Do Deviations from Investor Preferences Signal Informed Trading?*

Jeremy K. Page

November 3, 2010

Preliminary and Incomplete

Abstract

This paper provides a novel method for identifying informed institutional trading. I argue that, given an information signal about a stock, an investor's tastes for certain characteristics of that stock can influence his decision to trade on the information. Thus, trades which deviate from an investor's tastes are more likely to reflect information. I test this hypothesis with respect to investors' taste for gambling (or more formally, for positive skewness), as proxied by local religious composition. Institutions located in areas with stronger gambling preferences allocate more portfolio weight to "lottery stocks" with high idiosyncratic skewness and volatility, hold more concentrated portfolios, and trade more, particularly among lottery stocks. The religion-based proxy thus captures predicted variation in trading behavior arising from the conjecture that investors' tastes influence their decision to trade on information. Consistent with the main hypothesis, I find that the lottery stock holdings of institutions in the most gambling-averse areas outperform those of institutions in the most gambling-tolerant areas by 115 basis points per quarter, after adjusting for risk. The risk-adjusted return differential between lottery stocks purchased and those sold by more gambling-averse institutions is 215 basis points over the quarter following the trades, while the buy-sell return differential for stocks traded by more gambling-tolerant institititions is much smaller and statistically insignificant. This confirms the greater information content of lottery stock trades by investors who are relatively averse to gambling.

1 Introduction

Finance research has shown a growing interest in the impact of investor tastes on asset prices. Recent theory papers have demonstrated that investors' taste for stock characteristics other than mean and variance can have an impact on equilibrium returns.[1] There is also a

*I would like to thank Alok Kumar, Andres Almazan, John Griffin, Umit Gurun, Andy Koch, Bob Parrino, Clemens Sialm, Oliver Spalt, Sheridan Titman, Malcolm Wardlaw, and seminar participants at UT-Austin for helpful discussions and valuable comments. I am responsible for all remaining errors and omissions.

[1]See for example Mitton and Vorkink (2007) and Barberis and Huang (2008), which demonstrate the price impact of investor preferences for skewness. Fama and French (2007) propose a general framework for thinking about this

growing empirical literature providing evidence of the influence of investor tastes on portfolio choice and expected returns, including preferences for return skewness, preferences for firms that exhibit corporate social responsibility, aversion to "sin stocks" such as alcohol, tobacco and gambling companies, and stock preferences based on political values.[2]

In this paper, I argue that heterogeneity in investor tastes can provide a useful way of identifying informed trades. The main idea is simple: when an investor receives an information signal about a security, the investor's taste for certain characteristics of that security (aside from the mean and variance of its return) can influence his or her threshold for trading on that signal. For example, suppose that an investor avoids holding the stock of company A because she opposes the firm's environental practices. The investors then obtains information indicating that company A's stock is going to appreciate substantially over the next period. Because of her aversion to investing in Company A's stock, she may require a stronger signal before she is willing to make a significant trade on that information. Empirically, then, if one observes an investor with strong preferences for environmental responsibility loading up on company A's, it is more likely that that trade reflects information.

Specifically, I focus on investors' gambling attitudes, or in more formal terms, their preferences for skewness. I argue that positive return skewness can offset the holding costs posed by idiosyncratic risk (e.g. Pontiff (2006)) for informed investors with a preference for skewness. This conjecture leads to a number of specific predictions. Because investors with stronger skewness preferences are willing to trade on weaker signals for positively skewed stocks, they exhibit higher turnover and overweight stocks with high idiosyncratic risk and skewness, leading to higher overall portfolio concentration. Conversely, because they require a stronger signal to trade in stocks with high idiosyncratic risk and skewness, informed investors with low skewness preferences allocate a lower portfolio weight to such stocks but

issue by introducing tastes into a CAPM setting.

[2]See Bennett, Sias, and Starks (2003), Mitton and Vorkink (2007), Boyer, Mitton, and Vorkink (2010), Hong and Kacperczyk (2009), Hong and Kostovetsky (2010), Kumar, Page, and Spalt (2010) for evidence of investor tastes and preferences influencing portfolio choice and asset prices.

earn higher abnormal returns on those they hold.

Testing these hypotheses is nontrivial, because it requires a measure of investors' preferences for skewness that is not inferred from the same trading behavior that we are trying to predict. This is because stocks with high skewness tend to be those with a greater potential scope for and reward to informed trading. The same stocks that earn low average returns because of investors' taste for gambling are also those among which we expect informed investors to produce the highest abnormal returns (see, for example, Schultz (2010)). Thus, observed portfolio choices such as the portfolio weight in stocks with high volatility and skewness are unsuitable as measures of gambling preferences in this context, because it is unclear whether an investor is overweighting these stocks because he has favorable private information about them, or whether he naively overweights these stocks in hopes of "hitting a home run."

To overcome this hurdle, I use geographic variation in religious composition as a proxy for local gambling (skewness) preferences. Specifically, I use the ratio of Catholic adherents to Protestant adherants (CPRATIO) in each county of the United States. This measure is motivated by the observation that the major Protestant denominations prohibit gambling, while the Catholic church maintains a tolerant position on moderate gambling.[3] The predictive power of religious background for gambling behavior has been well established in a variety of settings, including various financial market settings (e.g. Kumar (2009), Kumar, Page, and Spalt (2010)).

[3]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." Thompson 2001, pg. 317-324 provides a summary of the gambling views of major religious denominations in the U.S.

Using the local CPRATIO as a proxy for skewness preferences, I test the above hypotheses in data on institutional investors. I focus on institutional portfolio managers as a class of potentially informed investors that constitute a large portion of equity ownership and trading volume. I find that institutions in areas with a higher CPRATIO ratio not only hold higher portfolio weights in more speculative, "lottery-type" stocks (as has been documented in Kumar, Page, and Spalt (2010)), but they also hold more concentrated portfolios and trade more frequently. Such trading behavior itself could be indicative of superior information, as shown in Kacperczyk, Sialm, and Zheng (2005) with respect to industry concentration, and in Yan and Zhang (2009) with respect to turnover and short-term trading. At the same time, these bahaviors can reflect sub-optimal trading by investors subject to overconfidence and other biases, as in Odean (1999) or Goetzmann and Kumar (2008).

To determine the effect of gambling preferences on performance, I examine the returns to institutional portfolios sorted by CPRATIO. Overall portfolio returns are slightly lower for investors in stronger Catholic areas, where gambling preferences are expected to be relatively strong. Within the quintile of the most speculative securities, however, institutions in stronger Catholic areas underperform those in stronger Protestant areas by 115 basis points per quarter on a risk-adjusted basis (t-stat=-2.60). This suggests that the gambling preferences of these investors lead them to invest too aggressively in the most speculative stocks even, while the high volatility and skewness holdings of low CPRATIO investors reflect stronger information signals.

I examine subsamples of instutions to investigate the robustness of this effect and to confirm whether the strength of the effect varies along expected dimensions. The holdings and trades of smaller institutions are more likely to reflect the preferences of the fund managers, and I indeed find that the performance differential between high and low CPRATIO institutions to be stronger among smaller institutions. Similarly, insitutions with more concentrated portfolios are likely to be those with looser investment constraints whose holdings and trades more closely reflect the information and preferences of the manager. Also, the performance difference between institutions taking speculative positions based on information and those motivated by more naive gambling preferences should be stronger among institutitons with more concentrated portfolios, which I find to be true. The performance differential between high and low CPRATIO institutions is equally strong among institutions with greater or lesser weight in the most speculative securities, as well as during the earlier and later parts of the sample period.

Finally, I examine the returns following significant trades by high and low CPRATIO institutions. The return differential between stocks purchased and sold by low CPRATIO institutions is 215 basis points (t-stat 2.46) over the quarter following the trades in the highest quintile of the lottery index. Meanwhile, the buy-sell return difference is smaller and not significant for high CPRATIO institutions. This provides further evidence of the information content of trades by relatively gambling-averse investors in the most speculative stocks. Overall the evidence suggest that gambling preferences negatively impact portfolio performance through excessive trading in stocks that are costly to hold. A broader point suggested by the evidence here is that the information content of trades is especially high when an investor trades contrary to her typical preferences.

This paper is related to several strands of literature. It complements the recent growing literature that studies the theoretical impact of skewness preferences on portfolio choice and asset prices, such as Barberis and Huang (2008) and Mitton and Vorkink (2007). There are also several related empirical papers which document gambling-like trading behavior by individual investors, notably Kumar (2009), Grinblatt and Keloharju (2009), and Dorn and Huberman (2010). This paper is unique in that it examines the behavior of potentially informed institutional investors, as opposed to the retail investors studied in those papers, and focuses on the information content of investor trades conditional on their preferences, while previous papers focus simply on documenting gambling-like behavior by investors.

The papers closest to this one are Shu, Sulaeman, and Yeung (2010) and Ben-David, Glushkov, and Moussawi (2010). Shu, Sulaeman, and Yeung show that the portfolio returns of mutual funds located in Catholic-dominated areas are more volatile, and that intra-year changes in volatility in response to tournament incentives as in Brown, Harlow, and Starks (1996) are strongest in those areas. The latter finding confirms prior evidence shown in Kumar, Page, and Spalt (2010) for institutions. An important distinction between my paper and theirs is that I emphasize the role of skewness preferences rather than risk aversion. I make and test specific predictions about the impact of skewness preferences on informed trading, and focus particularly on the implications for abnormal returns earned by investors. Ben-David, Glushkov, and Moussawi make a similar argument to the one in this paper to interpret their finding that hedge fund trades are most informative among stocks with high idiosyncratic risk. In contrast to their paper, I focus on cross-sectional differences across institutions as a function of skewness preferences, which allow me to test directly the argument that trading against an investor's preferences is an indicator of information.

This paper is also related to recent work on information acquisition. Recent theory by Van Nieuwerburgh and Veldkamp (2010) and Koijen (2010) point out the role of preferences in information choice problems, showing that more risk tolerant investors acquire more information and should consequently perform better. This paper complements those studies by suggesting that stronger gambling preferences can lead investors to overshoot the optimal levels of information acquisition and trading to their detriment.

The paper is organized as follows. Section II discusses the data and sample construction. Section III details the trading behavior of high CPRATIO institutions. Section IV examines portfolio returns conditional on gambling preferences. Section V concludes.

2 Data and Sample Construction

2.1 Catholic-to-Protestant Ratio

To test for the role of gambling preferences on investor performance, I employ a proxy for gambling attitudes using county-level geographical variation in religious composition across the U.S. I collect data on religious membership using the "Churches and Church Membership" files from the American Religion Data Archive (ARDA). The data set compiled by Glenmary Research Center contains county-level statistics for 133 Judeo-Christian church bodies, including information on the number of churches and the number of adherents of each church. During my 1980 to 2008 sample period, the county-level religion data are available only for years 1980, 1990, and 2000. Following the approach in the recent literature (e.g., Alesina and La Ferrara (2000), Hilary and Hui (2009)), I linearly interpolate the religion data to obtain values for intermediate years and use the 2000 levels for all subsequent years.

In this study, I focus on the ratio of Catholics to Protetants in the county. However, similar results are obtained using just the proportion of Catholics or the proportion of Protestants.

2.2 Institutional Investor Data

The primary data for my study consist of quarterly institutional holdings from Thomson Financial for the 1980 to 2008 period. The data contain the end of quarter stock holdings of all institutions that file form 13F with the Securities and Exchange Commission (SEC). Institutions with more than \$100 million under management are required to file form 13F with the SEC and common stock positions of more than 10,000 shares or more than \$200,000 in value must be reported on the form. A typical institution in the sample holds a 214-stock portfolio (median is 95) worth \$2.77 billion (median = \$288 million). There is also considerable heterogeneity in the size of institutions in the sample. More than 10% of institutions hold stock portfolios with market capitalization of under \$65 million and more than 25% of institutions hold stock portfolios worth \$1 billion or more.

The level of institutional ownership in stocks has grown steadily during the last 25 years. For instance, in the year 1980, about 47% of stocks had zero institutional ownership, but in recent years, only less than 5% of stocks have zero institutional ownership. Furthermore, during the eighties, the mean institutional ownership in a typical stock was about 12%, but in recent years (2000 to 2004), the mean institutional ownership in stocks has increased to about 31%. Collectively, the evidence suggests that institutions are likely to be the marginal, price-setting investors in an increasing number of stocks. Several other standard datasets are used in this study. I obtain monthly prices, returns, shares outstanding, and monthly volume turnover data from the Center for Research on Security Prices (CRSP) and quarterly book value of common equity data from COMPUSTAT. The exchange code and the share code for all stocks are also obtained from CRSP. Lastly, the daily time-series of the three Fama-French factors and the momentum factor from Ken Frenchs data library.

I also use institutional classifications from Brian Bushee to help define the sample. Because I want a relatively homogenous sample of active institutions tat are more likely to have information, I focus on institutions with type codes 3 and 4 (investment companies and independent investment advisors). The type codes provided by Thomson Financial are not reliable after 1997, so I use the type codes provided by Bushee, which maintain the 1997 code for institutions that remain in the sample, and manually assign codes for institutions that enter the sample later. Finally, I also exclude institutions classified as “quasi-indexers” on the basis of their portfolio diversification and turnover. This further restricts the sample to institutions that are more likely to trade on information, where the hypothesized effects are more likely to be observed.

2.3 Lottery Stock Index

I construct a "lottery-stock" index to measure the degree to which a stock is attractive to investors with gambling preferences. The lottery index is based on idiosyncratic volatility and idiosyncratic skewness. It is similar to the binary lottery stock measure used in Kumar (2009), which defines a stock as a lottery stock if it is below median in price and above median in both idiosyncratic volatility and skewness. The definition is motivated by the characteristics of lottery tickets, and by the model in Barberis and Huang (2008), which shows how the probably weighting in Prospect Theory can generate a preference for positive skewness. To obtain a more continuous measure, I sort stocks into vigintiles based on idiosyncratic volatility and skewness, and the vigintile assignments together, then scale the sum to get an index that ranges from 0 to 1, a stock with a value of 1 is in the highest vigintiles of both idiosyncratic volatility and skewness. I compute idiosyncratic volatility as the standard deviation of the residuals from a four-factor regressions including the three Fama and French (1993) factors plus the Carhart (1997) momentum factor, estimated using daily returns over the prior 6 months. I compute idiosyncratic skewness as

$$idioskew_{it} = \frac{1}{N(t)} \frac{\sum_{d \in S(t)} \varepsilon_{i,d}^3}{idiovol_{i,t}^3}, \tag{1}$$

where $S(t)$ is the set of trading days in the previous six months, $N(t)$ is the number of trading days in $S(t)$, $\varepsilon_{i,d}^3$ is the residual on day d from the four-factor regression estimated over $S(t)$, and $idiovol_{i,t}$ is the idiosyncratic volatility of stock i as defined above.

In several parts of the subsequent analysis, I sort stocks based on the lottery index, in doing so, I perform a double-sort first on size, then on the lottery index. This controls for the fact that idiosyncratic volatility and skewness are both significantly correlated with size. Furthermore, it ensures that a greater fraction of the market by value falls into the higher quintiles of the lottery index, so that the results are both more meaningful and less subject to spurious outcomes that could arise from focusing on the smallest stocks.

Although a typical institution is likely to avoid risky, lottery-type stocks due to prudent man rules and other institutional constraints (e.g., DelGuercio (1996)), some institutions might gravitate toward these stocks because they provide "cheap bets" and offer good opportunities for exploiting information asymmetry. In particular, the institutional attraction for smaller, lottery-type stocks might increase over time as competition in other market segments increases (e.g., Bennett, Sias, and Starks (2003).

2.4 Summary Statistics

Table 1 presents summary statistics of the insitutional investor portfolios in the sample. The sample includes 31,679 institution-quarter observations for 2,606 unique institutions. The typical institution holds $381M in portfolio assets and holds about 15% of its portfolio in stocks which are in the highest (size-corrected) quintile of the lottery index.

Portfolio turnover is the defined as

$$Turnover_{k,t} = \frac{\min(Buy_{k,t}, \quad Sell_{k,t})}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t}+S_{k,i,t-1}P_{i,t-1}}{2}}, \tag{2}$$

where

$$Buy_{k,t} = \sum_{i=1,S_{k,i,t}>S_{k,i,t-1}}^{N_k} |S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t-1}\delta P_{i,t}| \tag{3}$$

$$Sell_{k,t} = \sum_{i=1,S_{k,i,t}\leq S_{k,i,t-1}}^{N_k} |S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t-1}\delta P_{i,t}|, \tag{4}$$

and where $P_{i,t}$ is the share price for stock i at the end of quarter t, and $S_{k,i,t}$ is the number of shares of stock i held by investor k at the end of quarter t. I adjust prices and shares for the effects of splits and stock dividends using the CRSP price and share adjustment factors. The average fund turns over 18.3% of its portfolio per quarter (median 15.7%), and there is substantial variation in turnover across institutions.

Portfolio concentration is a measured Herfindahl index (the sum of squared portfolio weights), while industry concentration is the sum of squared deviation of portfolio weights from the market weights of 10 industries as defined in Kacperczyk, Sialm, and Zheng (2005). Both measures are expressed in %.

3 Trading Behavior of High CPRATIO Institutions

3.1 Characteristics of CPRATIO-Sorted Portfolios

Table 2 presents the means of various portfolio measures for institutions sorted by CPRATIO. The portfolio measures are averaged cross-sectionally in each quarter, and the table displays the time-series averages of the cross-sectional means (or median, the case of the median portfolio size). Lottery weight is the portfolio weight in stocks that are in the top quintile of the lottery index, controlling for size through a double sort. The average lottery weight increases monotonically from 15.3% in the lowest CPRATIO quintile to 18.64% in the highest CPRATIO quintile. Average idiosyncratic volatility and skewness for the institution's portfolio are the value weighted averages of the individual stock measures of stocks held, weighted by their portfolio weights. These also increase monotonically with CPRATIO. A large proportion of institutions, including some of the largest institutions, are located in highest quintiles of CPRATIO, which skews the mean portfolio size upward substantionally in those quintiles. Nevertheless, the median portfolio size is fairly similar across CPRATIO quintiles. Portfolio turnover and the two concentration measures are also generally increasing with CPRATIO.

3.2 Trading Behavior of High CPRATIO Institutions

The patterns across CPRATIO quintiles noted in the rpevious section provide preliminary evidence supporting the hypothesis institutions with stronger skewness preferences trade more aggressively among stocks with higher idiosyncratic risk and skewness, leading to higher portfolio weights in lottery stocks, greater portfolio concentration, and higher turnover. I next examine these relations in more detail using a regression framework. Table 3 presents estimates from panel regressions of trading measures on CPRATIO and other institution characteristics. Each regression also includes demographic controls for the institution's location whose coefficients have been suppressed for brevity. These include: total population, income median age, minority population, male-to-female ratio, the proportion of the population that is married, median age, and the porportion living in urban areas. These additional local characteristics help control for geographic effects that might arise from other local characteristics besides the gambling attitudes associated with religion, such as population size, urbanicitiy, or the sophistication of the local population.

The dependent variables in regression (1) is the portfolio weight in lottery stocks, defined as stocks in the highest quintile of the lottery stock index. CPRATIO is significantly positively related to the weight in lottery stocks, consistent with CPRATIO capturing gambling preferences. In economic terms, going from the 25th to the 75th percentile of CPRATIO is associated with a 2.7% increase in the portfolio weight allocated to lottery stocks, which represents 17.6% increase relative to the typical institution's portfolio weight. Not surprisingly, smaller and more concentrated insitutions which trade more frequently also put more weight in speculative stocks. Somewhat interestingly, the weight in lottery stocks is also strongly related to the institution's past portfolio return. This could be reflective of a "house money" effect, or may possibly reflect some degree of self-attribution bias.

Regression (2) tests the related prediction that, as a consequence of the larger positions they take in stocks with high skewness, investors with stronger skewness preferences will hold more concentrated portfolios. Consistent with this prediction, I find that CPRATIO is significantly related to portfolio concentration. These first two results are also consistent with the model and empirical evidence in Mitton and Vorkink (2007), which also predicts underdiversification and increased holdings in positively skewed stocks on the basis of preferences. An important difference is that I have an exogenous measure of skewness preferences, whereas Mitton and Vorkink are limited to testing relationships between exogenous portfolio characteristics predicted by their model.

In the final three specifications (3)-(5), I test the prediction that investors with stronger skewness preferences will trade more, particularly among stocks with high idiosyncratic risk and skewness. This prediction is similar in spirit to those that arise from models of overconfidence, as in Odean (1999), which also predict excessive trading. In the overconfidence models, investors overestimate the precision of their signals, leading them to take larger positions than is warranted by the true conditional variance of the security. In this context, a positive skewness offsets the deterrent effect of idiosyncratic risk for investors with a preference for skewness, leading these investors to similarly trade more among stocks with positive skewness. Because investors will behave similarly among stocks with low idiosyncratic risk and skewness, we should observe higher overal turnover, but the difference in trading volume should be specially pronounced among lottery stocks.

In regression (3), the dependent variable is overall portfolio turnover, as defined in section 2.4. Consistent with the prediction, turnover is significantly higher for institutions in high CPRATIO areas. A change in CPRATIO from the 25th percentile to the 75th percentile is associated with a 3.4% increase in portfolio turnover, an increase of 21.9% relative to the turnover of the typical institution. Thus, the effect is economically as well as statistically significant. Regressions (4) and (5) look more specifically at the turnover rates in stocks with high idiosyncratic risk and skewness. In (4), the dependent variable is turnover among stocks in the highest quintile of the lottery stock index. In (5), the dependent variable is the difference in turnover between stock in the highest and in the lowest quintiles of the lottery index. In both cases, the coefficient on CPRATIO is positive and significant.

In sum, these relationships indicate that institutions in High CPRATIO areas put relatively greater weight in speculative stocks, and trade aggressively in general. Such trading behavior could be a hallmark of superior information, as shown in Kacperczyk, Sialm, and Zheng (2005) with respect to industry concentration, and in Yan and Zhang (2009) with respect to short-term trading. This could arise if the stronger gambling preferences of these investors lead them to dominate information acquisation as in a Grossman-Stiglitz type model, or in more recent models of information acquisition as in Van Nieuwerburgh and Veldkamp (2010) and Koijen (2010). On the other hand, these same bahaviors can reflect sub-optimal trading by investors subject to overconfidence and other biases, as in Goetzmann and Kumar (2008) or Odean (1999). In the next section, to identify the effect of gambling preferences on investment performance, I examine the returns to portfolios sorted by CPRATIO.

4 Investor Preferences and Performance

4.1 Returns to CPRATIO-Sorted Portfolios

Table 4 presents quarterly raw and DGTW-adjusted returns to portfolios sorted by CPRATIO. The returns are expressed in percent at the quarterly frequency, and are weighted by the value of the institutional holdings. Panel A shows returns to portfolios sorted by CPRATIO. Because of the value weighting, these represent the returns on the aggregate portfolio of institutions located in each quintile of CPRATIO. There is no strong pattern across CPRATIO for the overall portfolio returns, though there is some drop off in the highest CPRATIO quintile, which makes the High−Low return slightly negative, though it is fairly small and not statistically significant.

To get better insight on the relative performance of high CPRATIO institutions, I examine the returns to sub-portfolios, specifically the components of the aggregate CPRATIO quintile portfolios consisting of stocks in each quintile of the lottery index. Since high CPRATIO institutions exhibit a preference for speculative stocks, and since these stocks provide greater scope for obtaining and exploiting profitable information, these subsets of the portfolio may provide the best insight about the role of gambling preferences in institutions' trading behavior and performance.

Specifically, I argue that investors with stronger skewness preference are willing to trade on weaker signals among stocks with high skewness in order to gain exposure to the skewness offered by the security. In contrast, institutions with low skewness preference require a stronger signal in order to take a significant position in a stock with high idiosyncratic risk and skewness. As a result, the holdings of lottery stocks by investors with stronger skewness preferences should earn higher abnormal returns, since their holdings among those stocks reflect more precise information on average.

Consistent with this hypothesis, the performance of high CPRATIO institutions relative to that of low CPRATIO institutions declines dramatically for the more speculative stocks. Among stocks in the lowest quintile of the lottery index, high CPRATIO institutions slightly outperform low CPRATIO institutions, by approximately 25 bp per quuarter, or 23 bp after adjusting for risk. In contrast, high CPRATIO institutions *underperform* low CPRATIO institutiona by 115 basis points per quarter (t-stat -2.60) among the most speculative stocks, after adjusting for risk. Notably, high CPRATIO institutions earn the highest risk-adjusted returns on stocks in the lowest quintile of the lotterty index.

4.2 Alternative Explanations: Local Bias and Industry Concentration

While the results of the portfolio sorts are consistent with the hypothesis gambling averse investors require stronger signals in order to hold lottery stocks, other factors may influence investors' portfolio allocation to lottery stocks and the expected performance of their lottery stock holdings. One possibility is local bias. If institutions are biased towards holding the stocks local firms due to the potential information advantage, and if there is geographic variation in stock return skewness and volatility, then the CPRATIO measure may actually pick up variation in institutions' local opportunity set rather than gambling preferences. To account for this, I portfolio sorts in Panel C, while excluding local stocks from each institution's portfolio. Panel D displays the results fom these portfolio sorts, which remain virtually unchanged from the baseline portfolio returns presented in Panel C. This suggests that the pattern in abnormal returns to lottery stock holdings across institutions is not simply driven by geographic variation in the local opportunity set.

Another possibility is institutions specialize in certain industries (as Kacperczyk, Sialm, and Zheng (2005) show for mutual fund managers), and that skewness and volatility vary across industries (e.g. Zhang (2005)). Since industries are often clustered geographically (e.g. Almazan, Motta, Titman, and Uysal (2010)), CPRATIO may pick up variation in industry specialization, which could lead to differences in lottery stock holdings and performance without an explicit preference for skewness. To account for this possibility, I repeat the portfolio sorts using a modification of the DGTW return that adjusts for industry. Specifically, I compute the DGTW return of each of the 48 Fama and French (1997) industries, and subtract the DGTW industry return from the DGTW return of the individual. This adjusts the returns to rule out differences in abnormal returns due simply to variation in industry concentrations. The industry-adjusted portfolio returns are presented in Panel E. The results are qualitatively similar, albeit a bit weaker. Overall, the difference in performance of lottery stock holdings across firms sorted by CPRATIO does not appear to be driven simply by local bias or industry concentration.

4.3 Subsample Tests

I repeat the portfolio sorts for subsamples of institutions based on various institutional characteristics. This allows me to see whether the pattern of relative performance is robust over time and across different categories of institutions, as well as to gauge the extent to which the pattern strengthens in expected ways.

The holdings and trades of smaller institutions are more likely to reflect the preferences of the fund managers, and I indeed find that the performance differential between high and low CPRATIO institutions is stronger among smaller institutions. Similarly, insitutions with more concentrated portfolios are likely to be those with looser investment constraints whose holdings and trades more closely reflect the information and preferences of the manager. Also, the difference between institutions taking speculative positions based on information and those motivated by more naive gambling preferences should be stronger among more concentrated institutions, which I find to be true. The performance differential between high and low CPRATIO institutions is equally strong among institutions with greater or lesser weight in the most speculative securities, as well as during the earlier and later parts of the sample period.

Overall these portfolio-based results are consistent with the hypothesis that the lottery stock holdings of institutions that are relatively averse to gambling earn higher abnormal returns, because they require stronger signals in order to trade among these stocks.

4.4 Trade Portfolios

To provide further evidence on the information content of trades conditional on investor preferences, I examine trade portfolios by high CPRATIO and by low CPRATIO institutions. This allows me to better assess whether the relative holdings-based performance reflects superior information when low CPRATIO insitutions choose to trade in speculative stocks, or whether high CPRATIO institutions simply perform poorly in more speculative stocks from overly aggressive trading.

Table 6 presents quarterly DGTW-adjusted returns following trades by institutional investors. Each quarter, stocks are sorted into quintiles based on the change in low (high) CPRATIO institutional ownership over the preceding quarter. Stocks in the top quintile of institutional ownership change are placed in the "Buy" portfolio, while stocks in the lowest quintile of change in ownership are placed in the "Sell" portfolio. The "Buy" and "Sell" portfolios are further sorted into quintiles based on the speculative stock index. For each quintile of the speculative stock index, I compute the return over the quarter following trade for the "Buy" portfolio, the "Sell" portfolio, and the "Buy − Sell" portfolio. Returns are value-weighted by the magnitude of the trade (market value × change in % ownership). Panel A reports the returns to portfolios based on the trades of institutions located in low CPRATIO areas (quintiles 1 and 2), while Panel B reports returns for portfolios based on trades by high CPRATIO institutions (quintiles 4 and 5).

The return differential between stocks purchased and sold by low CPRATIO institutions is 215 basis points (t-stat 2.46) over the quarter following the trades in the highest quintile of the lottery index. Meanwhile, the buy-sell return difference is smaller and not significant for high CPRATIO institutions. This provides further evidence of the information content of trades by relatively gambling-averse investors in the most speculative stocks. Overall the evidence suggest that gambling preferences negatively impact portfolio performance through excessive trading in stocks that are costly to hold. A broader point suggested by the evidence here is that the information content of trades is especially high when an investor trades contrary to her typical preferences.

5 Conclusion

This paper has examined how the gambling preferences of insitutional investors impact return performace. I argue that positive skewness can offset the holding costs posed by idiosyncratic risk for informed investors with a preference for skewness. Because investors with stronger skewness preferences are willing to trade on weaker signals for positively skewed stocks, they exhibit higher turnover and overweight stocks with high idiosyncratic risk and skewness, leading to higher overall portfolio concentration. Conversely, because they require a stronger signal to trade in stocks with high idiosyncratic risk and skewness, investors with lower skewness preferences allocate a lower portfolio weight but earn higher abnormal returns on those they hold. Consistent with these predictions, I find that institutions located in areas with more tolerant social attitudes toward gambling put more weight in speculative stocks, hold more concentrated portfolios, and trade more frequently. High CPRATIO stocks earn lower returns on their portfolio, particularly among the lottery stocks that they seem to favor.

In contrast, the evidence from post-trade returns suggests that the relative aversion to speculative stocks by low CPRATIO investors leads them to avoid such stocks *unless* they observe a sufficiently strong signal. This indicates that conditioning on investor preferences can be a useful means of identifying informed trades. Intuitively, trades that run contrary to an investor's preferences, tastes, or other constraints are more likely to reflect information. It would be interesting in future work to study whether the same idea holds in othe settings. For example, Hong and Kacperczyk (2009) and Hong and Kostovetsky (2010) show that certain social values can restrict portfolio choices for some investors. When a Democrat fund manager takes a significant position in a defense industry industry stock which she would normally avoid based on her political values, such a trade may reflect an especially strong information signal. I intend to explore such contexts as I continue this line of research.

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Table 1: Summary Statistics

This table presents summary statistics for the main sample of institutional portfolios. Data on institutional holdings are from the Thomson Financial 13(f) database. The sample includes all manager-quarter observations for independent investment advisers and investment companies (Thomson Financial types 3 and 4), excluding banks, insurance companies, and other types. The sample period is from the first quarter of 1980 to the last quarter of 2008.

	Mean	SD	10th	25th	Median	75th	90th
CPRATIO	4.140	2.621	0.671	1.778	4.092	6.914	6.914
Lottery Weight (%)	19.548	15.820	3.662	8.273	15.465	27.023	40.734
Avg Idio. Volatility	2.160	0.883	1.303	1.576	1.966	2.540	3.245
Avg Idio. Skewness	0.346	0.508	-0.072	0.116	0.288	0.472	0.733
Assets (billions)	2.677	15.724	0.065	0.142	0.381	1.375	4.450
Number of Stocks in Portfolio	214.916	374.945	21.000	46.000	95.000	213.000	506.000
Portfolio Concentration (HHI)	5.620	10.417	0.775	1.393	2.550	4.864	12.045
Industry Concentration	12.187	17.329	1.070	2.332	5.459	12.959	33.919
Turnover	18.287	13.277	3.611	8.538	15.694	25.256	36.115
Observations	31679						

Table 2: Characteristics of CPRATIO-Sorted Portfolios

This table presents averages of various portfolio measures for institutions sorted by CPRATIO. Lottery weight is the portfolio weight in stocks that are in the top quintile of the lottery index, controlling for size through a double sort. Avg idiosyncratic volatility and skewness are the value weighted averages of the individual stock measures, based on a four-factor regression on daily returns over the prior 6 months. The sample includes all manager-quarter observations for independent investment advisers and investment companies (Thomson Financial types 3 and 4), excluding banks, insurance companies, and other types. The sample period is from the first quarter of 1980 to the last quarter of 2008.

	CPRATIO				
	Q1	Q2	Q3	Q4	Q5
Portf. Weight in Lottery Stocks (%)	15.30	17.07	18.01	18.12	18.64
Avg. Idiosyncratic Volatility (%)	1.89	1.95	1.98	2.03	2.04
Avg. Idiosyncratic Skewness	0.28	0.31	0.30	0.33	0.36
Portfolio Size ($B)	1.58	1.49	1.61	2.75	2.39
Median Portf Size ($B)	0.46	0.38	0.40	0.39	0.46
Number of Stocks Held	173.74	184.82	186.71	206.11	216.81
Portfolio Concentration (×100)	4.63	4.73	5.20	5.14	5.45
Industry Concentration (×100)	8.67	10.33	12.04	10.83	10.89
Portfolio Turnover (%)	15.75	16.35	16.94	17.12	17.43
Number of Institutions	40.66	45.68	57.43	40.83	104.87
% of Aggregate Portfolio	10.77	14.74	14.46	23.87	38.67

Table 3: Gambling Preferences and Trading Behavior

This table presents estimates from panel regressions of trading measures on CPRATIO and other institution characteristics. The dependent variables in the five regressions are lottery weight, the average volatility of stocks in the portfolio, the average skewness of stocks in the portfolio, portfolio concentration, and portfolio turnover. Each regression also includes demographic controls for the institution's location whose coefficients have been suppressed for brevity. These include: total population, income median age, minority population, male-to-female ratio, the proportion of the population that is married, median age, and the porportion living in urban areas. All regressions are estimated with time effects (quarters), with standard errors clustered by county. t-statistics are reported in parentheses below the coefficient estimates.

	(1)	(2)	(3)	(4)	(5)
	Lottery Wt.	Concentration	Turnover	Lottery Turnover	Lottery - Non-Lottery Turnover
CPRATIO	0.00531***	0.00227**	0.00671***	0.00631***	0.00263**
	(3.03)	(2.42)	(5.08)	(5.02)	(2.58)
ln(Assets)	-0.00382**	-0.0133***	-0.0109***	-0.00440**	-0.00194*
	(-2.24)	(-8.60)	(-5.48)	(-2.39)	(-1.75)
Portfolio Concentration	0.148***		-0.274***	-0.279***	-0.0410
	(4.18)		(-10.75)	(-8.98)	(-1.42)
Industry Concentration	0.0959***	0.263***	-0.0133	-0.0651***	-0.0491**
	(3.62)	(12.31)	(-0.62)	(-3.51)	(-2.58)
Turnover	0.281***	-0.107***			
	(10.43)	(-9.92)			
Past 1-Yr Portfolio Return	0.0960***	-0.000591	0.0741***	0.0611***	0.0617***
	(11.19)	(-0.11)	(8.76)	(7.66)	(8.56)
DemographicControls	Yes	Yes	Yes	Yes	Yes
TimeEffects	Yes	Yes	Yes	Yes	Yes
N	23684	23684	23684	23252	22031
r2	0.165	0.373	0.0984	0.0722	0.0262

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 4: Gambling Preferences and Portfolio Performance

This table presents quarterly raw and DGTW-adjusted returns to portfolios sorted by CPRATIO. Returns quarterly returns expressed in percent, weighted by the value of the institutional holdings. Panel A shows returns to portfolios sorted by CPRATIO, while panel B shows sub-portfolio returns for the stocks in each quintile of the size-corrected lottery stock measure. Panel C shows DGTW-adjusted returns for the sub-portfolios sorted by CPRATIO. Portfolios are rebalanced each quarter. T-statistics are reported below the mean returns in parentheses.

Panel A: Quarterly Returns to CPRATIO-Sorted Portfolios

	CPRATIO					
	Q1	Q2	Q3	Q4	Q5	Q5−Q1
Raw return						
Mean	2.97	2.96	3.21	3.00	2.80	−0.24
t-stat	(3.08)	(3.18)	(3.37)	(3.00)	(2.87)	(−1.15)
DGTW return						
Mean	0.27	0.30	0.40	0.31	0.15	−0.18
t-stat	(1.98)	(1.60)	(1.57)	(1.63)	(0.85)	(−1.31)

Panel B: Quarterly Raw Returns to CPRATIO-Sorted Portfolios, by Lottery Index

Lottery	CPRATIO					
Index	Q1	Q2	Q3	Q4	Q5	Q5−Q1
Q1	2.95	2.78	3.68	3.25	3.38	0.25
	(3.92)	(3.83)	(4.92)	(4.36)	(4.97)	(1.24)
Q2	2.77	2.64	3.52	3.07	2.82	−0.01
	(3.22)	(3.19)	(4.34)	(3.70)	(3.23)	(−0.02)
Q3	2.74	2.25	3.32	2.64	2.55	−0.25
	(2.64)	(2.29)	(3.48)	(2.54)	(2.54)	(−0.62)
Q4	3.00	2.81	3.40	2.88	2.75	−0.44
	(2.58)	(2.53)	(3.05)	(2.37)	(2.37)	(−1.04)
Q5	3.73	3.21	3.56	2.78	2.39	−1.23
	(2.27)	(1.90)	(2.16)	(1.87)	(1.57)	(−2.59)
Q5−Q1						−1.48
						(−2.87)

Panel C: Quarterly DGTW Returns to CPRATIO-Sorted Portfolios, by Lottery Index

Lottery	CPRATIO					
Index	Q1	Q2	Q3	Q4	Q5	Q5−Q1
Q1	0.18	0.13	0.59	0.42	0.55	0.23
	(0.83)	(0.44)	(2.21)	(1.49)	(2.32)	(1.47)
Q2	0.02	0.06	0.46	0.28	−0.02	−0.10
	(0.07)	(0.25)	(1.91)	(1.21)	(−0.06)	(−0.29)
Q3	0.35	−0.09	0.55	0.12	0.00	−0.33
	(1.34)	(−0.40)	(2.18)	(0.49)	(0.02)	(−1.10)
Q4	0.38	0.29	0.72	0.37	0.14	−0.40
	(1.15)	(0.86)	(1.71)	(0.94)	(0.39)	(−1.20)
Q5	1.00	0.52	0.78	0.23	−0.21	−1.15
	(1.15)	(0.53)	(0.83)	(0.37)	(−0.29)	(−2.60)
Q5−Q1						−1.39
						(−2.97)

Panel D: Quarterly DGTW Returns to CPRATIO-Sorted Portfolios, by Lottery Index (Exclude Local Stocks)

Lottery	CPRATIO					
Index	Q1	Q2	Q3	Q4	Q5	Q5−Q1
Q1	0.16	0.14	0.53	0.42	0.60	0.22
	(0.73)	(0.49)	(1.81)	(1.38)	(2.39)	(1.23)
Q2	0.02	0.09	0.36	0.32	−0.02	−0.12
	(0.09)	(0.37)	(1.42)	(1.38)	(−0.07)	(−0.33)
Q3	0.33	−0.15	0.69	0.09	0.06	−0.30
	(1.26)	(−0.64)	(2.21)	(0.39)	(0.24)	(−0.90)
Q4	0.33	0.26	0.84	0.31	0.29	−0.25
	(1.03)	(0.79)	(2.03)	(0.74)	(0.73)	(−0.73)
Q5	1.11	0.49	0.57	0.28	−0.07	−1.10
	(1.27)	(0.49)	(0.62)	(0.44)	(−0.10)	(−2.48)
Q5−Q1						−1.32
						(−2.88)

Panel E: Quarterly DGTW Returns to CPRATIO-Sorted Portfolios, by Lottery Index (Industry-Adjusted)

Lottery			CPRATIO			
Index	Q1	Q2	Q3	Q4	Q5	Q5−Q1
Q1	0.18	0.30	0.33	0.29	0.42	0.15
	(1.17)	(1.06)	(1.87)	(1.44)	(2.49)	(1.06)
Q2	−0.09	0.00	0.14	0.20	−0.16	−0.10
	(−0.35)	(−0.02)	(0.70)	(1.01)	(−0.56)	(−0.26)
Q3	0.17	−0.21	0.39	−0.04	−0.09	−0.19
	(0.78)	(−1.07)	(2.15)	(−0.21)	(−0.41)	(−0.79)
Q4	0.30	0.20	0.64	0.13	0.15	−0.28
	(1.17)	(0.67)	(1.72)	(0.44)	(0.53)	(−1.00)
Q5	0.78	0.33	0.70	0.28	−0.03	−0.78
	(1.20)	(0.43)	(0.91)	(0.56)	(−0.05)	(−1.85)
Q5−Q1						−0.93
						(−2.19)

Table 5: Gambling Preferences and Portfolio Performance: Subsample Results

This table presents quarterly DGTW-adjusted returns to portfolios sorted by CPRATIO. Returns are reported for subsamples based on various institutional characteristics, and by subperiods. Panel A shows results for the first half of the sample period and last half of the sample period. Panel B shows subsamples based on portfolio size, while in Panel C, institutoins are split by portfolio concentration. Panel D reports subsamples based on the institutions portfoli weight in stocks in the top quintile of the lottery index. Returns are DGTW-adjusted quarterly returns expressed in percent, weighted by the value of the institutional holdings. Portfolios are rebalanced each quarter. T-statistics are reported below the mean returns in parentheses.

Panel A: Institution Size

Assets≤Median	CPRATIO			**Assets>Median**	CPRATIO		
	Q1	Q5	Q5−Q1		Q1	Q5	Q5−Q1
Q1	0.53	0.76	0.08	Q1	0.27	0.40	0.10
	(1.62)	(2.55)	(0.21)		(1.23)	(1.73)	(0.65)
Q2	0.70	−0.73	−1.78	Q2	0.73	0.01	−0.58
	(1.06)	(−1.12)	(−2.24)		(0.81)	(0.01)	(−1.37)
Q5−Q1			−1.62	Q5−Q1			−0.68
			(−2.32)				(−1.66)

Panel B: Portfolio Concentration

Diversified	CPRATIO			**Concentrated**	CPRATIO		
	Q1	Q5	Q5−Q1		Q1	Q5	Q5−Q1
Q1	0.47	0.61	−0.02	Q1	0.16	0.64	0.34
	(2.09)	(2.31)	(−0.10)		(0.43)	(1.62)	(0.83)
Q5	0.87	0.19	−0.72	Q5	1.19	−1.04	−1.98
	(0.85)	(0.27)	(−1.41)		(2.31)	(−1.40)	(−2.48)
Q5−Q1			−0.70	Q5−Q1			−2.34
			(−1.41)				(−2.53)

Panel C: Subperiods

Subperiod: 1980-1994	CPRATIO			**Subperiod: 1995-2008**	CPRATIO		
	Q1	Q5	Q5−Q1		Q1	Q5	Q5−Q1
Q1	0.53	0.76	0.23	Q1	0.47	0.37	−0.09
	(1.62)	(2.55)	(0.71)		(1.38)	(1.04)	(−0.48)
Q5	0.70	−0.73	−1.36	Q5	1.88	0.07	−1.71
	(1.06)	(−1.12)	(−2.13)		(1.19)	(0.05)	(−2.26)
Q5−Q1			−1.14	Q5−Q1			−1.62
			(−2.11)				(−2.15)

Panel D: Portfolio Weight in Speculative Stocks

Low Lottery Stock Weight	CPRATIO			**High Lottery Stock Weight**	CPRATIO		
	Q1	Q5	Q5−Q1		Q1	Q5	Q5−Q1
Q1	0.15	0.64	0.20	Q1	0.41	0.32	−0.10
	(0.43)	(2.29)	(0.84)		(1.39)	(1.19)	(−0.34)
Q5	0.97	−0.60	−1.69	Q5	1.08	−0.21	−1.22
	(1.27)	(−1.07)	(−2.36)		(1.20)	(−0.28)	(−2.49)
Q5−Q1			−1.90	Q5−Q1			−1.12
			(−2.63)				(−2.23)

Table 6: Returns to Institutional Trades

This table presents quarterly DGTW-adjusted returns following trades following trades by institutional investors. Each quarter, stocks are sorted into quintiles based on the change in institutional ownership over the preceding quarter. Stocks in the top quintile of institutional ownership change are placed in the "Buy" portfolio, while stocks in the lowest quintile of change in ownership are placed in the "Sell" portfolio. The "Buy" and "Sell" portfolios are furter sorted into quintiles based on the speculative stock index. For each quintile of the speculative stock index, I compute the return over the quarter following trade for the "Buy" portfolio, the "Sell" portfolio, and the "Buy − Sell" portfolio. Returns are value-weighted by the magnitude of the trade (market value × change in % ownership). Panel A reports the returns to portfolios based on the trades of institutions located in low CPRATIO areas (quintiles 1 and 2), while Panel B reports returns for portfolios based on trades by high CPRATIO institutions (quintiles 4 and 5). The sample period is from 1980 to 2000.

Panel A: DGTW returns following trades by low CPRATIO institutions

	Speculative Stock Index				
	Low	2	3	4	High
Buy	0.46	−0.03	−0.32	0.91	1.10
Sell	0.12	0.70	1.53	0.00	−0.94
Buy − Sell	0.39	−0.65	−1.85	0.93	2.15
t-stat	(0.65)	(−1.14)	(−1.47)	(1.23)	(2.46)

Panel B: DGTW returns following trades by high CPRATIO institutions

	Speculative Stock Index				
	Low	2	3	4	High
Buy	0.29	0.32	0.45	0.76	−0.58
Sell	0.64	0.87	1.37	0.29	−1.12
Buy − Sell	−0.37	−0.57	−0.95	0.33	0.66
t-stat	(−0.65)	(−0.85)	(−0.63)	(0.47)	(0.64)