ONLINE APPENDIX

Gambling and Comovement

Alok Kumar, Jeremy K. Page, and Oliver G. Spalt

In this Online Appendix, we present background material to support the main results reported in the paper.

A.1. Religion and Attitudes Toward Gambling

Thompson 2001, Pages 317-324 provides a summary of the gambling views of major religious denominations in the U.S. In this study, we focus on the differences in the gambling attitudes of Catholics and Protestants, which are the two largest religious denominations in the U.S.

The gambling views typical of many Protestant churches are expressed in the United Methodist Church's *2004 Book of Resolutions*: "Gambling is a menace to society, deadly to the best interests of moral, social, economic, and spiritual life, and destructive of good government. As an act of faith and concern, Christians should abstain from gambling and should strive to minister to those victimized by the practice."

The position of the Catholic Church on gambling is summarized in the *New Catholic*

Encyclopedia: "A person is entitled to dispose of his own property as he wills... so long as in doing so he does not render himself incapable of fulfilling duties incumbent upon him by reason of justice or charity. Gambling, therefore, though a luxury, is not considered sinful except when the indulgence in it is inconsistent with duty." Further, *The Catechism of the Catholic Church (2413)* states: "Games of chance (card games, etc.) or wagers are not in themselves contrary to justice. They become morally unacceptable when they deprive someone of what is necessary to provide for his needs and those of others. The passion for gambling risks becoming an enslavement. Unfair wagers and cheating at games constitute grave matter, unless the damage inflicted is so slight that the one who suffers it cannot reasonably consider it significant."

Overall, Catholics are more tolerant of practices related to gambling, while Protestants strictly oppose all gambling-related activities.

A.2. Robustness Checks

In this appendix section, we present results from a large battery of additional tests to examine the robustness of our baseline regression estimates reported in Table 3, Panel A. The results are reported in Online Appendix Table A1. We re-estimate different versions of the baseline specification and for brevity we only report the coefficient estimates of the CPRATIO-LIDX interaction term.

First, we replace CPRATIO with an alternate measure of the lottery preferences of a stock's investors. Specifically, we measure investors' lottery preferences by observing their portfolio holdings during the prior year. While our holdings-based average lottery preference measure is arguably less exogenous than the location-based CPRATIO, it has the advantage of capturing the gambling preference of a stock's investors without requiring the assumption of local bias. For retail investors, we use holdings data from the discount brokerage data set, and we obtain institutional investor holdings from 13f filings provided by Thomson Reuters. In each period (monthly for retail investors and quarterly for institutional investors), we first compute the value-weighted LIDX of stocks held in each investor's portfolio and obtain the time-series average of the portfolio LIDX for each investor during the prior year. Investors with high past portfolio LIDX invest more heavily in stocks with lottery characteristics and thus reveal their preference for gambling. For each stock, we then compute the average past portfolio LIDX of investors who hold that stock, weighted by the value of the investors' holdings. Thus, stocks with high average lottery preference are held more by investors with strong gambling preferences and, therefore, their returns are more likely to be impacted by the sentiment of gambling-motivated investors.

Tests (1) and (2) in Online Appendix Table A1 report the estimates of the Average

Lottery Preference × LIDX interaction for the retail and institutional average lottery preference measures, respectively. These results are qualitatively similar to our baseline estimates. Lottery stock comovement is significantly stronger for high LIDX stocks that have a higher concentration of investors with relatively strong gambling preferences. These results help confirm our main finding that excess return comovement among lottery stocks for those more intensely held by investors with strong gambling preferences.

Next, we repeat the analysis using an alternate set of betas. Throughout most of the analysis we estimate lottery stock betas controlling for the standard MKTRF, SMB, HML and UMD factors. As an alternative, we estimate lottery stock betas as well as low price, high volatility, and high skewness betas, controlling for the market and industry factors. Specifically, we use the returns of one of the 48 Fama and French (1997) industry to which the stock belongs. Using these alternate betas that control for industry returns, we find very similar results.

We next include a large set of additional control variables to capture comovements induced by fundamental factors.[1] Specifically, we include the dividend yield, leverage, the

[1]We do not include these control variables in the main specifications because some of the variables are missing for a significant number of firms.

three-year average of research and development expense scaled by assets, the three year average of advertising expenditure scaled by assets, the three year average of return on assets, and the log of the number of firms headquartered in the MSA, all measured at the end of the prior year. Our results become weaker but still remain highly significant. When we include MSA fixed effects in the specification, the results are somewhat stronger.

We also consider different versions of the CPRATIO variable. We first show that defining CPRATIO and the demographic variables at either the county or the state level leaves our results unchanged. Hence, while an MSA can be appropriately used to define local, our results are robust to the granularity with which the local area is defined. As a further check, we include the level of religiosity in the MSA. This choice is motivated by the fact that the level of religiosity is related to risk aversion (e.g., Hilary and Hui (2009)). Including this control leaves our CPRATIO-LIDX interaction estimates unchanged, which suggests that our results are related to differences in skewness-preferences, rather than differences in risk-aversion. When we use the difference between the proportion of Catholics and Protestants in an MSA instead of ratio, we find that our results remain very similar.

Next, we exclude all stocks with a price below \$5. Our results do not change substantially, which shows that our effects are not driven exclusively by stocks that may be

affected more by microstructure biases. Additionally, we control for liquidity using Amihud's (2002) illiquidity measure. Our results do not appear to be driven by differences in liquidity.

In the next set of tests, we provide additional geographic robustness checks. We first include a dummy for the ten largest MSAs to show that our results are not driven merely by large cities and financial centers.[2] We also present results where we exclude New York, which is by far the largest MSA and also a high CPRATIO location. We also exclude each of the four census divisions (South, West, North-East, Mid-West). The qualitative results remain unchanged in each case, which suggests that our effects capture a general phenomenon that is not unique to any specific geographical region.

Overall, the evidence from these robustness checks indicates that our key finding that return comovement is strongest for high LIDX stocks located in high CPRATIO areas is robust. Thus, there is considerable support for our gambling-based comovement hypothesis and our findings are less likely to be explained by other alternative conjectures.

[2]The largest MSAs are associated with the cities of New York, Los Angeles, Chicago, Miami, Philadelphia, Dallas, Boston, San Francisco, Detroit, and Houston.

TABLE A1

Gambling and Return Comovement: Robustness Checks

Table A1 reports the results of robustness checks on the main regression results from Panel A of Table 3. For brevity, we report only the coefficient on the CPRATIO × LIDX interaction term, though each regression includes all of the same controls as in Table 3, as well as industry and year dummies. For convenience, the baseline estimates from Table 3 are displayed in the first row. Each subsequent row represents the coefficient on CPRATIO × LIDX estimated from variations on the basic specification. In tests (1) and (2), CPRATIO is replaced by Avg Lottery Preference (Retail) and Avg Lottery Preference (Inst.), respectively, as defined the Appendix. Alternate betas are computed controlling for market and industry factors, rather than the MKTRF, SMB, HML, and UMD factors used in estimating the dependent variables in the main analysis. Additional controls include the dividend yield, leverage, the three year average of research and development expense scaled by assets, the three year average of advertising expenditure scaled by assets, the three year average of return on assets, and the log of the number of firms headquartered in the MSA, all measured at the end of the prior year. Religiosity is the total number of adherents of any church in the MSA where the firm is located. CPDIFF is the difference, rather than the ratio between the proportion of Catholics and the proportion of Protestants in the firm's area. Liquidity is measured using the Amihud (2001) measure. Panel B reports geographic robustness checks, including dummy variables for very large MSAs and exclusions of firms located in various regions of the US. t-statistics, clustered by firm, are reported in parentheses below each estimate. The sample period is from 1980 to 2005.

TABLE A1 (continued)

Gambling and Return Comovement: Robustness Checks

	Comovement Measure			
Test	Lottery Stock	Low Price	High Volatility	High Skewness
Baseline	0.070	0.075	0.068	0.095
	(5.98)	(6.49)	(5.99)	(5.41)
	65,981	65,981	65,981	65,981
(1) Retail Lotto Pref.	4.346	4.324	4.231	6.113
	(19.89)	(20.42)	(20.12)	(18.24)
	35,197	35,197	35,197	35,197
(2) Institutional Lotto Pref.	7.661	7.913	7.194	10.707
	(27.03)	(28.34)	(25.92)	(24.84)
	61,545	61,545	61,545	61,545
(3) Alternate Betas	0.062	0.066	0.056	0.066
	(7.79)	(8.16)	(7.37)	(6.46)
	65,981	65,981	65,981	65,981
(4) Additional Controls	0.041	0.046	0.039	0.057
	(3.74)	(4.27)	(3.70)	(3.40)
	65,717	65,717	65,717	65,717
(5) Add. Controls and MSA FE	0.045	0.050	0.043	0.065
	(4.06)	(4.58)	(4.03)	(3.81)
	65,717	65,717	65,717	65,717
(6) CPRATIO at County Level	0.039	0.042	0.037	0.058
	(4.57)	(4.98)	(4.47)	(4.47)
	65,363	65,363	65,363	65,363
(7) CPRATIO at State Level	0.058	0.060	0.055	0.082
	(5.02)	(5.27)	(4.96)	(4.75)
	65,981	65,981	65,981	65,981
(8) Control for Religiosity	0.070	0.075	0.068	0.095
	(6.00)	(6.50)	(6.01)	(5.42)
	65,981	65,981	65,981	65,981
(9) CPDIFF inst. of CPRATIO	0.369	0.395	0.351	0.521
	(4.38)	(4.77)	(4.31)	(4.00)
	65,981	65,981	65,981	65,981
(10) Stock Price > \$5	0.063	0.065	0.060	0.094
	(5.29)	(5.68)	(5.22)	(5.20)
	45,865	45,865	45,865	45,865

TABLE A1 (continued)

Gambling and Return Comovement: Robustness Checks

	Comovement Measure			
Test	Lottery Stock	Low Price	High Volatility	High Skewness
(11) Control for Liquidity	0.063	0.065	0.060	0.094
	(5.31)	(5.69)	(5.23)	(5.20)
	45,865	45,865	45,865	45,865
(12) Large MSA Dummy	0.070	0.075	0.068	0.095
	(5.99)	(6.50)	(5.99)	(5.42)
	65,981	65,981	65,981	65,981
(13) Exclude New York	0.095	0.097	0.094	0.123
	(6.57)	(6.81)	(6.79)	(5.77)
	56,904	56,904	56,904	56,904
(14) Exclude North East	0.122	0.131	0.122	0.173
	(5.60)	(6.15)	(5.79)	(5.33)
	45,985	45,985	45,985	45,985
(15) Exclude Mid-West	0.064	0.070	0.062	0.086
	(5.07)	(5.62)	(5.08)	(4.58)
	53,726	53,726	53,726	53,726
(16) Exclude South	0.084	0.089	0.083	0.109
	(6.00)	(6.47)	(6.13)	(5.22)
	49,398	49,398	49,398	49,398
(17) Exclude West	0.063	0.067	0.059	0.089
	(5.30)	(5.71)	(5.13)	(4.97)
	48,834	48,834	48,834	48,834