Journal of Financial Economics xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

Time-varying demand for lottery: Speculation ahead of earnings announcements[☆]

Bibo Liu[a], Huijun Wang[b,c], Jianfeng Yu[a,*], Shen Zhao[d]

[a] PBCSF, Tsinghua University, 43 Chengfu Road, Haidian District, Beijing 100083, China
[b] Faculty of Business and Economics, University of Melbourne, Level 11, 198 Berkeley Street, Carlton, VIC 3053, Australia
[c] Harbert College of Business, Auburn University, 405 W. Magnolia Ave. Auburn, AL 36849, United States
[d] School of Management and Economics, Chinese University of Hong Kong (Shenzhen), 2001 Longxiang Blvd, Longgang District, Shenzhen, China

ARTICLE INFO

Article history:
Received 16 January 2019
Revised 6 November 2019
Accepted 8 November 2019
Available online xxx

JEL classification:
G12
G14

Keywords:
Speculation
Lottery
Earnings announcements
Skewness

ABSTRACT

Investor preferences for holding speculative assets are likely to be more pronounced ahead of firms' earnings announcements, probably because of lower inventory costs and immediate payoffs or because of enhanced investor attention. We show that the demand for lottery-like stocks is stronger ahead of earnings announcements, leading to a price run-up for these stocks. In sharp contrast to the standard underperformance of lottery-like stocks, lottery-like stocks outperform non-lottery stocks by about 52 basis points in the 5-day window ahead of earnings announcements. However, this return spread is reversed by 80 basis points in the 5-day window after the announcements. Moreover, this inverted-V-shaped pattern on cumulative return spreads is more pronounced among firms with a greater retail order imbalance, among firms with low institutional ownership, and in regions with a stronger gambling propensity, and it is also robust after controlling for past 12-month returns and various proxies for investor attention.

1. Introduction

Many studies find that investors exhibit a preference for speculative assets, and thus these assets tend to be overvalued on a

investhat

☆ We thank Zhuo Chen, Jay Coughenour, Zhiguo He, Shiyang Huang (discussant), Peter Kelly (discussant), Xiaoxia Lou, Christopher Malloy, Ron Masulis, Veronika Pool (discussant), Avanidhar Subrahmanyam (referee), and seminar participants at Auburn University, Federal Reserve Bank of Richmond, Shanghai Advanced Institute of Finance, University of Arkansas, University of Central Florida, University of Delaware, University of Melbourne, University of Missouri, University of New Mexico, University of New South Wales, University of Technology Sydney, University of Tennessee, University of Texas at San Antonio, 2017 China International Conference in Finance, University of Oregon Summer Finance Conference, and 2019 American Finance Association annual meeting for helpful comments and discussions. Yu acknowledges financial support from the National Natural Science Foundation of China (Grant no. 71790591).

* Corresponding author.
E-mail addresses: liubb@pbcsf.tsinghua.edu.cn (B. Liu), hzw0101@auburn.edu (H. Wang), yujf@pbcsf.tsinghua.edu.cn (J. Yu), shenzhao@cuhk.edu.cn (S. Zhao).

are especially good for speculation, the excess demand for these stocks should be notably higher especially before earnings announcements. In addition, since earnings announcement events tend to grab retail investors' attention and lottery stocks are traded predominantly by retail investors, the attention-driven demand for lottery stocks could increase prior to earnings announcements.[2] Moreover, because of inventory and idiosyncratic volatility concerns

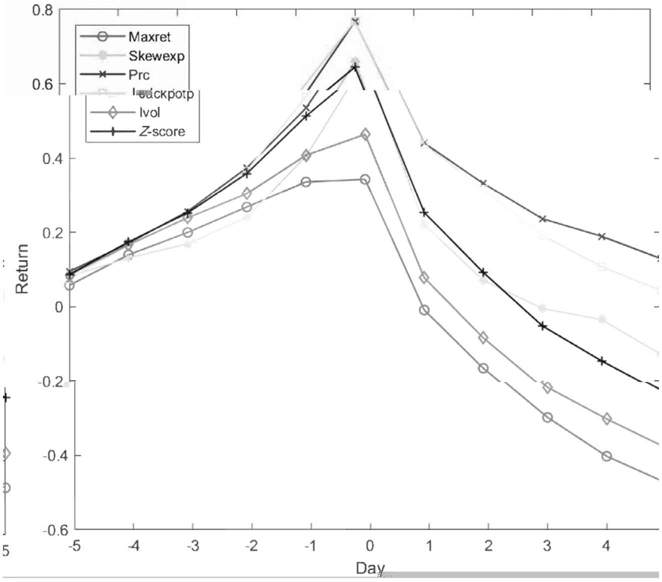

Fig. 1. Event-time lottery portfolio excess returns over 11 trading days. This figure plots the cumulative buy-and-hold hedge portfolio returns (in percentages) during the (−5,+5) event window centered at the earnings announcement date. Each quarter, firms with earnings announcements are divided into five portfolios based on each of six lottery proxies from the month prior to the announcements. If the earnings announcement date is in the first ten trading days of a month, we lag one more month and use the lottery proxies from two months prior to the announcements. For each day during the (−5,+5) event window for each portfolio, we calculate the equal-weighted average buy-and-hold excess returns (in excess of the value-weighted return of the CRSP index) accumulated starting from day −5. We plot the difference in the average returns between the top and bottom quintile lottery portfolios. We consider six lottery proxies: Maxret, Skewexp, Prc, Jackpotp, Ivol, and *Z*-score. Maxret is the maximum daily return; Skewexp is the expected idiosyncratic skewness from Boyer et al. (2010); Prc is the negative log of one plus stock price (i.e., $Prc = -log(1 + \text{Price})$); Jackpotp is the predicted jackpot probability from Conrad et al. (2014); Ivol is idiosyncratic volatility from Ang et al. (2006); *Z*-score is a composite *Z*-score based on the previous five lottery proxies. Detailed variaB TD -.0226 Tc J /ostoiaB TD -.0226 Tc 5 0 TD .0001 Tc [(Pr)14(c,)]TJ /F2 1 Tf 1.67(definitions( )Tj /F4 1 Tf 431 0 TD .0003 Tc [(Eac)10.7(h)75

subdued afterward, suggesting a stronger demand for these lottery-like assets ahead of earnings news.

Kumar et al. (2011) argue that gambling preferences should be stronger in regions with a higher concentration of Catholics relative to Protestants since the Catholic religion is more tolerant of gambling behavior. Indeed, they show that investors located in regions with a higher Catholic-Protestant ratio (CPRATIO) exhibit a stronger propensity to hold stocks with lottery features. Thus, if our positive lottery return spread ahead of earnings announcements is driven by the excess demand from investors with gambling preferences, we should expect that this positive lottery spread is higher for firms located in high CPRATIO regions where local speculative demand is expected to be stronger because of local bias. Using Fama–MacBeth regression analysis, we indeed confirm this hypothesis.

Using data from 38 countries, we also explore the cross-country variation in the pre-announcement lottery premium documented in this study. In particular, we investigate the pattern in our lottery return spreads around earnings announcements for 38 countries. We find that among countries with a stronger preference for lottery (i.e., countries with high stock market turnover), the pre-announcement lottery premium is much stronger than that among countries with a weaker preference for lottery, consistent with the intrinsic preference channel.

Since individuals tend to exhibit stronger preferences for lottery-like stocks, we expect this inverted-V-shaped pattern on cumulative lottery return spreads to be more pronounced among firms with lower institutional ownership. In addition, lower institutional ownership more severely impedes arbitrage forces, and thus the price run-up for lottery-like stocks ahead of earnings announcements is also expected to be stronger among this group of stocks. Indeed, we find that the inverted-V-shaped pattern is stronger among firms with lower institutional ownership, although it is still significant among firms with higher institutional ownership.

Lastly, since the lottery-like stocks can outperform non-lottery stocks ahead of earnings announcements, by taking this fact into account, one could improve the traditional strategy that bets against lottery-like stocks. In particular, we should bet for lottery-like stocks ahead of earnings news and revert to the traditional betting-against-lottery strategy during other times. We show that this new strategy improves substantially upon the standard betting-against-lottery strategy. In particular, the monthly strategy return is improved from 1.0[illegible]% to 1.50% for the composite lottery proxy.

In terms of related literature, our paper is related to a long list of papers on lottery-related anomalies. A large strand of literature documents that lottery-like assets have low subsequent returns. Boyer et al. (2010) find that expected idiosyncratic skewness and future returns are negatively correlated. Bali et al. (2011) show that maximum daily returns in the previous month are negatively associated with future returns.[7] More recently,

[7] Bali et al. (2011) and Bali et al. (2017) argue that preferences for lottery-like stocks can also account for the puzzle that firms with low volatility and low beta tend to earn higher risk-adjusted

Jackpotp: Conrad et al. (2014)

more likely to gamble before earnings announcements, then they might tend to trade more OTM calls than during other periods as well. To capture this sentiment, we examine the adjusted daily volume and implied volatility for all short-term OTM call options expiring in the following month. An option is defined as OTM if its strike price to stock price ratio is greater than 1.05. We remove options with nonstandard settlement, options that violate basic arbitrage conditions, and options with zero open interest, missing bid, or offer prices. After applying these filters, for each stock at each day, we aggregate the trading volume for all of its valid short-term OTM calls. The adjusted volume is then computed as the percentage change in daily volume from its past 3-month moving average to remove the upward time trend of the trading volume. Lastly, we average the adjusted volume across all stocks for each event day. Similarly, we average the implied volatility across all valid short-term OTM calls for each stock on each day and then average across all stocks for each event day.

The option abnormal retail order imbalance measure is computed using data from the ISE Open/Close Trade Profile from 2008 to 2014.[15] The ISE data contain daily information about buy and sell trading volumes for each option traded at the ISE disaggregated by different customer types (market maker, firm, customer, and professional customer), different size brackets (small, medium, and large), whether the trade is to open new positions or close existing positions (open buy, open sell, close

Table 1
Summary statistics.

This table reports the summary statistics for our sample of firm-quarter observations. $EXRET(-1,+1)$, $EXRET(-5,-1)$, and $EXRET(+1,+5)$ are the buy-and-hold excess returns for (−1,+1), (−5,−1), (+1,+5) three relevant earnings announcement window periods, respectively, with day 0 referring to the earnings announcement date. The excess return is the difference between stock return and the return of the value-weighted CRSP index. ME is the market value of equity in millions, and MB is ME divided by the book value of equity, both measured at the end of the prior fiscal quarter. Momentum ($MOM(-12,-1)$) is cumulative stock returns over the past year, skipping one month. Turnover is monthly trading volume divided by the number of shares outstanding. To address the issue of double counting of volume for Nasdaq stocks, we follow Anderson and Dyl (2005) and scale down the volume of Nasdaq stocks by 50% before 1997 and 38% after 1997 to make it roughly comparable to the volume on the NYSE. We consider six lottery proxies: Maxret is the maximum daily return, Skewexp is the expected idiosyncratic skewness from Boyer et al. (2010), Price is the month-end stock price, Jackpotp is the predicted jackpot probability from Conrad et al. (2014), and Ivol is the standard deviation of daily residual returns relative to the Fama and French (1993) three-factor model from Ang et al. (2006). The *Z*-score is a composite *Z*-score based on the previous five lottery proxies. Detailed variable definitions are described in the appendix. We exclude stocks with a price of less than $1 per share at the end of the month prior to the earnings announcements. All continuous variables (except returns) are winsorized cross-sectionally at the 1st and 99th percentiles. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014 except for Skewexp which is from 1988 to 2014. Variables are reported in percentages except for ME, MB, Skewexp, Price, and *Z*-score.

	Mean	Std	Q1	Median	Q3
EXRET(−1,+1)	0.204	8.708	−3.384	−0.075	3.414
EXRET(−5, −1)	0.331	7.819	−3.128	−0.113	3.093
EXRET(+1,+5)	−0.170	8973	−3944	−0.409	3.171
ME	1496.112	5707.589	39.791	151.830	684.693
MB	2.862	4.492	1.026	1.672	2923
MOM(−12, −1)	0.167	0.733	−0.178	0.067	0.346
Turnover	7.432	10.078	1.631	3938	9.078
Maxret	6.869	5.865	3.150	5.128	8.499
Skewexp	0.750	0.598	0.332	0.653	1.092
Price	19.505	18.312	6.375	14.375	26.750
Jackpotp	1.818	3.071	0.534	1.052	1989
Ivol	2.612	1915	1.303	2.061	3.305
Z-score	−0.059	0.838	−0.764	−0.112	0.612

and

return

$EXRET(+1,+5)$ are the buy-and-hold excess returns for the (−1,+1), (−5,−1), and (+1,+5) earnings announcements window periods, respectively, with day 0 referring to the earnings announcement date. The excess return is the difference between **the**

1

Table 2
Pre-event and post-event portfolio returns.
Each quarter, firms with earnings announcements in that quarter are sorted into five portfolios based on each of six lottery

clean measure of post-event performance, we focus on the (+1,+5) post-event window. In the robustness checks section, we use an alternative definition of the earnings announcement date based on the day of highest relative trading volume following Engelberg et al. (2018) and show that our results remain quantitatively similar.[21] Further, in untabulated tests, we find similar results if we use (0, +5) as our post-event window or (−5, 0) as our pre-event window.

Further, to make sure that the patterns we discovered are specific to earnings announcements, rather than a general phenomenon for any date, we compare the announcement period returns to the non-announcement period using a placebo test based on "pseudo-event" dates. In particular, we repeat our portfolio analysis in Panel A.1 and Panel B.1 using randomly selected non-announcement dates. Following So and Wang (2014), pseudo-announcement dates are chosen from a baseline period relative to the actual announcement dates by subtracting a randomly selected number of days that is drawn from a uniform distribution from ten to 40 days. We skip ten days from the actual announcement dates to avoid the scenario that the post-event period of the pseudo-announcement dates overlaps with the pre-event period of the actual-announcement dates. Panel A.2 and Panel B.2 report the results for these "pseudo-announcement" portfolios. Lottery-like stocks generally earn similar returns to non-lottery stocks. More importantly, Panel A.3 and Panel B.3 compare the "actual-announcement" and "pseudo-announcement" portfolios and report their differences. All the difference-in-differences are significant with the right sign during both pre-event and post-event periods, in both a statistical and economical sense.

Fig. 1 plots the difference in the cumulative buy-and-hold excess returns between top and bottom quintile portfolios based on lottery proxies over the (-5,+5) 11 trading days centered around the earnings announcement dates. In particular, we calculate equal-weighted average buy-and-hold excess returns accumulated starting from day −5. We plot the difference in the average returns between the top and the bottom quintile lottery portfolios. For all six lottery proxies, the returns of these hedge portfolios start to increase five days prior to the event date and then decrease immediately after the event, with the biggest drop happening on the date right after the event. Further, a similar pattern holds if we use the (−10,+10) 21 trading days event window, as shown in Fig. 2. In sum, we provide information on when the overvaluation of lottery-like stocks occurs in the first place, whereas most prior studies focus on the subsequent reversals of lottery-like stocks.

We have documented an inverted-V-shaped cumulative return spread based on lottery proxies before and after earnings announcements in Fig. 1. [illegible] might think that the more intense speculative trading behavior may also hold for other anomaly characteristics, and thus there is

[21] As another robustness check, in untabulated tests, we repeat the analysis using the earlier of the IBES earnings announcement and Compustat earnings announcement dates as the

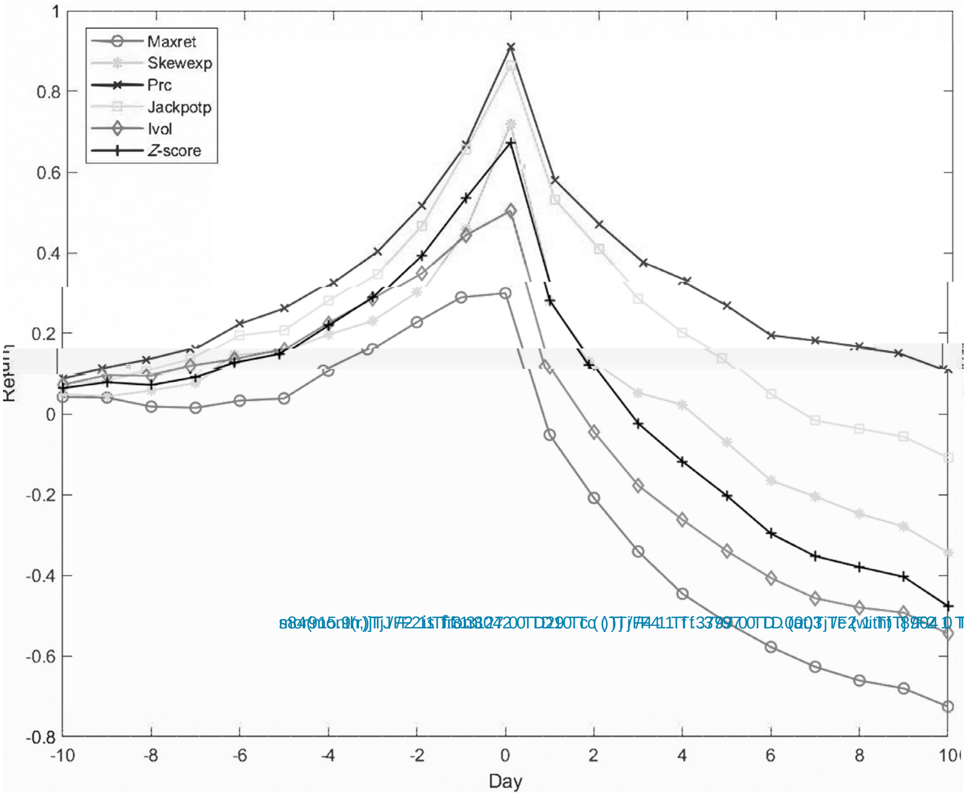

Fig. 2. Event-time lottery portfolio excess returns over 21 trading days. This figure plots the cumulative buy-and-hold hedge portfolio returns (in percentages) during the (−10,+10) event window centered at the earnings announcement date. Each quarter, firms with earnings announcements are divided into five portfolios based on each of six lottery proxies from the month prior to the announcements. If the earnings announcement date is in the first ten trading days of a month, we lag one more month and use the lottery proxies from two months prior to the announcements. For each day during the (−10,+10) event window for each portfolio, we calculate the equal-weighted average buy-and-hold excess returns (in excess of the value-weighted return of the CRSP index) accumulated starting from day −10. We plot the difference in the average returns between the top and bottom quintile lottery portfolios. Lottery proxies are defined as in Fig e

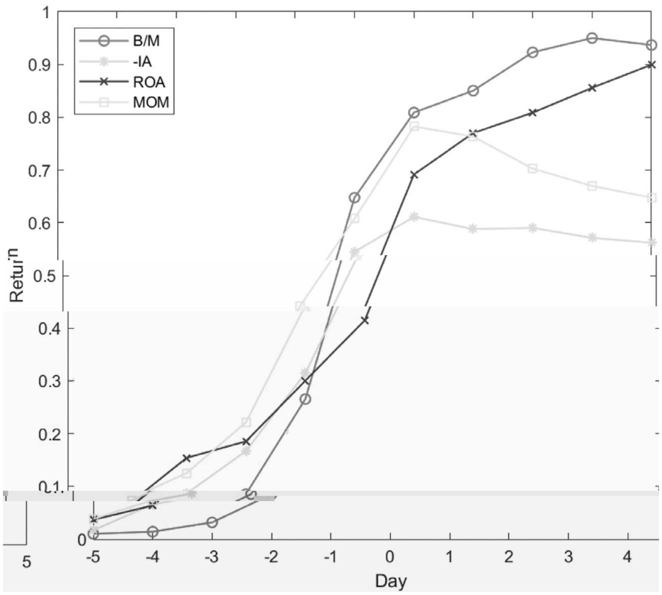

Fig. 3. Event-time portfolio excess returns over 11 trading days. This figure plots the cumulative buy-and-hold hedge portfolio returns (in percentages) during the (−5,+5) event window centered at the earnings announcement date. Each quarter, firms with earnings announcements are divided into five portfolios based on each of four proxies from the month prior to the announcements: book-to-market equity (B/M), momentum (MOM), profitability (ROA), and the opposite of investment-to-assets (-IA). If the earnings announcement date is in the first ten trading days of a month, we lag one more month and use the proxies from two months prior to the announcements. For each day during the (−5,+5) event window for each portfolio, we calculate the equal-weighted average buy-and-hold excess returns (in excess of the value-weighted return of the CRSP index) accumulated starting from day −5, and plot the difference in the average returns between the top and bottom quintile portfolios. BM is the book value of equity divided by market value at the end of the last fiscal year. MOM is the cumulative stock return over the past year, skipping one month. ROA is quarterly earnings divided by total assets in the previous quarter. IA is the annual change in total assets divided by total assets in the previous year. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014.

investors when firms fail to announce on the expected announcement date. As a result, the stock prices before announcements tend to partially reflect the unfavorable news. Thus, combining early, on-time, and late announcers together on the actual announcement date is likely to overstate the announcement-period premia. However, the mechanism above is likely to bias against us finding the outperformance of lottery stocks over non-lottery stocks before earnings announcements for the following reasons. First, as shown in Table A1 in the Online Appendix, lottery-like stocks on average tend to have worse earnings news (i.e., negative earnings surprises) compared with non-lottery stocks, and **thus** lottery-like stocks tend to be later announcers rather than earlier announcers. For later announcers, the average more negative news is somewhat anticipated, thus reducing its pre-announcement returns. Thus, the

Table 3
Fama–MacBeth regressions.

Every quarter, we run two cross-sectional regressions of (−5,−1) pre-event excess returns (Panel A) and (+1,+5) post-event returns (Panel B) on lagged variables. If the announcement date is in the first ten trading days of a month, we lag one more month for the control The time-series average of the regression coefficients is reported. Excess returns are defined relative to the value-weighted CRSP index and in percentages. LogMB is the log of market-to-book equity, LogME is the log of market equity, $MOM(-1,0)$ is the return in the last month, $MOM(-12,-1)$ is the return over the past year with a one-month gap, and $MOM(-36,-12)$ is the cumulative return over past three years with a gap. Past turnover is measured as monthly trading volume divided by number of shares outstanding. To address the issue of double counting of volume for Nasdaq stocks, we follow Anderson and Dyl (2005) and scale down the volume of Nasdaq stocks by 50% before 1997 and 38% after 1997 to make it roughly comparable to the volume on the NYSE. Lottery proxies are defined in Table 1 The intercept of the regression is not reported. Independent variables (except returns) are winsorized at their cross-sectional 1st and 99th percentiles. The sample is the same as in Table 2. The *t*-statistics based on the heteroskedasticity-consistent standard errors of White (1980).

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel A: (−5,−1) Pre-event regression						
Proxy	1.279	0.317	0.199	6.811	4.078	0.180
	(2.48)	(4.50)	(4.32)	(3.09)	(2.34)	(3.53)
LogMB	−0.019	0.000	−0.015	−0.024	−0.019	−0.028
	(−0.60)	(0.01)	(−0.49)	(−0.79)	(−0.62)	(−0.93)
LogME	−0.097	−0.042	−0.046	−0.079	−0.091	−0.052
	(−6.80)	(−2.55)	(−3.50)	(−5.06)	(−6.65)	(−3.74)
MOM(−1,0)	−0.567	−0.458	−0.374	−0.470	−0.487	−0.483
	(−2.91)	(−2.12)	(−2.11)	(−2.66)	(−2.71)	(−2.67)
MOM(−12,−1)	0.471	0.245	0.526	0.467	0.474	0.509
	(6.78)	(3.15)	(8.11)	(6.77)	(6.90)	(7.66)
MOM(−36,−12)	−0.075	−0.046	−0.054	−0.056	−0.073	−0.064
	(−3.15)	(−1.78)	(−2.42)	(−2.57)	(−3.09)	(−2.88)
Turnover	−1.007	1.960	−0.801	−0.854	−1.059	−1.238
	(−1.57)	(3.55)	(−1.28)	(−1.32)	(−1.64)	(−2.05)
Panel B: (+1,+5) Post-event regression						
Proxy	−2.971	−0.603	−0.350	−11.870	−9.717	−0.339
	(−5.01)	(−7.74)	(−7.78)	(−4.05)	(−4.9)	(−6.63)
LogMB	−0.138	−0.164	−0.135	−0.132	−0.134	−0.112
	(−4.29)	(−4.48)	(−4.14)	(−3.88)	(−4.16)	(−3.58)
LogME	0.082	0.015	−0.009	0.084	0.073	−0.005
	(5.86)	(0.76)	(−0.67)	(5.19)	(5.54)	(−0.34)
MOM(-1,0)	−0.446	−0.537	−0.957	−0.759	−0.684	−0.666
	(−2.71)	(−2.89)	(−6.61)	(−4.94)	(−4.54)	(−4.37)
MOM(−12,−1)	−0.156	−0.274	−0.238	−0.184	−0.149	−0.194
	(−2.79)	(−4.12)	(−4.4)	(−3.2)	(−2.7)	(−3.55)
MOM(−36,−12)	0.012	0.019	−0.039	0.009	0.010	−0.007
	(0.45)	(0.73)	(−1.56)	(0.33)	(0.41)	(−0.29)
Turnover	−2.377	−2.097	−2.757	−2.679	−2.304	−2.002
	(−4.56)	(−4.16)	(−5.2)	(−4.87)	(−4.32)	(−4.02)

5-day return tends to decrease by an even larger amount of 0.28%.

In sum, the evidence based on both the portfolio-sorting approach and Fama–MacBeth regressions is consistent with the notion that investors are especially attracted to lottery-like stocks before earnings announcements, which generates positive lottery spreads that are in the opposite direction from the traditional lottery anomalies.

4. Inspecting the mechanisms

In this section, we provide further evidence of investors' gambling behavior before earnings announcements. In particular, we will present results controlling for past 12-month stock returns and various proxies for investor attention, as well as results from the retail order imbalance and the trading behavior on the options market. In addition, we will also perform robustness checks based on variation in religious beliefs in gambling propensity and based on 38 international markets.

4.1. Evidence from attention proxies

In a related paper, Trueman et al. (2003) document an economically large abnormal return over the 5-day window prior to Internet stocks' earnings announcements from 1998 to 2000. More important, Aboody et al. (2010) document that stocks with the strongest prior 12month returns experience a significant average marketadjusted return of 1.58% during the five trading days before their earnings announcements and a significant average marketadjusted return of −1.86% in the five trading days after the announcements. In addition, they show that during the preannouncement period, past winners experience a significant positive abnormal retail order imbalance. In the postannouncement period, the positive abnormal retail order imbalances disappear. They argue that this pattern is due to the attention-grabbing feature of past extreme winners, especially before earnings announcements.

Since the return patterns for lottery stocks and past extreme winners are similar around earnings announcements, it is important to show that our results are not driven by the extreme winners. In Table 4, we perform

Table 4
Pre-event and post-event portfolio returns, controlling for past 12-month returns.

This table reports our portfolio excess returns controlling for past 12-month returns in Aboody et al. (2010). Panel A reports the past 12-month return-adjusted portfolio spreads. Each quarter, firms with earnings announcements in that quarter are first sorted into ten deciles according to their past 12-month returns; within each decile, stocks are then sorted into five groups according to each of the six lottery proxies from the month prior to the announcement date; and finally we collapse across the past 12-month return groups and obtain five past 12-month return-adjusted lottery portfolios. Panel B excludes the top decile past 12-month return stocks and sorts firms with earnings announcements each quarter into five portfolios based on each of six lottery proxies from the month prior to the announcement date. Lottery proxies are defined as in Table 1. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014 except for Skewexp which is from 1988 to 2014. Excess returns are reported in percentages. The *t*-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980). We only report the top and bottom quintile lottery portfolios and their difference to save space.

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel A: Conditional double sort						
			Panel A.1: (−5,−1) Pre-event excess return			
Q1	0.189	0.213	0.096	0.114	0.117	0.094
Q5	0.441	0.630	0.756	0.713	0.506	0.627
Q5–Q1	0.253	0.417	0.661	0.599	0.389	0.533
t-stat	(3.53)	(4.65)	(8.39)	(7.17)	(5.27)	(6.46)
			Panel A.2: (+1,+5) Post-event excess return			
Q1	0.106	0.096	0.094	0.092	0.114	0.146
Q5	−0.469	−0.550	−0.403	−0.458	−0.445	−0.472
Q5–Q1	−0.575	−0.647	−0.497	−0.550	−0.559	−0.618
t-stat	(−7.82)	(−6.49)	(−6.26)	(−6.24)	(−7.14)	(−7.25)
Panel B: Excluding top decile winner stocks						
			Panel B.1: (−5,−1) Pre-event excess return			
Q1	0.102	0.129	0.087	0.054	0.084	0.054
Q5	0.371	0.573	0.649	0.590	0.424	0.513
Q5–Q1	0.269	0.444	0.562	0.536	0.339	0.459
t-stat	(2.85)	(3.77)	(5.83)	(4.82)	(3.27)	(4.25)
			Panel B.2: (+1,+5) Post-event excess return			
Q1	0.127	0.170	0.163	0.127	0.141	0.170
Q5	−0.473	−0.563	−0.396	−0.475	−0.456	−0.502
Q5-Q1	−0.600	−0.732	−0.559	−0.601	−0.597	−0.671
t-stat	(−6.18)	(−5.72)	(−5.76)	(−5.37)	(−5.75)	(−5.99)

two tests to address this issue. First, Panel A performs a double-sorting exercise to control for the effect of previous returns. In particular, each quarter, firms with earnings announcements in that quarter are first sorted into ten deciles according to their past 12-month return; within each decile, stocks are then sorted into five groups according to each one of the six lottery proxies from the month prior to the announcement date; and finally we collapse across the past 12-month return groups and obtain five past 12-month return-adjusted lottery portfolios. We find that after controlling for past returns, the average return spread between lottery and non-lottery stocks (using the composite lottery index *z*-score) before earnings announcements is still 53.3 basis points, a magnitude similar to our original unconditional spread of 52 basis points.[24] Second, in Panel B, we repeat our univariate lottery portfolio test within the subsample that excludes the top 10% of firms with the highest past 12-month returns. Our results remain largely the same. The average return spread between lottery and non-lottery stocks before earnings announcements is still 459 basis points. In addition, controlling for past returns, the post-event results also remain similar. In particular, the average return spreads between lottery and non-lottery stocks (using the composite lottery index *z*-score) after earnings announcements is still -62 basis points, a magnitude slightly smaller than the original unconditional spread of -80 basis points.

Although the

[24] In untabulated results, we find that the return spreads are statistically significant within all of the ten past 12-month returns deciles.

Table 5
Pre-event and post-event portfolio returns conditional on media coverage.

This table compares our event portfolio pattern conditional on whether the stock has media coverage during the (−5,−1) pre-event window. Each quarter, firms with earnings announcements in that quarter are sorted into five portfolios based on each of six lottery proxies from the month prior to the announcement date. If the announcement date is in the first ten trading days of a month, we lag one more month for the proxies. We report equal-weighted excess returns of these lottery portfolios of firms without media coverage, as well as the differences between the top and bottom quintile portfolios during the (−5,−1) pre-event period in Panel A.1 and the (+1,+5) post-event period in Panel B.1, with day 0 referring to the earnings announcement date. Panels A.2 and B.2 present analogous average returns of firms with media coverage. Lottery proxies are defined as in Table 1. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 2000 to 2014. Excess returns are reported in percentages. The *t*-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980). We only report the top and bottom quintile lottery portfolios and their difference to save space.

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel A: (−5,−1) Pre-event excess return						
			Panel A.1: No media coverage			
Q1	0.044	0.095	0.109	0.117	0.017	0.038
Q5	0.363	0.417	0.602	0.625	0.457	0.530
Q5–Q1	0.319	0.322	0.493	0.509	0.440	0.491
t-stat	(1.64)	(1.97)	(3.02)	(2.44)	(2.16)	(2.40)
			Panel A.2: With media coverage			
Q1	0.172	0.219	0.131	0.110	0.094	0.071
Q5	1.097	1.245	1.317	1.345	1.234	1.371
Q5–Q1	0.925	1.026	1.186	1.235	1.140	1.300
t-stat	(2.81)	(3.52)	(3.96)	(3.21)	(3.02)	(3.36)
Panel B: (+1,+5) Post-event excess return						
			Panel B.1: No media coverage			
Q1	0.318	0.234	0.167	0.249	0.351	0.332
Q5	−1.207	−0.836	−0.975	−1.225	−1.231	−1.343
Q5–Q1	−1.525	−1.070	−1.141	−1.474	−1.583	−1.675
t-stat	(−7.05)	(−5.37)	(−5.49)	(−5.85)	(−6.53)	(−6.91)
			Panel B.2: With media coverage			
Q1	0.153	0.182	0.156	0.118	0.250	0.286
Q5	−1.120	−0.947	−0.998	−1.034	−1.174	−1.267
Q5-Q1	−1.273	−1.129	−1.154	−1.153	−1.425	−1.553
t-stat	(−5.75)	(−6)	(−5.63)	(−5.01)	(−6.11)	(−6.03)

announcements) from the pure attention-grabbing channel (that is, lottery stocks, just like past winners, tend to attract more attention before earnings announcements). Before we perform formal tests, we would like to point out that we believe that investor attention must play some role for the pre-announcement lottery premium. After all, without attention to stocks, no one would buy lottery stocks even if they had an intrinsic desire for these stocks. For example, Barber and Odean (2008) argue that "preferences determine choices after attention has determined the choice set."

Although attention should play some role, our evidence below shows that our results are not completely driven by the pure attention-grabbing channel. To validate this statement, we use direct proxies for investor attention, other than retail order imbalance as used in Aboody et al. (2010). This is because retail order imbalance for a stock could be

Table 6 conducts a double-sorting exercise using three additional proxies for attention that have been used in previous studies including the magnitude of recent standardized unexpected earnings, or SUE (|SUE|), the population density of a firm's headquarters (PD), and the social connectedness of a firm's headquarters (SCIH), as well as a composite measure for attention (Attn) based on the average of the individual *z*-scores of media, |SUE|, PD, and SICH. Each quarter, firms with earnings announcements in that quarter are sequentially sorted into 25 5-by-5 portfolios based first on each one of the four attention proxies and then on each one of the six lottery proxies. To save space, except for the double sort by the composite attention measure and the composite lottery measure, we only report the results of the five attention-adjusted lottery portfolios from collapsing across the five attention groups. Panel A reports the excess returns of the 25 portfolios from the double sort by the composite attention score and the lottery *z*-score, the difference between the bottom and top quintile lottery portfolios within each attention quintile, as well as the conditional returns average across all five attention quintiles. The results show that within each attention quintile, lottery stocks still earn significantly higher (lower) returns than non-lottery stocks before (after) earnings announcements. Panel B reports the returns of the attention-adjusted lottery portfolios from our double sort when using different attention proxies. The results show that for each of these four measures, after controlling for attention in a double-sorting exercise, the effect is still there. More specifically, after controlling for each of these 4 measures, the average outperformance of lottery stocks over non-lottery stocks before earnings announcements is still significant. For example, the outperformance is 54 bps, 52 bps, 53 bps, and 51 bps after controlling for each of these four measures, respectively. The average value is 53 bps in the 5-day pre-event window. That is, among firms with a similar level of pre-event attention, the pre-event lottery effect is similar to that (i.e., 52 bps) without controlling for the effect of attention.[26]

In addition, in Table 7, we add the composite attention score to the Fama-MacBeth regressions in Table 3. The results show that after controlling for investor attention and other variables, the coefficients on lottery proxies are still positive (negative) and significant during the pre-event (post-event) window for all six lottery proxies. In particular, when the composite *z*-score (attention score, momentum) increases by one standard deviation, the pre-event 5-day return tends to increase by 0.13% (0.06%, 0.28%), and the post-event 5-day return tends to decrease by 0.31% (0.04%, 0.10%). Thus, although the attention proxy is statistically more significant than the lottery proxy, the lottery proxy is economically more significant than the attention proxy. On the other hand, the lottery proxy has weaker (stronger) power in predicting the pre-event (post-event) return than the momentum variable.

[26] In Table A4 in the Online Appendix,

Table 6
Pre-event and post-event portfolio returns, controlling for attention.

Each quarter, firms with earnings announcements in that quarter are sequentially sorted into 25 5-by-5 portfolios based first on each of the four attention proxies and then on each of six lottery proxies. We further collapse across the attention groups and obtain five attention-adjusted lottery portfolios. The sorting variables are from the month prior to the announcement date. If the announcement date is in the first ten trading days of a month, we lag one more month for the proxies. We consider four attention proxies: |*SUE*| is the absolute value of standardized unexpected earnings (SUE) in the previous quarter, where SUE is the difference in split-adjusted quarterly earnings per share between the current fiscal quarter and the same fiscal quarter in the previous year, divided by the standard deviation of this change over the previous eight quarters. Population density (PD) is measured as the county-level population in thousands per square mile of land area. The social connectedness of people living in the county of a firm's headquarters (SCIH) is the sum of the Facebook Social Connectedness Index (SCI) of a firm's headquarters with all other counties in the United States. The composite attention score (Attn) is a composite attention measure calculated as the average of the individual z-scores of the previous three attention measures and the media measure in Table 5. Panel A reports equal-weighted excess returns of the 25 portfolios sequentially sorted by the composite attention score and then by the composite lottery score, as well as the difference between the bottom and top quintile lottery portfolios within each attention quintile during the (−5,−1) pre-event period (Panel A.1) and the (+1,+5) post-event period (Panel A.2), with day 0 referring to the earnings announcement date. Ave is the average returns across the five attention quintiles. Panel B reports the equal-weighted excess returns of the bottom and top quintile lottery portfolios as well as their differences for the five attention-adjusted lottery portfolios during the (−5,−1) pre-event period in Panel B.1 and the (+1,+5) post-event period in Panel B.2. We only report the top and bottom quintile lottery portfolios and their difference in Panel B to save space. Lottery proxies are defined as in Table 1. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least \$1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014 except for PD, which is from 1976 to 2014, and Skewexp, which is from 1988 to 2014. Excess returns are reported in percentages. The t-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980).

Panel A: Double-sorted portfolios by Attn and *Z*-score

Attn port.=	P1	P2	P3	P4	P5	Ave
			Panel A.1: (−5,−1) Pre-event excess return			
Q1	0.008	0.041	0.101	0.117	0.077	0.069
Q2	0.027	0.136	0.231	0.302	0.300	0.199
Q3	0.160	0.247	0.253	0.356	0.386	0.280
Q4	0.221	0.329	0.363	0.405	0.599	0.384
Q5	0.586	0.591	0.559	0.546	0.631	0.583
Q5–Q1	0.579	0.550	0.458	0.429	0.554	0.514
t-stat	(4.53)	(4.7)	(3.7)	(3.08)	(3.68)	(4.72)
			Panel A.2: (+1,+5) Post-event excess return			
Q1	0.180	0.185	0.114	0.173	0.165	0.163
Q2	0.165	0.108	0.137	0.164	0.112	0.137
Q3	0.139	-0.012	-0.078	-0.020	-0.067	-0.007
Q4	-0.116	-0.358	-0.354	-0.342	-0.288	-0.292
Q5	-0.622	-0.649	-0.547	-0.601	-0.790	-0.642
Q5-Q1	-0.801	-0.834	-0.662	-0.774	-0.955	-0.805
t-stat	(-6.23)	(-6.09)	(-4.74)	(-5.55)	(-6.91)	(-6.89)

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel B: Conditional premium						
			Panel B.1: (-5,-1) Pre-event excess return			
			Panel B.1.1: |*SUE*|			
Q1	0.129	0.223	0.142	0.080	0.096	0.077
Q5	0.458	0.636	0.701	0.644	0.505	0.616
Q5-Q1	0.329	0.413	0.560	0.564	0.409	0.539
t-stat	(3.5)	(3.74)	(6.04)	(5.23)	(3.97)	(5.01)
			Panel B.1.2: PD			
Q1	0.110	0.217	0.130	0.052	0.084	0.070
Q5	0.468	0.638	0.680	0.666	0.522	0.595
Q5-Q1	0.358	0.421	0.550	0.615	0.438	0.524
t-stat	(3.38)	(3.78)	(5.49)	(5.32)	(3.87)	(4.48)
			Panel B.1.3: SCIH			
Q1	0.110	0.218	0.135	0.069	0.086	0.066
Q5	0.446	0.648	0.700	0.648	0.506	0.593
Q5-Q1	0.336	0.430	0.564	0.579	0.420	0.526
t-stat	(3.47)	(3.88)	(6.07)	(5.37)	(3.96)	(4.85)
			Panel B.1.4: Attn			
Q1	0.120	0.208	0.144	0.069	0.093	0.069
Q5	0.451	0.631	0.682	0.645	0.511	0.583
Q5-Q1	0.332	0.424	0.538	0.576	0.418	0.514
t-stat	(3.42)	(3.78)	(5.8)	(5.23)	(3.92)	(4.72)
			Panel B.2: (+1,+5) Post-event excess return			
			Panel B.2.1: |*SUE*|			
Q1	0.120	0.080	0.111	0.117	0.131	0.154
Q5	-0.546	-0.589	-0.436	-0.515	-0.541	-0.569
Q5-Q1	-0.665	-0.670	-0.546	-0.631	-0.672	-0.724
t-stat	(-6.88)	(-5.61)	(-5.86)	(-5.75)	(-6.58)	(-6.55)

(*continued on next page*)

Table 6 (*continued*)

			Panel B.2.2: PD			
Q1	0.108	0.066	0.063	0.094	0.111	0.147
Q5	-0.617	-0.567	-0.427	-0.518	-0.591	-0.586
Q5-Q1	-0.726	-0.633	-0.490	-0.612	-0.702	-0.733
t-stat	(-6.69)	(-5.25)	(-4.88)	(-5.16)	(-5.93)	(-6.05)
			Panel B.2.3: SCIH			
Q1	0.115	0.065	0.080	0.111	0.135	0.154
Q5	-0.615	-0.587	-0.440	-0.532	-0.608	-0.598
Q5-Q1	-0.730	-0.652	-0.519	-0.643	-0.743	-0.753
t-stat	(-7.39)	(-5.43)	(-5.46)	(-5.78)	(-6.83)	(-6.6)
			Panel B.2.4: Attn			
Q1	0.123	0.072	0.089	0.114	0.141	0.163
Q5	-0.623	-0.605	-0.463	-0.529	-0.622	-0.642
Q5-Q1	-0.746	-0.677	-0.552	-0.643	-0.762	-0.805
t-stat	(-7.26)	(-5.42)	(-5.73)	(-5.68)	(-6.85)	(-6.89)

Table 7
Fama–MacBeth regressions, controlling for attention.

Every quarter, we run two cross-sectional regressions of (-5,-1) pre-event excess returns (Panel A) and (+1,+5) post-event excess returns (Panel B) on lagged variables. If the announcement date is in the first ten trading days of a month, we lag one more month for the control variables. The time-series average of the regression coefficients is reported. Excess returns are defined relative to the value-weighted CRSP index and are in percentages. The composite attention score (Attn) is defined as in Table 6, and other variables are defined as in Table 3. The intercept of the regression is not reported. Independent variables (except returns) are winsorized at their cross-sectional 1st and 99th percentiles. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014 except for Skewexp, which is from 1988 to 2014. The *t*-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980).

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel A: (-5,-1) Pre-event regression						
Attn	0.100	0.102	0.091	0.095	0.099	0.091
	(4.77)	(3.72)	(4.59)	(4.44)	(4.72)	(4.59)
Proxy	1.366	0.294	0.203	6.421	4.494	0.154
	(2.15)	(4.57)	(4.3)	(3.23)	(2.05)	(2.98)
LogMB	-0.040	-0.014	-0.038	-0.035	-0.040	-0.050
	(-1.33)	(-0.4)	(-1.28)	(-1.17)	(-1.32)	(-1.77)
LogME	-0.105	-0.049	-0.047	-0.086	-0.102	-0.064
	(-7.51)	(-2.96)	(-3.65)	(-5.74)	(-7.66)	(-4.71)
MOM(-1,0)	-0.489	-0.376	-0.351	-0.448	-0.446	-0.447
	(-2.63)	(-1.85)	(-2.08)	(-2.62)	(-2.61)	(-2.58)
MOM(-12,-1)	0.453	0.226	0.518	0.459	0.455	0.496
	(6.35)	(2.82)	(7.79)	(6.59)	(6.51)	(7.32)
MOM(-36,-12)	-0.065	-0.036	-0.041	-0.048	-0.063	-0.052
	(-2.78)	(-1.46)	(-1.88)	(-2.31)	(-2.73)	(-2.44)
Turnover	-1.167	1.711	-1.099	-1.110	-1.219	-1.496
	(-1.96)	(3.34)	(-1.91)	(-1.82)	(-2.03)	(-2.66)
Panel B: (+1,+5) Post-event regression						
Attn	-0.074	-0.098	-0.060	-0.077	-0.072	-0.057
	(-3.91)	(-4.22)	(-3.25)	(-3.65)	(-3.83)	(-3.07)
Proxy	-3.241	-0.628	-0.377	-12.136	-11.104	-0.377
	(-5.78)	(-7.44)	(-8.1)	(-4.35)	(-5.74)	(-7)
LogMB	-0.142	-0.175	-0.143	-0.136	-0.136	-0.113
	(-4.42)	(-4.58)	(-4.36)	(-4.03)	(-4.24)	(-3.65)
LogME	0.081	0.016	-0.015	0.084	0.069	-0.015
	(5.9)	(0.8)	(-1.1)	(5.24)	(5.32)	(-1.02)
MOM(-1,0)	-0.382	-0.508	-0.928	-0.708	-0.621	-0.622
	(-2.39)	(-2.76)	(-6.61)	(-4.7)	(-4.25)	(-4.25)
MOM(-12,-1)	-0.123	-0.256	-0.207	-0.174	-0.120	-0.169
	(-2.15)	(-3.79)	(-3.67)	(-3.02)	(-2.13)	(-3.02)
MOM(-36,-12)	0.007	0.024	-0.044	-0.002	0.005	-0.012
	(0.28)	(0.95)	(-1.93)	(-0.09)	(0.21)	(-0.53)
Turnover	-2.460	-2.214	-2.930	-2.802	-2.346	-2.121
	(-4.58)	(-4.45)	(-5.4)	(-4.78)	(-4.28)	(-4.13)

Table 8
Evidence from retail order imbalance.

This table reports the difference in the change in the retail order imbalance between top and bottom quintile lottery portfolios. We first compute the retail order imbalance during each window period using the difference between buy-initiated and sell-initiated small-trade volume divided by the total of buy-initiated and sell-initiated small-trade volume: $RIMB = (\mathrm{BUYVOL} - \mathrm{SELLVOL})/(\mathrm{BUYVOL} + \mathrm{SELLVOL})$, where BUYVOL and SELLVOL are the sum of daily buy-initiated and sell-initiated small-trade volume of this stock during each window period. We measure the change in the retail order imbalance during the event window by taking the difference between RIMB during the $(-5,-1)$ pre-event or (+1,+5) post-event window and the average RIMB of the six five-day windows starting 30 days after the earnings announcements and ending 59 days after. Panel A reports unconditional lottery portfolios. Each quarter, firms with earnings announcements in that quarter are sorted into five portfolios based on each of six lottery proxies. Panel B controls for past 12-month returns by a conditional double sort (Panel B.1) or excluding the top 10% of past 12-month winner stocks (Panel B.2). In Panel B.1, each quarter, firms with earnings announcements in that quarter are first sorted into ten deciles according to their past 12-month returns; within each decile, stocks are then sorted

six

Table 8 (*continued*)

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
			Panel C.2.2: (+1,+5) Post-event window			
Q5-Q1	−0.440	−0.26[illegible]	0.825	0.415	0.67[illegible]	0.462
t-stat	(−1.18)	(−0.44)	(1.31)	(0.67)	(1.3)	(0.83)
			Panel C.3: Controlling for SCIH			
			Panel C.3.1: (−5, −1) Pre-event window			
Q5-Q1	1.337	1.445	2.[illegible]81	2.6[illegible]4	2.[illegible]0[illegible]	2.805
t-stat	(3.04)	(1.[illegible]8)	(4.68)	(4.26)	(5.76)	(4.67)
			Panel C.3.2: (+1,+5) Post-event window			
Q5-Q1	−0.2[illegible]2	−0.00[illegible]	1.023	0.305	0.78[illegible]	0.442
t-stat	(−0.77)	(−0.01)	(1.62)	(0.48)	(1.51)	(0.76)
			Panel C.4: Controlling for Attn			
			Panel C.4.1: (−5, −1) Pre-event window			
Q5-Q1	1.384	1.3[illegible]1	2.880	2.775	3.143	2.[illegible]06
t-stat	(3.27)	(1.81)	(4.65)	(4.24)	(6.36)	(4.7[illegible])
			Panel C.4.2: (+1,+5) Post-event window			
Q5-Q1	−0.214	0.114	0.[illegible]50	0.2[illegible]0	0.[illegible]12	0.674
t-stat	(−0.58)	(0.2)	(1.53)	(0.47)	(1.85)	(1.18)
Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score

Panel D: Double-sorted portfolios by Attn and *Z*-score

Attn port.=	P1	P2	P3	P4	P5	Ave

between buy and sell orders, market markers may absorb the order imbalance by serving as the trade counterparty. However, market makers may demand greater compensation for incurring inventory risks because of the greater anticipated volatility associated with the information event (see, e.g., Nagel, 2012; So and Wang, 2014). In addition, as discussed in the introduction, arbitrage forces should also be more limited ahead of earnings announcements because of greater uncertainty. Taken together, this implies a greater price run-up for lottery-like stocks ahead of earnings announcements, consistent with our main findings in Table 2.

In light of the above discussion, we also study how the retail order imbalance affects returns ahead of earnings announcements. In Panel E of Table 8, we use the regression approach and include the (−5,−1) RIMB and its interaction with lottery proxwith

Table 9
Fama–MacBeth regressions with religious beliefs interactions.

Each quarter, we run two sets of cross-sectional regressions of (−5, −1) pre-event excess returns (Panel A) and (+1,+5) post-event excess returns (Panel B) on lagged variables. If the announcement date is in the first ten trading days of a month, we lag one more month for the control variables. The time-series average of the regression coefficients is reported. Excess returns are defined relative to the value-weighted CRSP index and are in percentages. LogCPRATIO is the log of the Catholic-Protestant ratio from Kumar et al. (2011). Other control variables include logmb, logme, returns over past one month, 12 months, and 36 months, and turnover. Lottery proxies are defined as in Table 1. Independent variables (except returns) are winsorized at their cross-sectional 1st and 99th percentiles. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2010 except for Skewexp, which is from 1988 to 2010. The *t*-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980). We only report the regression coefficients of LogCPRATIO, lottery proxies, and the interaction terms to save space.

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*-score
Panel A: (−5, −1) Pre-event regression						
LogCPRATIO	−0.001	0.010	0.104	0.002	−0.020	0.034
	(−0.07)	(0.50)	(2.06)	(0.11)	(−0.84)	(2.69)
Proxy	1.967	0.400	0.245	8.329	6.434	0.247
	(3.49)	(5.00)	(4.79)	(3.56)	(3.54)	(4.74)
Proxy x LogCPRATIO	0.722	0.052	0.026	1.785	2.709	0.032
	(2.16)	(1.95)	(1.61)	(1.32)	(2.41)	(2.08)
Panel B: (+1,+5) Post-event regression						
LogCPRATIO	−0.041	0.011	−0.081	−0.012	−0.027	−0.014
	(−2.34)	(0.41)	(−1.82)	(−0.73)	(−1.3)	(−1.21)
Proxy	−2.703	−0.614	−0.331	−9.677	−9.090	−0.313
	(−3.94)	(−6.81)	(−6.76)	(−3.1)	(−4.16)	(−5.8)
Proxy x LogCPRATIO	0.271	−0.051	−0.024	−0.755	0.118	−0.014
	(0.91)	(−1.45)	(−1.69)	(−0.68)	(0.13)	(−0.98)

In particular, we regress firm-level pre- or post-event window returns on the lottery composite index *z*-score, logMB, logME, past returns over different horizons, firm-level turnover, and country dummies. In the

Table 10
International evidence.

Panel A reports the pre-event and post-event portfolio returns for international countries. We first divide all 38 countries by their aggregate turnover (Turnover^{AG}) into three groups, and then each quarter within each group, firms with earnings announcements are divided into five portfolios based on a composite *z*-score of three lottery proxies (Maxret, Prc, and Ivol) from the month prior to the announcement date. If the announcement date is in the first ten trading days of a month, we lag one more month for the proxies. Maxret is the maximum daily return, Prc is the negative log of one plus the stock price (i.e., $Prc = -log(1 + \text{Price})$), and Ivol is idiosyncratic volatility from Ang et al. (2006). Turnover^{AG} is the average annual turnover across all the years we have data for the country. We report equal-weighted excess returns of the top and bottom *z*-score quintile portfolios and their differences during the $(-5, -1)$ pre-event period in Panel A.1 and the (+1,+5) post-event period in Panel A.2, with day 0 referring to the earnings announcement date. We skip the middle Turnover^{AG} group to save space. Panel B reports results for two sets of Fama and MacBeth regressions for international countries. Test (I) first divides all 38 countries by their aggregate turnover (Turnover^{AG}) into three groups, and then within each group, we run Fama–MacBeth regressions on country dummies and a set of control variables including logmb, logme, returns over past one month, 12 months, and 36 months, and turnover. Test (II)

Table 11
Pre-event and post-event retu rns among bottom and top 50% IO subsample

are further sorted into five portfolios based on each of six lottery proxies from the month prior to the announcement date. If the announcement date is in

well as the differences between the top and bottom quintile portfolios during the (−5, −1) pre-event period in Panel A.1 and the (+1,+5) post-event period in Panel B.1, with day 0 referring to earnings announcement date. IO is as the percentage firms' shares by institutional investors at the end of the prior quarter. Lottery proxies are defined as in Table 1. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1980 to 2014 except for Skewexp, which is from 1988 to 2014. retu rns are reported in percentages. The *t*-statistics are calculated based on heteroskedasticity-consistent standard errors of White (1980). We only report the bottom and top quintile lottery portfolios and their differences to save space.

Proxy=	Maxret	Skewexp	Prc	Jackpotp	Ivol	*Z*
Panel A: (− , −1) Pre-event excess retu rn						
			Panel A.1: Bottom 50% IO subsample			
Q1	0.117	0.176	0.141	0.169	0.145	0.118
Q5	0.520	0.727	0.752	0.727	0.575	0.624
Q5-Q1	0.403	0.551	0.611	0.558	0.430	0.506
t	(3.45)	(4.07)	(4.62)	(4.23)	(3.28)	(3.72)
			Panel A.2: Top 50% IO subsample			
Q1	0.025	0.257	0.158	0.068	0.050	0.042
Q5	0.337	0.301	0.227	0.291	0.342	0.316
Q5-Q1	0.312	0.044	0.069	0.223	0.291	0.274
			Panel A.3: Top minus bottom 50% IO subsample			
Q5-Q1	−0.091	−0.508	−0.542	−0.335	−0.138	−0.232
t	(−1.04)	(−4.07)	(−4.93)	(−	(−1.45)	−2.22)
Panel B: (+1,+5) Post-event excess retu rn						
Q1	0.070	−0.111	−0.103	−0.043	0.061	0.093
Q5	−0.896	−0.822	−0.687	−0.760	−0.846	−0.824
Q5-Q1	−0.967	−0.711	−0.584	−0.717	−0.908	−0.917
t	(−6.87)	(−5.07)	(−4.69)	(−	(−6.05)	−6.03)
			Panel B.2: Top 50% IO subsample			
Q1	0.146	0.108	0.123	0.135	0.176	0.204
Q5	−0.214	−0.066	−0.079	−0.037	−0.220	−0.208
Q5-Q1	−0.359	−0.174	−0.202	−0.172	−0.395	−0.412
t	(−3.13)	(−1.31)	(−1.75)	(−	(−3.01)	−2.94)
			Panel B.3: Top minus bottom 50% IO subsample			
Q5-Q1	02607	0.537	0.382	0.545	02512	0.505
t	(5.91)	(4.36)	(3.31)	(4.34)	(4.72)	(4.63)

ex post bad news, the lottery stocks do not earn significantly higher returns than non-lottery stocks before earnings announcements.

Earlier studies (e.g., Givoly and Palmon, 1982, Chambers and Penman, 1984, Bagnoli et al., 2002, Johnson and So, 2018) find that firms with unfavorable news tend to be late announcers, while firms with

ing the event window on contemporaneous aggregate mutual fund flows (MFFLOW) and aggregate hedge fund flows (HFFLOW) at the quarterly frequency. Panel A reports the result during the (− −1) pre-event window, and Panel B reports the result during the (+1,+5) post-event Consistent with the finding in Akbas al. (2015) that tual fund flow is dumb money, MFFLOW is positively significantly related to the price run-up of lottery stocks. The effect of HFFLOW is the opposite but insignificant,

[34] MFFLOW and HFFLOW as the of monthly MFFLOW and HFFLOW within a quarter, respectively. We follow Akbas et al. (2015) to compute monthly MFFLOW as $MFFLOW_t = \frac{\sum_{i=1}^{N}[T_{i,t} - T_{i,t-}(1+MRET_{i,t})]}{\sum_{i=1}^{N} TNA_{i,t-1}}$, where $TNA_{i,t}$ is the total net assets of equity mutual i in month t i,t FLOW is defined similarly.

Table 12
Realized skewness of event returns and earnings surprises.

Each quarter, firms with earnings announcements in that quarter are sorted into five portfolios based on each of six lottery proxies from the month prior to the announcement date. If the announcement date is in the first ten trading days of a month, we lag one more month for the proxies. We report the skewness (Panel A.1) of firm-quarter panel excess returns during the (−1,+1) three-day event-window centered at the announcement date for the top and bottom quintile portfolios, as well as their differences. We also present analogous skewness (Panel A.2) using pseudo-announcement dates. Pseudo-announcement dates are computed by subtracting a randomly selected number of trading days from the actual announcement date, where the random numbers are drawn from a uniform distribution spanning ten to 40 days. Panel A.3 compares the differences between actual- and pseudo-announcement dates. Panel B reports the skewness of firm-quarter panel earnings surprise at the announcement date for the top and bottom quintile portfolios, as well as their differences. The earnings surprise is calculated by taking the difference between actual quarterly earnings per share and the most recent median consensus earnings per share (EPS) forecast of analysts for that quarter normalized by assets per share at previous quarter end. Lottery proxies are defined as in Table 1. The sample includes NYSE/Amex/Nasdaq common stocks with a price of at least $1 per share at the end of the month prior to the earnings announcements. The sample period is from 1972 to 2014 in Panel A, from 1985 to 2014 in Panel B,

Table 13
Enhanced lottery strategy.
This table compares the monthly return spreads of the standard lottery strategy (Panel A), our refined strategy (Panel B), and their differences (Panel C). The standard lottery strategy is constructed by holding a hedge from longing the bottom quintile lottery portfolios and shorting the top quintile lottery portfolios. Each month, stocks are divided five portfolios based on of six lottery proxies from the previous month. Our refined lottery strategy adds a pre-event strategy to the standard lottery strategy. Firms with earnings announcements in a certain month are bought if they belong to the top quintile lottery portfolios and sold if they belong to the bottom quintile lottery portfolios during the (−10, −1) pre-event window. To ensure that the strategy is implementable, we only use the pre-event days after the portfolio formation date. The portfolio is held for one month, and the value-weighted excess return and Fama–French four-factor (FF4) alpha spreads are calculated. lottery proxies are defined as in Table 1. The sample includes

is from 1972 to 2014 except for Skewexp, which is from 1988 to 2014. Excess returns and FF4 alphas are reported in percentages. The *t*-statistics are calculated based on the heteroskedasticity-consistent standard errors of White (1980). We only report the bottom and top quintile lottery portfolios and their differences to save space.

Proxy =	Maxret	Skewexp		Jackpotp	Ivol	*Z*-score
Panel Standard lottery strategy						
Q1	0.577	0.790	0.522	0.547	0.568	0.583
Q5	0.145	0.211	0.523	−0.186	0.244	−0.449
R^e_{Q1-Q5}	0.432	0.579	−0.001	0.733	0.811	1.031
t-stat	(1.59)	(1.61)	(−0.00)	(2.10)	(2.76)	(2.99)
α^{FF4}_{Q1-Q5}	0.514	0.412	−0.006	0.835	0.881	1.085
t-stat	(2.95)	(1.82)	(−0.03)	(4.36)	(4.85)	(5.01)
Panel Refined lottery strategy						
Q1	0.359	0.460	0.256	0.271	0.299	0.322
Q5	−0.236	−0.277	−0.165	−0.729	0.586	−0.910
R^e_{Q1-Q5}	0.595	0.737	0.421	1.000	0.885	1.231
t-stat	(2.58)	(2.54)	(1.5)	(3.45)	(3.55)	(4.22)
α^{FF4}_{Q1-Q5}	0.810	0.795	0.597	12288	12144	12500
t-stat	(4.16)	(3.37)	(2.53)	(6.55)	(6.31)	(7.30)
Panel Refined strategy minus standard strategy						
Q1	−0.218	−0.329	−0.266	−0.276	0.269	−0.261
Q5	−0.381	−0.488	−0.689	−0.543	0.342	−0.461
R^e_{Q1-Q5}	0.163	0.158	0.422	0.267	0.073	0.200
t-stat	(1.23)	(0.94)	(3.20)	(1.71)	(0.55)	(1.46)
α^{FF4}_{Q1-Q5}	0.295	0.382	0.603	0.453	0.263	0.415
t-stat	(1.79)	(2.10)	(3.71)	(2.45)	(1.61)	(2.48)

that the improvement is even more statistically significant. Nonetheless, an important caveat in reality the improvement might be much smaller because of the higher transaction costs associated with this refined strategy.

6. Conclusion

In this paper, we argue that investors' preferences for lottery/gambling are time varying and are especially strong ahead of earnings news, probably because of lower inventory costs for speculators. Meanwhile, the countervailing arbitrage forces are more limited because of elevated uncertainty leading to the earnings news. Taken together, we expect that there should be positive return spreads between lottery-like assets and non-lottery assets during the days ahead of earnings announcements. Indeed, we document that the return spreads between lottery-like assets and non-lottery assets have opposite patterns before and after earnings announcements. Most prior studies show that lottery-like stocks can be overvalued and focus on the subsequent price reversal of lottery-like Thus, our focus on earnings announcements identifies the periods when the overvaluation of lottery-like stocks occurs, rather than their corrections, as studied by most prior studies.

Our empirical findings are robust across six different proxies that are studied in the literature of lottery-related anomalies. In addition, this lottery return spreads is more pronounced among firms with a greater retail order imbalance, among firms with low institutional ownership, and in with a stronger gambling propensity, and it is also after controlling for past 12-month returns and various proxies for attention. Moreover, we show that the cumulative return spreads based on other anomalies characteristics such as book-to-market, past returns, profitability, and the opposite of investment over assets increase *both* before and after announcements. Thus, the inverted-V-shaped cumulative return spread is unique to lottery-related characteristics. This sharp contrast in the shape of cumulative return spreads highlights the unique role ahead of earnings announcements for our lottery-related characteristics.

Appendix A. Definitions of Key Variables

This appendix provides the details for constructing various lottery and attention

Lottery measures: of

Skewexp: The expected idiosyncratic skewness is calculated in two steps following Boyer et al. (2010) (Table 2, Model 6, page 179). First, we estimate the following cross-sectional regressions separately at the end of each month *t*:

$$is_{i,} = \beta_{0,t} + \beta_{1,t} is_{i,t-60} + \beta_{2,t} v_{i,t-60} + {}_{t} \; {}_{,t-60} \quad \varepsilon_{i,t},$$

where $is_{i,t}$ and $iv_{i,t}$ denote the historical estimates of idiosyncratic volatility and skewness relative to the Fama and French three-factor model, respectively, for firm i using daily stock data over the past 60 months to month t. $X_{i,t}$ is a set of firm-specific variables including momentum as the cumulative returns over months $t-72$ through $t-61$, turnover as the average daily turnover in month $t-60$, the small-size market capitalization dummy, the medium-size market capitalization dummy, the industry dummy based on the Fama–French 17-industries definition, and the NASDAQ dummy. After we have these regression parameters, the expected idiosyncratic skewness for each firm i at the end of each month t is then computed in the second step:

$$Skewexp_t \equiv E_t[is_{i,t+60}] = \beta_{0,t} + \beta_{1,t} is_{i,t} + \beta_{2,t} iv_{i,t}$$

s(of)] TJ 0 Tc /F2 1 Tf 6.3761 0 0 6.3761105.5126523. 542 Tm [( )] TJ -0.001 Tc /F4 1 Tf 7.701 0 0 7.701108.5184723. 542 Tm [Journa

in
ily re d(t)11(e)] TJ 0 Tc /F2 1 Tf 6.3761 0 0 6.3761 2 5.3568 310.128 Tm [( )] TJ /F8 1 Tf 7.70
e
Be ,Ld
t
ve d(ae)] TJ 0 Tc /F2 1 Tf 6.3761 0 0 6.3761 480.335 0
ty
wsing
estimate end to

Ang, A., Hodrick, R., Xing, Y., Zhang, X., 2009.

. (2033.3(1)9466(7)91.899.)]TJ /F2 1 Tf 232759 0 TD 0 Tc ( )Tj /F4 1 Tf 3197 0 TD[A