. The results are robust in subsamples, when controlled for a wide range of other calendar anomalies, as well as to time-varying risk premia and conditional heteroskedasticity.

The findings have implications for academics and stock market participants. For individual and institutional investors, this study has identified an exotic yet moderately profitable trading strategy. For empirical finance researchers, it has highlighted the nuanced idiosyncratic nature and persistence of calendar anomalies, showing that country-specific superstitions can have notable market-specific effects. While some anomalies can have no explanations consistent with the efficient market hypothesis – like Friday the 13th effect or, indeed, the Groundhog Day effect established in this paper – they seem to exist, hence the market truly is *that* irrational.

Further research could augment the perspective of this study by incorporating the track record of other prognosticating groundhogs besides Phil into the developed framework and, more importantly, by investigating the impact of other cultural superstitions on national and international financial markets.

CRediT author statement:

Savva Shanaev: conceptualisation; writing – original draft; methodology; software; data curation; investigation; supervision

Arina Shuraeva: conceptualisation; writing – original draft; writing – review and editing; project administration

Svetlana Fedorova: conceptualisation; writing – review and editing; investigation; visualisation

References

Aaron, M., Boyd, B., Curtis, M., & Sommers, P. (2001). Punxsutawney's Phenomenal Phorecaster. *The College Mathematics Journal, 32*(1), 26-29.

Abbes, M., & Abdelhedi-Zouch, M. (2015). Does hajj pilgrimage affect the Islamic investor sentiment? *Research in International Business and Finance, 35*(1), 138-152.

Abu Bakar, A., Siganos, A., & Vagenas-Nanos, E. (2014). Does mood explain the Monday effect? *Journal of Forecasting, 33*(6), 409-418.

Al-Hajieh, H., Redhead, K., & Rodgers, T. (2011). Investor sentiment and calendar anomaly effects: A case study of the impact of Ramadan on Islamic Middle Eastern markets. *Research in International Business and Finance, 25*(3), 345-356.

Al-Khazali, O. (2014). Revisiting fast profit investor sentiment and stock returns during Ramadan. *International Review of Financial Analysis, 33*(1), 158-170.

Bollerslev, T., Engle, R., & Wooldridge, J. (1988). A capital asset pricing model with time-varying covariances. *Journal of Political Economy, 96*(1), 116-131.

Bouman, S., & Jacobsen, B. (2002). The Halloween indicator, “Sell in May and go away”: Another puzzle. *American Economic Review, 92*(5), 1618-1635.

Cadsby, C., & Ratner, M. (1992). Turn-of-month and pre-holiday effects on stock returns: Some international evidence. *Journal of Banking & Finance, 16*(3), 497-509.

Dichtl, H., & Drobetz, W. (2014). Are stock markets really so inefficient? The case of the "Halloween Indicator". *Finance Research Letters, 11*(2), 112-121.

Ding, Z., Granger, C., & Engle, R. (1993). A long memory property of stock market returns and a new model. *Journal of Empirical Finance, 1*(1), 83-106.

Dubois, M., & Louvet, P. (1996). The day-of-the-week effect: The international evidence. *Journal of Banking & Finance, 20*(9), 1463-1484.

Jaffe, J., & Westerfield, R. (1985). The week-end effect in common stock returns: The international evidence. *The Journal of Finance, 40*(2), 433-454.

Garrett, I., Kamstra, M., & Kramer, L. (2005). Winter blues and time variation in the price of risk. *Journal of Empirical Finance, 12*(2), 291-316.

Hirshleifer, D., Jian, M., & Zhang, H. (2018). Superstition and financial decision making. *Management Science, 64*(1), 235-252.

Hirshleifer, D., & Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *The Journal of Finance*, *58*(3), 1009-1032.

Kamstra, M., Kramer, L., & Levi, M. (2000). Losing sleep at the market: The daylight saving anomaly. *American Economic Review, 90*(4), 1005-1011.

Kamstra, M., Kramer, L., & Levi, M. (2003). Winter blues: A SAD stock market cycle. *American Economic Review, 93*(1), 324-343.

Kayacetin, V., & Lekpek, S. (2016). Turn-of-the-month effect: New evidence from an emerging stock market. *Finance Research Letters, 18*(1), 142-157.

Keef, S., Khaled, M., & Zhu, H. (2009). The dynamics of the Monday effect in international stock indices. *International Review of Financial Analysis, 18*(3), 125-133.

Loewenstein, G. (1999). Experimental economics from the vantage-point of behavioural economics. *The Economic Journal, 109*(453), 25-34.

Lucey, B. (2000). Friday the 13th and the philosophical basis of financial economics. *Journal of Economics and Finance, 24*(3), 294-301.

MacKinlay, A. (1997). Event studies in economics and finance. *Journal of Economic Literature, 35*(1), 13-39.

Neal, R., & Trzcinka, C. (2015). Financial markets 2016: The Groundhog forecast. *Indiana Business Review, 90*(4), 6-8.

Plastun, A., Sibande, X., Gupta, R., & Wohar, M. (2019). Rise and fall of calendar anomalies over a century. *The North American Journal of Economics and Finance*, *49*(1), 181-205.

Ross, A., Grow, R., Hayhurst, L., MacLeod, H., McKee, G., Stratton, K., ... & Rennie, M. (2021). Broadscale assessment of groundhog (*Marmota monax*) predictions of spring onset no better than chance. *Weather, Climate, and Society*, *13*(3), 503-510.

Shanaev, S., & Ghimire, B. (2021). Efficient scholars: academic attention and the disappearance of anomalies. *European Journal of Finance, 27*(3), 278-304.

Symeonidis, L., Daskalakis, G., & Markellos, R. (2010). Does the weather affect stock market volatility? *Finance Research Letters, 7*(4), 214-223.

Teng, C., & Yang, J. (2018). Chinese Lunar New Year effect, investor sentiment, and market deregulation. *Finance Research Letters, 27*(1), 175-184.

Thaler, R. (1987a). Anomalies: the January effect. *Journal of Economic Perspectives, 1*(1), 197-201.

Thaler, R. (1987b). Anomalies: weekend, holiday, turn of the month, and intraday effects. *Journal of Economic Perspectives, 1*(2), 169-177.

Thaler, R. (2000). From homo economicus to homo sapiens. *Journal of Economic Perspectives, 14*(1), 133-141.

Wasiuzzaman, S. (2017). Religious anomalies in Islamic stock markets: The Hajj effect in Saudi Arabia. *Journal of Asset Management*, *18*(3), 157-162.

Yoder, D. (2003). *Groundhog Day*. Stackpole Books.

Zhang, J., Lai, Y., & Lin, J. (2017). The day-of-the-week effects of stock markets in different countries. *Finance Research Letters, 20*(1), 47-62.

Appendix: Robustness test: results in subsamples.

Figure A.1. Buy-and-hold abnormal returns around the Groundhog Day (1928-1974).

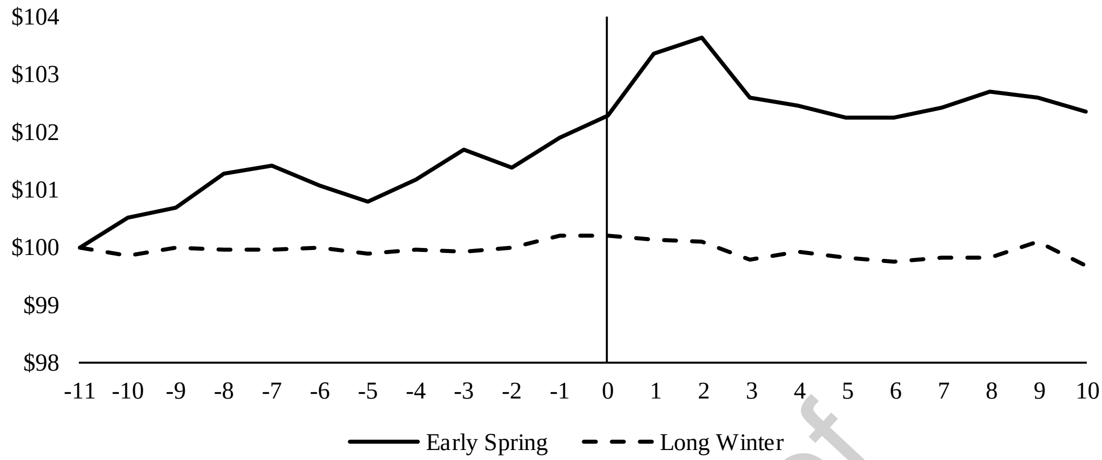


Figure A.2. Buy-and-hold abnormal returns around the Groundhog Day (1975-2021).

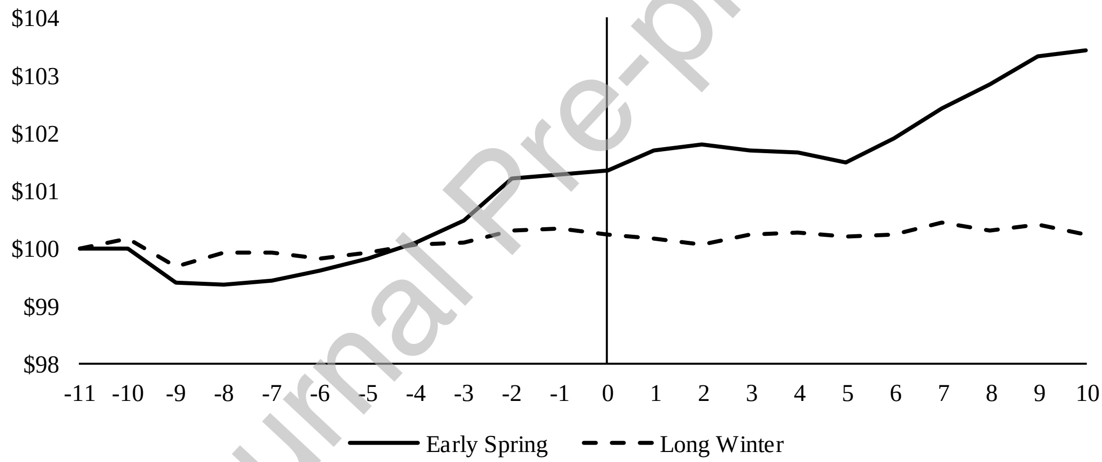


Figure A.3. Buy-and-hold abnormal returns around the Groundhog Day (2000-2021).