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Anticipating the 2007–2008 Financial Crisis: Who Knew What and When Did They Know It?

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Abstract

We examine the ability of three groups of informed market participants to anticipate the 2007–2008 financial crisis. Institutional investors and financial analysts exhibit some awareness of the impending crisis in their preference for nonfinancial stocks over financial stocks. In contrast, corporate insiders of financial firms appear to be completely unaware of the timing and extent of the financial crisis. Net purchases by managers of financial firms exceed those by managers of nonfinancial firms over the entire 2006–2008 period. Our results add considerable weight to the argument that the financial crisis was more a case of flawed judgment than flawed incentives.

I. Introduction

The 2007–2008 financial crisis created the largest economic disruption since the Great Depression. It resulted in the collapse of financial institutions, the bailout of banks by governments, and severe downturns in stock markets around the world. By any measure of economic activity (e.g., employment, gross domestic product, and asset values), the 2007–2008 financial crisis, the so-called Great Recession, ranks uncomfortably close to the Great Depression. A large body of work has emerged to examine the causes and consequences of the recent financial crisis. Much of this research focuses on the banking sector, liquidity problems, policy reactions, and the real effects of the financial crisis.[1] The purpose of this study is to contribute to our understanding of financial crises by analyzing the behavior of major market participants before and during the Great Recession. Specifically, we investigate the ability of three groups of informed market participants, that is, institutional investors, financial analysts, and corporate insiders, to forecast the impending crisis.

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[1]See, for example, Campello, Graham, and Harvey (2010), Ivashina and Scharfstein (2010), Longstaff (2010), Erkens, Hung, and Matos (2012), and Gorton and Metrick (2012) and references therein.

Previous studies have examined the informational role of institutional investors, financial analysts, and corporate insiders during normal market conditions. These studies draw conflicting conclusions about the extent to which institutions, analysts, and insiders are informed. Several studies show that institutional trading predicts future earnings and stock returns (e.g., Nofsinger and Sias (1999), Ali, Durtschi, and Trombley (2004), and Yan and Zhang (2009)), whereas others find an inverse relation between institutional demand and future returns (e.g., Cai and Zheng (2004), Dasgupta, Prat, and Verardo (2011)). Similarly, many studies find that changes in analyst recommendations are informative of subsequent stock returns (e.g., Womack (1996), Jegadeesh, Kim, Krische, and Lee (2004)), whereas others contend that analyst recommendations are uninformed (e.g., Altinkilic and Hansen (2009)). Finally, several studies find that trading by corporate insiders earns abnormal returns (e.g., Rozeff and Zaman (1988), Lakonishok and Lee (2001)), whereas others document zero or even negative abnormal performance by insiders (e.g., Eckbo and Smith (1998), Chakravarty and McConnell (1999)).

In addition to these mixed results regarding the predictive abilities of institutions, analysts, and insiders, no previous study has examined their predictive abilities during an extreme financial crisis. One of the difficulties faced by researchers during normal market conditions is the lack of identifiable and significant events that would prompt intensive information-based trading. We overcome this difficulty by focusing on the recent financial crisis, a significant event with large wealth effects, thereby increasing the power of our tests for private information. During the 2007–2008 crisis, the stock market in general and the financial sector in particular suffered substantial losses.[2] If institutional investors, financial analysts, and corporate insiders possessed superior knowledge about the impending crisis, we would expect them to have acted on it.

Although the degree to which market participants are able to anticipate financial crises is an open empirical question, Piotroski and Roulstone (2004) provide an analytical framework from which to structure our analysis. Their study examines the relative abilities of institutions, analysts, and insiders to process firm-level, industry-level, and market-level information. They find that financial analysts have a comparative advantage at the industry level, whereas corporate insiders have a comparative advantage at the firm level. The comparative advantage of institutional investors is less straightforward, because it depends on whether the institution represents an insider (firm-level advantage) or outsider (market-level advantage). Because the 2007–2008 financial crisis originated in the financial sector and then spread to the overall market, we expect that financial analysts are in the best position to anticipate this industry-level meltdown. In contrast, we expect that corporate insiders' firm-level information advantage is unlikely to have given them advance warning of an industry-based crisis. Finally, the predictive ability of institutions should lie somewhere between that of analysts and insiders, because institutional investors have comparative advantages at the aggregate market level.

[2]From June 2007 to Dec. 2008, financial stocks lost, on average, nearly 60% of their market value, whereas nonfinancial stocks lost less than 40%.

In addition to generating evidence on the predictive ability of informed market participants, our results have direct implications for the ongoing debate about the role of financial firm executives. The critical issue in this debate is whether the disastrous outcomes of 2007–2008 were caused by financial firm executives' exploitation of a fundamentally flawed incentive system or by what proved to be bad decision making after the fact. Johnson (2011) summarizes this debate as follows:

> One view of executives at our largest banks in the run-up to the crisis of 2008 is that they were hapless fools. Unaware of how financial innovation had created toxic products and made the system fundamentally unstable, they blithely piled on more debt and inadvertently took on greater risks. The alternative view is that these people were more knaves than fools. They understood to a large degree what they and their companies were doing, and they kept at it up until the last minute—and in some cases beyond—because of incentives they might receive.

The debate of "knaves versus fools" has important consequences for corporate policy and regulatory changes, as well as for civil and criminal liabilities. Empirical evidence that might shed light on this issue is only at the beginning stages, and rather mixed to date. Bhagat and Bolton (2013) support the knaves' view by arguing that poorly designed incentive packages encouraged financial executives to knowingly take on excessive risk. In contrast, Fahlenbrach and Stulz (2011) lean toward the fools' view by arguing that the financial crisis was the result of "unexpected poor outcomes." These poor outcomes are the result of a bad draw from an ex post viewpoint and not the result of excessive risk taking or the pursuit of private gains at shareholder expense on an ex ante basis.[3] Which of these two narratives, knaves or fools, best captures actual executive behavior before and during the crisis is an open empirical question. Our empirical results add considerable weight to this debate by examining insider trading among financial firm executives.

Our first set of empirical tests examines the ability of institutional investors to anticipate the financial crisis. We investigate the levels of and changes in institutional ownership of financial versus nonfinancial firms for the 12-quarter period before and during the financial crisis (2006–2008). Our results show that institutional investors significantly underweight financial firms relative to nonfinancial firms (by 23.31% to 25.48%) in each of the 12 quarters under investigation. When examining cumulative trading since the beginning of 2006, we find evidence that institutions, particularly short-term institutions and top-performing institutions, exhibit some predictive ability for the financial crisis. Overall, we conclude that institutional investors had some knowledge of the impending financial crisis.

Our second set of empirical tests investigates the ability of financial analysts to anticipate the financial crisis. We examine analyst recommendations for

[3] Cheng, Raina, and Xiong (2014) reach similar conclusions about the role of financial managers in the related housing market bubble. In a related paper, Cheng, Hong, and Scheinkman (2015) show that executive compensation and firm risk can be positively correlated, even in the absence of managerial entrenchment.

financial versus nonfinancial firms. Our results show that analyst recommendations are significantly lower for financial firms relative to nonfinancial firms in every month of our 36-month period. In addition, we find weak evidence that analysts are more likely to downgrade financial firms relative to nonfinancial firms leading up to the financial crisis. Taken together, the analyst results suggest that financial analysts exhibit some awareness of the financial sector weaknesses around the crisis period.

Our third and perhaps most interesting set of empirical tests examines the ability of corporate insiders to anticipate the financial crisis. Our results show that insiders of financial firms have higher net purchases than insiders of nonfinancial firms in every 6-month interval of our sample period. Whereas insiders of nonfinancial firms are net sellers over the entire sample period, insiders of financial firms are net buyers in half of these 6-month intervals. Even during the periods when financial firm insiders are net sellers, the magnitude of their net selling is significantly smaller than that of their nonfinancial firm counterparts. These insider trading results are striking. Corporate insiders of financial firms reveal significantly more optimism in their trading patterns than do the insiders of nonfinancial firms. Contrary to the popular view that bank executives exploited their privileged inside information during the financial crisis, our results demonstrate that these executives were net accumulators of their own company stock relative to executives in nonfinancial firms.

Several concurrent papers examine the role of institutional investors and corporate insiders in the recent financial crisis (e.g., Manconi, Massa, and Yasuda (2012), Ben-David, Franzoni, and Moussawi (2012), and Erkens et al. (2012)). Our paper differs from these studies in two important ways. First, we perform our analysis at the aggregate (i.e., industry) level, rather than at the individual firm level. Although there are large variations across financial firms, the recent financial crisis is primarily an aggregate phenomenon driven by macro and systemic risk rather than firm-specific risk. Second, we draw most of our inferences from comparing financial firms with nonfinancial firms, rather than by examining financial firms in isolation. This research design helps control for unobserved factors that might influence both financial and nonfinancial firms while exploiting the facts that i) the 2007–2008 crisis originated in the finance sector, and ii) financial firms suffered substantially greater losses than nonfinancial firms during the crisis.

Our study makes several contributions to the literature and provides relevant evidence to ongoing policy debates. First, this is the first comprehensive study that analyzes the degree to which informed market participants are able to anticipate severe economic and financial shocks. Although researchers could not perform such an analysis for the Great Depression due to data constraints, we are able to examine the question of "who knew what and when did they know it" for the Great Recession.

Second, we provide new evidence that institutional investors and financial analysts expressed their concerns about a possible crisis by underweighting financial stocks or by giving significantly more negative recommendations to financial firms than to nonfinancial firms. Our finding regarding financial analysts, in particular, is consistent with the implications of Piotroski and Roulstone's (2004)

study that financial analysts have a relative information advantage at the industry or market level. The authors argue that "financial analysts are outsiders who generally have less access to firm-level idiosyncratic information than either management or significant institutional investors. As such, analysts could focus their efforts on obtaining and mapping industry- and market-level information into prices" (p. 1121). Our findings support this argument by showing that financial analysts appeared anxious about the overall financial sector during the run-up to the crisis.

Third, we show that the insiders of financial firms made significantly higher net purchases than their nonfinancial firm counterparts. This finding is consistent with a growing body of evidence (e.g., Fahlenbrach and Stulz (2011), Cheng et al. (2014)) suggesting that the financial crisis was more the result of flawed judgment (or a bad draw) than flawed managerial incentives. This conclusion suggests that recent regulatory proposals designed to restructure managerial incentives as a means of preventing future financial crises are unlikely to succeed.

The remainder of this paper proceeds as follows: Section II describes our data and provides descriptive statistics. Section III presents the empirical results. Section IV concludes the study.

II. Data Sources, Sample Construction, and Descriptive Statistics

A. Data Sources and Sample Construction

We obtain data on institutional quarterly holdings from the Thomson Financial Network (TFN) 13F Holdings database for the period from 2006:Q1 to 2008:Q4. In addition to analyzing all institutional investors as a single group, we separately examine short-term institutions, hedge funds, and top-performing institutions. We follow Yan and Zhang (2009) and classify an institution as a short-term institution if its turnover over the past 4 quarters ranks in the top tercile of all institutions. We classify an institution as a hedge fund if its name in the TFN database matches a name from the Center for International Securities and Derivatives Markets (CISDM) hedge fund database. We classify an institution as a top-performing institution if its 4-factor alpha (based on Carhart (1997)) estimated over the past 36 months ranks in the top tercile of all institutions.

We merge the institutional holdings data with the Compustat database to obtain the book value of common equity and common stock dividends and with the Center for Research in Security Prices (CRSP) monthly database to obtain Standard Industrial Classification (SIC) code, price, return, shares outstanding, and volume information. We restrict our study to common stocks (CRSP share code 10 or 11) and use SIC codes to determine whether a firm belongs to the financial industry. We follow the definition of financial firm provided in the U.S. Securities and Exchange Commission (SEC) Emergency Order from Sept. 18, 2008; specifically, financial firms include companies with the SIC codes 6000, 6011, 6020–6022, 6025, 6030, 6035–6036, 6111, 6140, 6144, 6200, 6210–6211,

6231, 6282, 6305, 6310–6311, 6320–6321, 6324, 6330–6331, 6350–6351, 6360–6361, 6712, and 6719.[4,5]

We obtain analyst recommendations from the Institutional Brokers' Estimate System (IBES) database. Analysts report their recommendations using different rating scales. However, IBES changes those scales to maintain a standard set of recommendations with five values, ranging from 1 = strong buy to 5 = strong sell. We re-code this recommendation system so that larger numbers indicate better ratings (i.e., 1 = strong sell and 5 = strong buy).

We use the TFN Insider database to obtain information on insider trades. The SEC requires insiders to report their trades within 2 business days of the transaction date. We restrict our insider trading analysis to management only. Following Lakonishok and Lee (2001), we define a firm's management group to include the CEO, CFO, chairperson of the board, directors, officers, presidents, and vice presidents (TFN role codes CEO, CFO, CB, D, O, P, VP). To focus on information-driven trading, we exclude all transactions related to the exercise of executive stock options (i.e., the acquisition and subsequent disposition of company stock). Following Lakonishok and Lee (2001), we apply several filters to the insider trading data to ensure accuracy. We exclude all transactions that are less than 100 shares or more than 20% of shares outstanding, as well as transactions with prices that differ by more than 20% of the closing price.

B. Descriptive Statistics

In Table 1 we present descriptive statistics for our full sample, as well as for subsamples of financial and nonfinancial firms. We report the time-series mean and standard deviation of cross-sectional average values for the following firm characteristics: share price (PRC), market capitalization (SIZE), book-to-market ratio (BM), share turnover (TURN), return volatility (VOL), firm age (AGE), previous 3-month return ($\text{RET}_{t-3,t}$), previous 9-month return ($\text{RET}_{t-12,t-3}$), and dividend yield (DP).[6] More detailed variable definitions are provided in the Appendix.

For the full sample, the mean values include a share price of \$24.33, market capitalization of \$3.79 billion, a book-to-market ratio of 0.63, and a monthly turnover rate of 19%. The average age since initial public offering is a little

[4]We replicate all empirical results using two alternative definitions of financial firms, one definition that is more restrictive than the SEC definition and a second definition that is less restrictive than the SEC definition. Our more restrictive definition is based on that of Flannery, Kwan, and Nimalendran (2004) and includes only those firms with SIC codes from 6021 to 6025 and from 6710 to 6712. Our less restrictive definition includes all firms with SIC codes from 6000 to 6999. The empirical results based on both alternative definitions are consistent with those reported herein. Due to space limitations, we provide these results in an Internet Appendix (available at www.jfqa.org).

[5]In addition to financial versus nonfinancial firms, we also compare Troubled Asset Relief Program (TARP) firms to non-TARP firms. The findings are consistent with those of the financial versus nonfinancial firms (i.e., institutions and analysts show some ability to identify financially vulnerable firms before the onset of the crisis). We present the TARP versus non-TARP results in our Internet Appendix.

[6]We exclude two financial firms from the analysis because their stock prices are above \$1,000 per share. We winsorize DP at the 99th percentile and BM at the 1st and 99th percentiles.

TABLE 1

Descriptive Statistics

Table 1 presents the descriptive statistics for our full sample, as well as subsamples of financial and nonfinancial firms, for the period from 2006 to 2008. We report the time-series means and standard deviations of the cross-sectional average values for the following firm characteristics: share price (PRC), market capitalization (SIZE), book-to-market ratio (BM), share turnover (TURN), return volatility (VOL), firm age (AGE), prior 3-month return ($RET_{t-3,t}$), prior 9-month return ($RET_{t-12,t-3}$), and dividend yield (DP). Data sources and detailed variable definitions are described in the Appendix. Our sample includes only common stocks (those with a share code of 10 or 11 in the CRSP). Two firms with stock price above $1,000 are excluded from the analysis. To identify financial firms, we follow the definition from the SEC Emergency Order of Sept. 18, 2008.

	All Firms		Financial Firms		Nonfinancial Firms	
Firm Characteristics	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
PRC ($)	24.33	3.54	27.09	5.34	23.74	3.28
SIZE ($bil)	3.79	0.45	2.97	0.65	3.96	0.45
BM	0.63	0.16	0.78	0.27	0.59	0.14
TURN	0.19	0.02	0.10	0.03	0.21	0.02
VOL	0.11	0.01	0.07	0.02	0.12	0.01
AGE (months)	218.55	2.40	167.14	1.70	229.55	2.62
$RET_{t-3,t}$	−2.57%	12.55%	−3.66%	7.76%	−2.33%	13.71%
$RET_{t-12,t-3}$	4.65%	12.14%	−1.56%	12.95%	5.98%	12.28%
DP	1.22%	0.32%	2.31%	0.60%	0.99%	0.27%

over 218 months (18.2 years), and the mean dividend yield is 1.22%. The mean cumulative return over the previous 3 months is −2.57%, whereas the mean cumulative return over the 9-month period from $t - 12$ to $t - 3$ is 4.65%. For the financial (nonfinancial) subsample, mean values include a share price of $27.09 ($23.74), market capitalization of $2.97 billion ($3.96 billion), a book-to-market ratio of 0.78 (0.59), and a monthly turnover rate of 10% (21%). The average age is 167.14 (229.55) months and the mean dividend yield is 2.31% (0.99%). The mean cumulative return over the previous 3 months is −3.66% (−2.33%), and the mean cumulative return from $t - 12$ to $t - 3$ is −1.56% (5.98%). These results show that financial firms tend to have lower capitalizations, turnover, volatility, and age, but higher dividend yields and book-to-market ratios, than the typical nonfinancial firm. The main difference, however, is the negative cumulative return (from $t - 12$ to $t - 3$) for financial firms compared to the positive cumulative return for nonfinancial firms.

III. Empirical Results

A. Institutional Investors

1. Institutional Ownership: Levels and Changes

To determine whether institutional investors were able to predict the financial crisis, we first examine how institutional ownership and trading differ between financial firms and nonfinancial firms. If institutions possess foresight about the impending crisis, we expect them to underweight financial firms relative to nonfinancial firms. Following Gompers and Metrick (2001), we define institutional ownership (IO) as the fraction of a firm's shares held by institutional investors. Specifically, for each firm in each quarter (firm–quarter) we sum the shares held across all reporting institutions and divide by the total number of

shares outstanding.[7] We then calculate equal-weighted average institutional ownership across all financial and nonfinancial firms. We define change in institutional ownership (ΔIO) for a given stock as the quarterly change in IO between two consecutive quarters. We define cumulative change in institutional ownership (ΔIO^{CUM}) as the cumulative change in IO since the beginning of our sample period (2006:Q1), and $DIFF^{CUM}$ as the difference in average cumulative ΔIO between financial and nonfinancial firms.

In Panel A of Table 2, we report the average IO for financial and nonfinancial firms, as well as the difference in average IO between financial and nonfinancial firms. The IO results show some initial evidence that institutions were able to anticipate the financial crisis. Institutions hold a significantly smaller fraction of financial firms than nonfinancial firms in every quarter of the sample period. For example, in the first quarter of 2007 the average institutional ownership is 63.41% for nonfinancial firms but is only 38.84% for financial firms. The difference in institutional ownership between financial and nonfinancial firms, ranging from 23.31% at the beginning of the sample period (2006:Q1) to 25.48% when the financial crisis was beginning to emerge (2007:Q3),[8] is economically large and statistically significant.

In Panel B of Table 2, we report the average ΔIO for financial and nonfinancial firms, as well as the difference in average ΔIO between financial and nonfinancial firms. Because we are analyzing quarterly changes over a 3-year period, the results are more volatile and more difficult to summarize than are the ownership levels in Panel A. That said, the results show some evidence that institutions reduced their holdings of financial firms relative to nonfinancial firms during the six quarters of the run-up to the financial crisis (i.e., from 2006:Q1 to 2007:Q2). All six *t*-statistics for the ΔIO differences in the financial versus nonfinancial firms (DIFF) are negative and three of the six *t*-statistics are statistically significant. During the second half of our sample period (i.e., the crisis period), institutions mostly increased their holdings of financial firms relative to nonfinancial firms. This result suggests that institutions became less cautious about holding financial firms after the crisis began than they had been during the precrisis period. Five of the six *t*-statistics for ΔIO differences are positive and two of the five positive *t*-statistics are statistically significant.

We also examine differences in cumulative IO changes ($DIFF^{CUM}$) from the beginning of 2006 for financial versus nonfinancial firms. As expected, these cumulative changes are less volatile than are quarterly changes. Moreover, the cumulative changes reveal more consistent evidence of reductions in institutional exposure to financial firms relative to nonfinancial firms. Specifically, all differences in cumulative IO changes between financial and nonfinancial firms are negative, and 10 out of 12 are significantly negative.

[7] If a resulting IO value is greater than 100% due to stock lending for short sales, we set it equal to 100%.

[8] Two Bear Stearns' hedge funds (High-Grade Structured Credit Fund and High-Grade Structured Credit Enhanced Leverage Fund) reported large losses in June 2007, followed by bankruptcy filings in July 2007.

TABLE 2

Institutional Ownership and Changes in Institutional Ownership

Table 2 presents the average quarterly institutional ownership (IO) and quarterly changes in institutional ownership (ΔIO) for the period from 2006 to 2008. Panel A reports the average IO for financial (FIN) and nonfinancial (NONFIN) firms, as well as the difference (DIFF) in average IO between financial and nonfinancial firms. Panel B reports the average ΔIO for financial and nonfinancial firms, as well as the difference in average ΔIO between financial and nonfinancial firms. The variable DIFF^{CUM} is the difference in average cumulative ΔIO between financial and nonfinancial firms. Data sources and detailed variable definitions are described in the Appendix. To identify financial firms, we follow the definition from the SEC Emergency Order of Sept. 18, 2008. We exclude two firms with share prices above $1,000 from the analysis. The variables IO and ΔIO are expressed as percentages. The numbers in parentheses are *t*-statistics for differences in means, assuming equal variances. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Institutional Ownership

Date	FIN	NONFIN	DIFF	(*t*-stat.)
Mar 2006	36.44	59.75	−23.31***	(−17.17)
Jun 2006	36.95	60.69	−23.75***	(−17.58)
Sep 2006	37.52	61.62	−24.10***	(−17.71)
Dec 2006	38.92	62.78	−23.86***	(−17.27)
Mar 2007	38.84	63.41	−24.57***	(−18.07)
Jun 2007	39.72	65.05	−25.32***	(−18.34)
Sep 2007	40.99	66.47	−25.48***	(−17.84)
Dec 2007	40.65	65.07	−24.42***	(−17.64)
Mar 2008	39.55	64.20	−24.65***	(−17.74)
Jun 2008	40.40	65.05	−24.64***	(−17.73)
Sep 2008	40.12	64.60	−24.48***	(−17.65)
Dec 2008	37.58	61.79	−24.21***	(−17.47)

Panel B. Changes in Institutional Ownership

Date	FIN	NONFIN	DIFF	(*t*-stat.)	DIFF^{CUM}	(*t*-stat.)
Mar 2006	1.13	1.58	−0.45	(−1.52)	−0.45	(−1.52)
Jun 2006	0.41	0.85	−0.44	(−1.39)	−0.88**	(−2.12)
Sep 2006	0.69	1.20	−0.51**	(−1.92)	−1.48***	(−3.04)
Dec 2006	1.43	1.66	−0.23	(−0.74)	−1.65***	(−3.09)
Mar 2007	0.13	0.75	−0.62**	(−1.96)	−2.34***	(−4.02)
Jun 2007	1.04	1.99	−0.95***	(−3.35)	−3.38***	(−5.41)
Sep 2007	1.86	1.71	0.15	(0.43)	−3.03***	(−4.38)
Dec 2007	−0.64	−1.65	1.01***	(2.69)	−2.10***	(−3.00)
Mar 2008	−0.11	0.08	−0.18	(−0.59)	−2.15***	(−2.86)
Jun 2008	0.62	0.61	0.01	(0.02)	−2.26***	(−2.88)
Sep 2008	0.09	0.03	0.06	(0.20)	−2.20***	(−2.72)
Dec 2008	−2.00	−3.00	0.99**	(2.41)	−1.08	(−1.27)

2. Short-Term Institutions, Hedge Funds, and Top-Performing Institutions

In Table 3 we refine the analysis by presenting the IO, ΔIO, and $\Delta\text{IO}^{\text{CUM}}$ results for three subcategories of institutional investors: short-term institutions, hedge funds, and top-performing institutions (as defined in Section I.A). We select these subcategories because we are interested in identifying institutional traders with both the incentive and information to make informed trades before and during a financial crisis. Short-term institutions are expected to collect and process information that can be exploited over the short to intermediate term. Previous studies (e.g., Ke and Ramalingegowda (2005), Yan and Zhang (2009)) present evidence that short-term institutions are better informed than are long-term institutions. Hedge fund managers are often regarded by Wall Street commentators as representing the interests of "smart money." Top-performing institutions have displayed superior investing skills in the recent past and therefore might be expected to identify and trade ahead of an approaching financial crisis.

The IO results in Panel A of Table 3 show that each institutional subcategory had significantly less exposure to financial firms than to nonfinancial firms during the 2006–2008 sample period. The differences are negative and significant in all 12 quarters for all three subcategories of institutions. These results

TABLE 3

Institutional Ownership and Changes in Institutional Ownership: Subgroups of Institutions

Table 3 presents the average quarterly institutional ownership (IO) and quarterly changes in institutional ownership (ΔIO) for the period from 2006 to 2008 for the following subgroups of institutions: short-term institutions, hedge funds, and top-performing institutions. We define short-term institutions as those whose past 4-quarter turnover rate ranks in the top tercile. We identify hedge funds by using the CISDM hedge fund database. We define top-performing institutions as those whose 4-factor alpha (Carhart (1997)) estimated over the prior 36 months ranks in the top tercile. Panel A reports the average IO for financial (FIN) and nonfinancial (NONFIN) firms, as well as the difference (DIFF) in average IO between financial and nonfinancial firms. Panel B reports the average ΔIO for financial and nonfinancial firms, as well as the difference in average ΔIO between financial and nonfinancial firms. The variable $DIFF^{CUM}$ is the difference in average cumulative ΔIO between financial and nonfinancial firms. Data sources and detailed variable definitions are described in the Appendix. To identify financial firms, we follow the definition from the SEC Emergency Order of Sept. 18, 2008. We exclude 2 firms with share prices above $1,000 from the analysis. The variables IO and ΔIO are expressed as percentages. The numbers in parentheses are *t*-statistics for differences in means, assuming equal variances. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Institutional Ownership

	Short-Term Institutions				Hedge Funds				Top-Performing Institutions			
Date	FIN	NONFIN	DIFF	(*t*-stat.)	FIN	NONFIN	DIFF	(*t*-stat.)	FIN	NONFIN	DIFF	(*t*-stat.)
Mar 2006	15.61	31.48	−15.87***	(−18.46)	1.85	3.74	−1.89***	(−10.42)	6.63	10.47	−3.84***	(−9.49)
Jun 2006	15.89	32.05	−16.17***	(−18.60)	1.98	3.86	−1.88***	(−10.30)	7.70	12.32	−4.62***	(−9.95)
Sep 2006	15.92	31.69	−15.77***	(−18.35)	1.88	3.69	−1.82***	(−10.15)	7.32	12.01	−4.69***	(−10.28)
Dec 2006	14.85	30.07	−15.22***	(−18.75)	1.94	3.59	−1.66***	(−9.37)	7.96	14.29	−6.33***	(−12.62)
Mar 2007	15.37	31.27	−15.91***	(−18.94)	1.94	3.78	−1.85***	(−9.84)	7.70	15.98	−8.27***	(−15.17)
Jun 2007	16.62	34.05	−17.43***	(−19.70)	2.03	3.89	−1.85***	(−9.78)	6.89	14.67	−7.78***	(−14.67)
Sep 2007	15.66	30.24	−14.58***	(−18.35)	2.01	3.80	−1.79***	(−9.75)	5.11	12.93	−7.81***	(−16.39)
Dec 2007	15.76	30.61	−14.84***	(−18.33)	1.98	3.94	−1.95***	(−10.05)	5.22	13.26	−8.04***	(−16.99)
Mar 2008	16.43	30.55	−14.12***	(−17.50)	2.18	4.54	−2.36***	(−11.49)	6.34	14.14	−7.81***	(−15.81)
Jun 2008	17.53	33.41	−15.88***	(−17.86)	2.10	4.51	−2.41***	(−11.48)	6.41	13.65	−7.24***	(−14.98)
Sep 2008	16.43	31.44	−15.02***	(−18.04)	1.98	4.21	−2.23***	(−10.77)	5.00	10.62	−5.62***	(−13.47)
Dec 2008	13.81	26.99	−13.18***	(−17.37)	2.17	4.63	−2.46***	(−10.36)	3.74	7.95	−4.21***	(−12.06)

(continued on next page)

TABLE 3 (continued)

Institutional Ownership and Changes in Institutional Ownership: Subgroups of Institutions

Panel B. Changes in Institutional Ownership

	Short-Term Institutions				Hedge Funds				Top-Performing Institutions			
Date	FIN	NONFIN	DIFF (*t*-stat.)	$DIFF^{CUM}$ (*t*-stat.)	FIN	NONFIN	DIFF (*t*-stat.)	$DIFF^{CUM}$ (*t*-stat.)	FIN	NONFIN	DIFF (*t*-stat.)	$DIFF^{CUM}$ (*t*-stat.)
Mar 2006	0.71	1.34	−0.63** (−2.43)	−0.63** (−2.43)	0.20	0.36	−0.16** (−2.23)	−0.16*** (−2.23)	−1.51	−0.71	−0.80*** (−2.77)	−0.80*** (−2.77)
Jun 2006	0.23	0.46	−0.24 (−1.02)	−0.84*** (−2.67)	0.13	0.15	−0.01 (−0.20)	−0.14 (−1.49)	1.01	1.88	−0.87*** (−3.71)	−1.67*** (−5.10)
Sep 2006	−0.06	−0.44	0.38 (1.38)	−0.52 (−1.36)	−0.08	−0.13	0.05 (0.81)	−0.08 (−0.77)	−0.34	−0.31	−0.03 (−0.16)	−1.70*** (−5.17)
Dec 2006	−1.12	−1.37	0.25 (0.91)	−0.31 (−0.73)	0.06	−0.07	0.13 (1.65)	−0.01 (−0.07)	0.63	2.36	−1.73*** (−7.25)	−3.47*** (−8.94)
Mar 2007	0.57	1.22	−0.64** (−2.50)	−0.99** (−2.17)	−0.01	0.17	−0.18** (−2.25)	−0.17 (−1.25)	−0.28	1.68	−1.96*** (−8.54)	−5.38*** (−12.45)
Jun 2007	1.21	2.78	−1.57*** (−5.87)	−2.69*** (−5.23)	0.10	0.19	−0.09 (−1.21)	−0.22 (−1.54)	−0.82	−1.35	0.53** (1.86)	−4.77*** (−10.52)
Sep 2007	−0.93	−3.91	2.98*** (8.91)	0.45 (−0.83)	−0.03	−0.03	0.00 (0.03)	−0.20 (−1.25)	−1.69	−1.79	0.10 (0.35)	−4.53*** (−9.89)
Dec 2007	0.06	0.42	−0.36 (−1.38)	0.02 (0.03)	0.00	0.17	−0.17** (−2.13)	−0.35*** (−2.19)	0.08	0.45	−0.36 (−1.45)	−4.69*** (−9.88)
Mar 2008	0.97	0.01	0.96*** (3.31)	0.99 (1.69)	0.24	0.63	−0.40*** (−4.34)	−0.75*** (−4.28)	1.26	0.91	0.35 (1.33)	−4.22*** (−8.80)
Jun 2008	0.90	2.85	−1.95*** (−5.78)	−0.99 (−1.63)	−0.09	0.00	−0.09 (−0.99)	−0.84*** (−4.75)	−0.16	−0.47	0.31 (1.24)	−3.78*** (−7.85)
Sep 2008	−0.92	−1.93	1.01*** (3.26)	−0.01 (−0.02)	−0.09	−0.26	0.17** (2.39)	−0.66*** (−3.80)	−1.45	−3.01	1.57*** (5.82)	−2.07*** (−4.52)
Dec 2008	−2.45	−4.63	2.18*** (7.06)	2.16*** (3.62)	0.21	0.44	−0.22** (−2.13)	−0.80*** (−3.92)	−1.08	−2.69	1.61*** (6.38)	−0.26 (−0.57)

are consistent with the findings in Table 2 and confirm that major subcategories of sophisticated institutional traders had relatively low holdings of financial firms compared with nonfinancial firms heading into and during the financial crisis. Our ΔIO and ΔIO^{CUM} results in Panel B of Table 3 are less straightforward to summarize due to the volatile nature of quarterly changes. But again, as in Table 2, there are some discernible patterns. First, top-performing institutions exhibit the strongest evidence of timing ability in the run-up to the financial crisis. These institutions significantly reduced their exposure to financial firms relative to nonfinancial firms in four out of six quarters, resulting in a cumulative reduction of 4.77% between Jan. 2006 and June 2007. Second, short-term institutions also reduced their exposure to financial firms relative to nonfinancial firms in the run-up to the financial crisis (significant in 3 out of 6 quarters). We also note that during the second half of the sample period (i.e., in the midst of the crisis) short-term institutional ownership toggled back and forth between large negative and large positive changes. Finally, hedge funds tended to decrease their exposures to financial firms significantly more in the second half of the period. This pattern could be the result of redemptions on the part of nervous limited partners, as suggested by Ben-David et al. (2012).

3. Regression Analysis

Overall, our univariate findings in Tables 2 and 3 provide some initial evidence that institutions were aware of potential trouble in the financial sector before the outbreak of the crisis. Although the univariate results indicate that institutions prefer nonfinancial to financial firms prior to and during the financial crisis, prior literature identifies several variables that influence institutional preferences for stocks (e.g., Gompers and Metrick (2001)). It may be that these preferences, rather than information about the impending financial crisis, are actually driving the results. To control for this possibility, we follow Gompers and Metrick and estimate the following cross-sectional regression in each quarter:

$$\begin{aligned}(1)\qquad \mathrm{IO}_{i,t} \text{ or } \Delta\mathrm{IO}_{i,t,t+1} \;=\; & \beta_0 + \beta_1 \mathrm{FIN}_{i,t} + \beta_2 \mathrm{SIZE}_{i,t} + \beta_3 \mathrm{BM}_{i,t} \\ & + \beta_4 \mathrm{RET}_{i,t-3,t} + \beta_5 \mathrm{RET}_{i,t-12,t-3} + \beta_6 \mathrm{TURN}_{i,t} \\ & + \beta_7 \mathrm{VOL}_{i,t} + \beta_8 \mathrm{AGE}_{i,t} + \beta_9 \mathrm{PRC}_{i,t} + \beta_{10} \mathrm{DP}_{i,t} \\ & + \beta_{11} \mathrm{SP500}_{i,t} + e_{i,t},\end{aligned}$$

where IO represents institutional ownership and ΔIO represents institutional trading, FIN is an indicator variable for financial firms, and SP500 is an indicator variable for membership in the Standard & Poor's (S&P) 500 index. All variables except for prior returns and indicator variables are in natural logarithms. To reduce the impact of outliers, we winsorize DP at the 99th percentile and BM at both the 1st and 99th percentiles. We estimate regression (1) for all institutions, as well as for the subcategories of short-term institutions, hedge funds, and top-performing institutions. For brevity, we report the estimated coefficients only for the FIN indicator variable, our main variable of interest, in Table 4.

The IO results in Table 4 show that institutions held significantly lower percentages of financial firm shares than nonfinancial firm shares, even after controlling for the variables known to impact institutional investor preferences. In the first

TABLE 4

Cross-Sectional Regressions of Institutional Ownership and Changes in Institutional Ownership

Table 4 presents the coefficient of the financial indicator variable from the following regression:

$$IO_{i,t} \text{ or } \Delta IO_{i,t,t+1} = \beta_0 + \beta_1 FIN_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 BM_{i,t} + \beta_4 RET_{i,t-3,t} + \beta_5 RET_{i,t-12,t-3} + \beta_6 TURN_{i,t} + \beta_7 VOL_{i,t} + \beta_8 AGE_{i,t} + \beta_9 PRC_{i,t} + \beta_{10} DP_{i,t} + \beta_{11} SP500_{i,t} + e_{i,t}.$$

We estimate this regression each quarter for all institutions and for the following subgroups of institutions: short-term institutions, hedge funds, and top-performing institutions. The variable IO is quarterly institutional ownership, ΔIO is changes in quarterly institutional ownership, FIN is an indicator variable for financial firms, SIZE is market capitalization, BM is the book-to-market ratio, $RET_{t-3,t}$ is the prior 3-month return, $RET_{t-12,t-3}$ is the cumulative return between month $t-12$ to month $t-3$, TURN is share turnover, VOL is return volatility, AGE is firm age, DP is dividend yield, PRC is share price, and SP500 is an indicator variable for S&P 500 membership. Data sources and detailed variable definitions are described in the Appendix. All variables except IO, ΔIO, $RET_{t-3,t}$, $RET_{t-12,t-3}$, FIN, and SP500 are expressed in natural logarithms. Our sample includes only common stocks (those with a share code of 10 or 11 in the CRSP). Two firms with stock prices above $1,000 are excluded from the analysis. The coefficients of FIN are expressed as percentages. The numbers in parentheses are *t*-statistics. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	All Institutions		Short-Term Institutions		Hedge Funds		Top-Performing Institutions	
Date	IO	ΔIO	IO	ΔIO	IO	ΔIO	IO	ΔIO
Mar 2006	−20.48***	0.18	−12.16***	−0.57*	−1.95***	0.04	−3.76***	−1.53***
	(−19.27)	(0.51)	(−16.62)	(−1.87)	(−9.54)	(0.49)	(−9.01)	(−4.66)
Jun 2006	−20.20***	−0.23	−11.97***	−0.11	−1.99***	−0.08	−4.34***	−0.85***
	(−19.38)	(−0.64)	(−16.13)	(−0.42)	(−9.63)	(−1.01)	(−9.29)	(−3.13)
Sep 2006	−19.64***	−0.39	−10.85***	0.54*	−1.87***	−0.02	−4.02***	0.24
	(−19.18)	(−1.28)	(−15.25)	(1.67)	(−9.21)	(−0.21)	(−8.86)	(1.09)
Dec 2006	−21.03***	−0.73**	−11.16***	−0.20	−1.73***	0.14	−6.34***	−2.13***
	(−19.24)	(−2.04)	(−16.04)	(−0.65)	(−8.57)	(1.59)	(−12.81)	(−7.81)
Mar 2007	−20.28***	−0.03	−11.31***	−0.59*	−1.89***	−0.20**	−7.57***	−1.57***
	(−19.06)	(−0.07)	(−15.66)	(−1.97)	(−8.80)	(−2.12)	(−14.59)	(−5.97)
Jun 2007	−20.41***	−0.88***	−12.40***	−1.55***	−1.79***	−0.02	−6.08***	1.30***
	(−19.28)	(−2.66)	(−16.39)	(−4.93)	(−8.33)	(−0.17)	(−12.21)	(3.92)
Sep 2007	−19.55***	0.42	−10.03***	1.97***	−1.70***	0.02	−6.31***	−0.25
	(−18.41)	(1.11)	(−14.23)	(5.29)	(−8.18)	(0.24)	(−13.42)	(−0.78)
Dec 2007	−20.13***	0.96**	−10.84***	−0.28	−2.08***	−0.28***	−6.88***	−0.81***
	(−18.53)	(2.39)	(−14.87)	(−0.93)	(−9.34)	(−3.11)	(−14.57)	(−2.80)
Mar 2008	−20.08***	−0.18	−9.83***	0.71**	−2.22***	−0.20*	−6.37***	0.43
	(−18.58)	(−0.50)	(−13.69)	(2.10)	(−9.64)	(−1.85)	(−12.91)	(1.40)
Jun 2008	−17.82***	0.36	−10.47***	−1.32***	−2.26***	−0.13	−5.73***	−0.19
	(−16.89)	(0.88)	(−14.18)	(−3.49)	(−9.67)	(−1.30)	(−11.86)	(−0.66)
Sep 2008	−20.16***	0.02	−11.17***	0.55	−2.24***	0.11	−5.26***	1.02***
	(−18.97)	(0.05)	(−15.84)	(1.56)	(−9.79)	(1.35)	(−12.35)	(3.38)
Dec 2008	−15.23***	0.85*	−7.83***	1.88***	−2.01***	−0.04	−3.67***	1.80***
	(−14.38)	(1.85)	(−12.28)	(5.50)	(−7.63)	(−0.32)	(−9.91)	(6.45)

column (all institutions), the coefficient estimates of FIN are negative and highly significant in every quarter of our sample. We find similar results for each subcategory of institutions; namely, the FIN coefficient estimates are negative and highly significant in every quarter of the IO regressions. These multivariate findings clearly show that institutions favored nonfinancial firms over financial firms in the run-up to and during the financial crisis.

In contrast to the IO regressions, the ΔIO regressions reveal weaker evidence of informed trading on a quarter-by-quarter basis. The ΔIO regressions based on all institutions contain three statistically significant FIN coefficients, two negative and significant coefficients in the first half of the sample period (i.e., precrisis period), and one positive and significant coefficient in the second half of the sample period. Short-term institutions also have two negative and significant coefficients in the first half of the sample period, followed by three positive and

significant coefficients and one negative and significant coefficient in the second half. Hedge funds have one negative and significant coefficient in the first half of the period and two negative and significant coefficients in the second half. As in Table 3, the top-performing institutions show the strongest ability to anticipate the financial crisis, with four negative and significant coefficients in the precrisis period. They then reverse their aversion to financial stock in the second half of the period, with three positive and significant coefficients and one negative and significant coefficient. During the last quarter of 2008, in particular, top-performing and short-term institutions made fairly aggressive moves into financial sector stocks. One possible explanation is that top-performing and short-term institutions anticipated that the government would bail out the troubled financial institutions (i.e., through the TARP).

On the whole, these regression results are similar to the univariate results. Institutional investors seem to have had the foresight to underweight financial firms relative to nonfinancial firms before the financial crisis.[9] Although the findings suggest that institutions were informed with respect to the vulnerability of the financial sector, we find less clear evidence that institutions were able to time adverse market moves on a quarter-by-quarter basis. The results suggest that institutions possessed general, if vague, knowledge of the impending crisis.

B. Financial Analysts

1. Analyst Recommendations

Our first set of results is based on average analyst recommendations. For each month in our sample period, we obtain the most recent recommendation for a given firm issued by an analyst within the previous 12 months. The consensus recommendation is the average of all outstanding recommendations for a given stock. Similar to our previous analyses, we focus on differences between financial firms and nonfinancial firms. If analysts are informed about the financial crisis, we expect that the average consensus analyst recommendations for financial firms will be significantly lower than those for nonfinancial firms.

The results in Panel A of Table 5 show that analyst recommendations are significantly lower for financial firms than for nonfinancial firms in every month of our sample. These findings are consistent with considerable foresight on the part of financial analysts. Not only are the differences negative and significant in each month (ranging from -0.15 to -0.39), but the absolute values of the t-statistics are quite large (ranging from -6.18 to -16.23).

To ensure that our univariate results are not driven by other variables that analysts rely on when issuing recommendations (Jegadeesh et al. (2004)), we examine how analyst recommendations for financials versus nonfinancials differ while controlling for firm size, book-to-market ratio, and prior stock returns. In particular, we estimate the following Fama–MacBeth (1973) type of regression

[9]We also perform difference-in-differences analyses that compare institutional investors' underweighting of financial firms during the crisis period to their underweighting of financial firms during a noncrisis benchmark period. These regression results confirm that institutional investors underweight financial firms significantly more during the crisis than during a noncrisis benchmark period. We provide these difference-in-differences results in our Internet Appendix.

TABLE 5

Analyst Recommendations

Table 5 presents the average consensus analyst recommendations (REC) and cross-sectional regressions of analyst recommendations for the period from Jan. 2006 to Dec. 2008. Panel A reports the average consensus analyst recommendations for financial (FIN) and nonfinancial (NONFIN) firms, as well as the difference (DIFF) in average consensus analyst recommendations between financial and nonfinancial firms. The numbers in parentheses are *t*-statistics for the differences in means, assuming equal variances. Panel B reports the Fama–MacBeth (1973) coefficients from the following cross-sectional regression:

$$\mathrm{REC}_{i,t} = \beta_0 + \beta_1 \mathrm{FIN}_{i,t} + \beta_2 \mathrm{SIZE}_{i,t} + \beta_3 \mathrm{BM}_{i,t} + \beta_4 \mathrm{RET}_{i,t-3,t} + \beta_5 \mathrm{RET}_{i,t-12,t-3} + e_{i,t},$$

where FIN is an indicator variable for financial firms, SIZE is market capitalization, BM is the book-to-market ratio, $\mathrm{RET}_{t-3,t}$ is the prior 3-month return, and $\mathrm{RET}_{t-12,t-3}$ is the cumulative return between month $t-12$ to month $t-3$. Data sources and detailed variable definitions are described in the Appendix. The variables BM and SIZE are expressed in natural logarithms. Our sample includes only common stocks (those with a share code of 10 or 11 in the CRSP). Two firms with stock prices above $1,000 are excluded from the analysis. We report the average coefficients across all months from Jan. 2006 to Dec. 2008. The *t*-statistics are based on Fama and MacBeth (1973), with a Newey–West (1987) adjustment for autocorrelation up to 12 lags. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Average Analyst Recommendations

Date	FIN	NONFIN	DIFF	(*t*-stat.)
Jan 2006	3.37	3.64	−0.27***	(−11.06)
Feb 2006	3.38	3.63	−0.25***	(−10.32)
Mar 2006	3.39	3.63	−0.24***	(−9.69)
Apr 2006	3.39	3.62	−0.23***	(−9.08)
May 2006	3.43	3.64	−0.21***	(−8.34)
Jun 2006	3.46	3.67	−0.20***	(−8.18)
Jul 2006	3.46	3.68	−0.22***	(−9.05)
Aug 2006	3.43	3.67	−0.24***	(−9.71)
Sep 2006	3.39	3.65	−0.26***	(−10.56)
Oct 2006	3.32	3.60	−0.28***	(−11.66)
Nov 2006	3.31	3.57	−0.25***	(−10.49)
Dec 2006	3.31	3.56	−0.24***	(−9.95)
Jan 2007	3.32	3.53	−0.21***	(−8.46)
Feb 2007	3.34	3.53	−0.19***	(−7.77)
Mar 2007	3.36	3.55	−0.20***	(−8.06)
Apr 2007	3.35	3.54	−0.19***	(−7.90)
May 2007	3.34	3.54	−0.20***	(−8.44)
Jun 2007	3.34	3.54	−0.20***	(−8.25)
Jul 2007	3.40	3.55	−0.15***	(−6.18)
Aug 2007	3.41	3.59	−0.18***	(−7.20)
Sep 2007	3.42	3.59	−0.17***	(−6.93)
Oct 2007	3.42	3.60	−0.18***	(−7.17)
Nov 2007	3.42	3.62	−0.20***	(−8.17)
Dec 2007	3.38	3.63	−0.26***	(−10.27)
Jan 2008	3.37	3.67	−0.30***	(−12.20)
Feb 2008	3.32	3.66	−0.34***	(−13.66)
Mar 2008	3.30	3.65	−0.34***	(−13.92)
Apr 2008	3.29	3.63	−0.34***	(−13.82)
May 2008	3.30	3.62	−0.31***	(−12.67)
Jun 2008	3.32	3.61	−0.29***	(−11.80)
Jul 2008	3.30	3.62	−0.32***	(−12.97)
Aug 2008	3.27	3.60	−0.33***	(−13.24)
Sep 2008	3.19	3.58	−0.39***	(−16.23)
Oct 2008	3.26	3.59	−0.32***	(−13.59)
Nov 2008	3.26	3.58	−0.33***	(−13.42)
Dec 2008	3.26	3.55	−0.29***	(−11.37)

Panel B. Regressions of Analyst Recommendations

Intercept	FIN	SIZE	BM	$\mathrm{RET}_{t-3,t}$	$\mathrm{RET}_{t-12,t-3}$
4.19***	−0.19***	−0.02***	−0.39***	0.20***	0.21***
(54.00)	(−11.39)	(−5.91)	(−8.01)	(14.96)	(7.92)

for each month in our sample:

$$\mathrm{REC}_{i,t} = \beta_0 + \beta_1 \mathrm{FIN}_{i,t} + \beta_2 \mathrm{SIZE}_{i,t} + \beta_3 \mathrm{BM}_{i,t} + \beta_4 \mathrm{RET}_{i,t-3,t} + \beta_5 \mathrm{RET}_{i,t-12,t-3} + e_{i,t}, \quad (2)$$

where REC is the consensus recommendation for the firm; the other variables are described in the Appendix. We average the coefficients across months and adjust

the resulting standard errors for heteroskedasticity and autocorrelation for up to 12 monthly lags using the Newey–West (1987) procedure. Our main variable of interest is the FIN dummy variable.

We report the results from regression model (2) in Panel B of Table 5. The estimated FIN coefficient (-0.19) is negative and significant (t-statistic $= -11.39$). This finding confirms that analyst recommendations were significantly lower for financial firms than for nonfinancial firms during the period from 2006:01 to 2008:12, after controlling for other known variables that affect analyst recommendations.[10,11]

2. Changes in Analyst Recommendations

Our next set of results is based on changes in analyst recommendations. The results in Panel A of Table 6 show that monthly changes in analyst recommendations are quite volatile during this 3-year period. The differences (DIFF) in monthly changes in analyst recommendations between financial and nonfinancial firms are statistically significant at the 10% level or better in approximately half of the months (17 out of 36), and slightly more than half of these significant differences are negative (10 out of 17). The differences in cumulative changes in analyst recommendations (DIFF^{CUM}) reveal a more consistent pattern; that is, there are 18 negative and significant differences and 0 positive and significant differences.

Although we hesitate to draw strong conclusions based on volatile monthly changes, the results do show more negative recommendation changes for financial firms relative to nonfinancial firms. This overall trend toward negative differences is more apparent when viewing the cumulative changes in analyst recommendations. There are 18 instances of negative and significant differences in cumulative changes in analyst recommendations between financial and nonfinancial firms and not a single instance of a positive and significant difference in cumulative changes. It should be noted, however, that most of the significantly negative DIFF^{CUM} values occur after the financial crisis had begun (especially after Nov. 2007). That is, this result captures more of a reaction to the crisis than a prediction of the crisis. There is a shorter 4- to 5-month run of significantly negative DIFF^{CUM} values before the crisis period.

Next, we examine changes in analyst recommendations for financials versus nonfinancials in a regression setting while controlling for firm size, book-to-market ratio, and prior stock returns. We estimate the following Fama–MacBeth (1973) type of regression for each month in our sample:

$$\begin{aligned}(3)\qquad \Delta\text{REC}_{i,t,t+1} &= \beta_0 + \beta_1\text{FIN}_{i,t} + \beta_2\text{SIZE}_{i,t} + \beta_3\text{BM}_{i,t} + \beta_4\text{RET}_{i,t-3,t} \\ &\quad + \beta_5\text{RET}_{i,t-12,t-3} + e_{i,t},\end{aligned}$$

[10]We also perform difference-in-differences analyses that compare analyst recommendations for financial versus nonfinancial firms during the financial crisis to their relative (i.e., financial versus nonfinancial firms) recommendations during a noncrisis benchmark period. The difference-in-differences regressions confirm that analyst recommendations for financial firms are significantly lower (relative to nonfinancial firms) during the crisis than during a noncrisis benchmark period. We present these results in our Internet Appendix.

[11]Our results are similar if we use the sample period 2006:01 to 2007:06.

TABLE 6

Changes in Analyst Recommendations

Table 6 presents the average change in analyst recommendations (ΔREC) and cross-sectional regressions of changes in analyst recommendations for the period from Jan. 2006 to Dec. 2008. Panel A reports the average ΔREC for financial (FIN) and nonfinancial (NONFIN) firms, as well as the difference (DIFF) in average ΔREC between financial and nonfinancial firms. The variable DIFF^{CUM} is the difference in average cumulative ΔREC between financial and nonfinancial firms. The numbers in parentheses are *t*-statistics for the differences in means, assuming equal variances. Panel B reports Fama–MacBeth (1973) coefficients from the following cross-sectional regression:

$$\Delta\text{REC}_{i,t,t+1} = \beta_0 + \beta_1\text{FIN}_{i,t} + \beta_2\text{SIZE}_{i,t} + \beta_3\text{BM}_{i,t} + \beta_4\text{RET}_{i,t-3,t} + \beta_5\text{RET}_{i,t-12,t-3} + e_{i,t},$$

where FIN is an indicator variable for financial firms, SIZE is market capitalization, BM is the book-to-market ratio, $\text{RET}_{t-3,t}$ is the prior 3-month return, and $\text{RET}_{t-12,t-3}$ is the cumulative return between month $t-12$ and month $t-3$. Data sources and detailed variable definitions are described in the Appendix. The variables BM and SIZE are expressed in natural logarithms. Our sample includes only common stocks (those with a share code of 10 or 11 in the CRSP). Two firms with stock prices above $1,000 are excluded from the analysis. We report the average coefficients across all months from Jan. 2006 to Dec. 2008. The *t*-statistics are based on Fama and MacBeth (1973), with a Newey–West (1987) adjustment for autocorrelation up to 12 lags. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Average Changes in Analyst Recommendations

Date	FIN	NONFIN	DIFF (*t*-stat.)	DIFF^{CUM} (*t*-stat.)
Jan 2006	−0.10	−0.08	−0.02 (−0.18)	−0.02 (−0.18)
Feb 2006	0.02	0.00	0.02 (0.58)	0.00 (−0.03)
Mar 2006	0.00	−0.01	0.01 (0.44)	0.02 (0.30)
Apr 2006	0.00	−0.01	0.01 (0.51)	0.03 (0.69)
May 2006	0.06	0.03	0.03 (1.78)	0.07 (1.71)
Jun 2006	0.02	0.03	−0.01 (−0.60)	0.03 (0.87)
Jul 2006	−0.02	0.02	−0.03 (−2.19)	0.00 (0.01)
Aug 2006	−0.02	0.00	−0.02 (−1.38)	−0.02 (−0.69)
Sep 2006	−0.03	−0.02	−0.02 (−1.84)	−0.04 (−1.32)
Oct 2006	−0.10	−0.04	−0.06 (−4.97)	−0.09 (−3.30)
Nov 2006	0.00	−0.02	0.02 (2.18)	−0.06 (−2.23)
Dec 2006	−0.02	−0.01	0.00 (−0.46)	−0.06 (−2.49)
Jan 2007	0.01	0.00	0.02 (1.91)	−0.04 (−1.80)
Feb 2007	0.02	0.01	0.01 (1.53)	−0.03 (−1.38)
Mar 2007	0.01	0.02	−0.01 (−1.04)	−0.03 (−1.36)
Apr 2007	0.00	−0.01	0.01 (0.87)	−0.03 (−1.26)
May 2007	0.00	0.00	0.00 (−0.04)	−0.05 (−2.12)
Jun 2007	0.01	0.00	0.01 (1.16)	−0.03 (−1.44)
Jul 2007	0.03	0.00	0.03 (2.76)	−0.01 (−0.29)
Aug 2007	0.00	0.03	−0.03 (−3.14)	−0.04 (−1.46)
Sep 2007	−0.01	0.00	0.00 (−0.62)	−0.04 (−1.62)
Oct 2007	−0.04	−0.02	−0.02 (−2.11)	−0.03 (−1.06)
Nov 2007	−0.01	0.01	−0.02 (−1.59)	−0.04 (−1.40)
Dec 2007	−0.04	0.00	−0.04 (−5.07)	−0.07 (−2.68)
Jan 2008	−0.02	0.01	−0.04 (−3.33)	−0.09 (−3.34)
Feb 2008	−0.04	−0.01	−0.03 (−3.29)	−0.12 (−4.60)
Mar 2008	−0.01	0.00	−0.01 (−0.81)	−0.13 (−4.81)
Apr 2008	0.00	−0.02	0.02 (1.81)	−0.11 (−4.07)
May 2008	0.00	−0.01	0.01 (0.84)	−0.10 (−3.83)
Jun 2008	0.02	0.00	0.01 (1.89)	−0.08 (−3.03)
Jul 2008	−0.02	0.00	−0.03 (−2.92)	−0.12 (−4.36)
Aug 2008	−0.02	−0.01	−0.01 (−0.78)	−0.11 (−4.04)
Sep 2008	−0.06	−0.01	−0.05 (−5.38)	−0.17 (−6.22)
Oct 2008	0.06	0.01	0.05 (4.38)	−0.12 (−4.64)
Nov 2008	0.00	−0.01	0.01 (1.31)	−0.09 (−3.53)
Dec 2008	−0.02	−0.03	0.01 (0.76)	−0.07 (−2.72)

Panel B. Regressions of Changes in Analyst Recommendations

Intercept	FIN	SIZE	BM	$\text{RET}_{t-3,t}$	$\text{RET}_{t-12,t-3}$
−4.85***	−0.29	0.22***	−0.74	−0.46	0.52
(−3.56)	(−0.82)	(3.56)	(−0.62)	(−0.48)	(1.05)

where ΔREC is the average change in recommendation for a stock across the analysts who issued recommendations within the past 12 months; all other variables are described in the Appendix. Panel B of Table 6 shows that the estimated FIN coefficient (−0.29) is negative and insignificant. In summary, we find a negative and significant relation between analyst recommendations and financial firms in

regression (2) and a negative but insignificant relation between changes in analyst recommendations and financial firms in regression (3).

C. Corporate Insiders

After finding some confirmatory evidence that outsiders (i.e., institutions and analysts) possessed superior information about the vulnerability of the financial sector, we now focus our analysis on corporate insiders. Corporate insiders would presumably have the best information about what is going on inside their firms. Furthermore, many commentators in the popular press maintain that insiders of financial institutions sold their company shares in expectation of the financial crisis. As discussed in the Introduction, the critical issue in this debate is whether the executives of financial firms behaved more as knaves or fools during the financial crisis.

The knave argument states that flawed incentives allowed executives to (knowingly) take on excessive debt in an effort to maximize personal wealth while risking shareholder wealth. Because these executives were fully aware of their excessive risk taking, they also would have been fully prepared to abandon ship (sell shares) at the first sign of trouble. The fool argument states that financial executives did not knowingly subject their firms to excessive risks. They might have exercised poor judgment or might have simply gotten a bad draw from a random distribution, but they did not anticipate financial collapse. Fortunately, these competing narratives have completely opposite implications with respect to insider trading. If most financial firm executives behave as knaves, then we should find significantly more insider selling before and during the financial crisis when compared with nonfinancial firm executives; if most financial executives behaved as fools, then there should be no significant difference between the trading patterns of insiders at financial firms and insiders at nonfinancial firms.

1. Univariate Analysis

Following Lakonishok and Lee (2001), we measure insider trading as net insider purchases over the previous 6 months divided by total shares outstanding (NIT). In particular, for each firm-month we sum purchases (sales) across all management insiders who traded in the past 6 months. We subtract sales from purchases and divide by total shares outstanding. The choice of shares outstanding as opposed to total transactions used by Lakonishok and Lee is driven by data frequency and the cross-sectional nature of our analysis. If no insider traded in the prior 6 months, the NIT variable is set to 0.

We first examine differences in mean insider trading for financial versus nonfinancial firms during 6 half-year intervals from Jan. 2006 to Dec. 2008. We present the results of this analysis in Table 7. The results are striking. The insiders of financial firms consistently buy more (sell less) of their company shares than do the insiders of nonfinancial firms. Differences in net insider purchases (financial minus nonfinancial firm purchases) are positive in all 6 half-year trading intervals and statistically significant in 4 of the 6 half-year periods. Whereas nonfinancial firm insiders are net sellers during the entire sample period, financial

TABLE 7

Insider Trading

Table 7 presents the average insider trading for the period from 2006 to 2008. We include only trades by the firm's management (TFN role code = CEO, CFO, CO, CB, P, D, VP, and O) and exclude option-related trades. The variable NIT is the ratio of net insider dollar purchases (dollar purchases minus dollar sales) over the previous 6 months divided by the firm's market capitalization. Data sources and detailed variable definitions are described in the Appendix. This table reports the average NIT for financial (FIN) and nonfinancial (NONFIN) firms, as well as the difference (DIFF) in average NIT between financial and nonfinancial firms. To identify financial firms, we follow the definition from the SEC Emergency Order of Sept. 18, 2008. The numbers in parentheses are Student's *t*-statistics for differences in means, assuming equal variances. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Date	FIN	NONFIN	DIFF	(*t*-stat.)
Jun 2006	−0.04	−0.12	0.08**	(2.05)
Dec 2006	−0.07	−0.10	0.04	(0.90)
Jun 2007	−0.03	−0.13	0.11***	(2.86)
Dec 2007	0.06	−0.06	0.12***	(4.10)
Jun 2008	0.05	−0.02	0.08***	(2.99)
Dec 2008	0.04	−0.01	0.05	(1.43)

firms' insiders become net buyers in the latter half of this period.[12] This evidence is contrary to the popular view that insiders of financial firms exploited their information advantage by selling company shares before the general public learned the full extent of their companies' poor performance. Indeed, the trading behavior of financial firm insiders shows that they believed their companies to be undervalued relative to nonfinancial firms both before and during the financial crisis.

2. Multivariate Analysis

Next, we explore insider trading between financial and nonfinancial firms in a multivariate setting by including control variables. We estimate the following cross-sectional regression:

$$\text{NIT}_{i,t-6,t} = \beta_0 + \beta_1 \text{FIN}_{i,t-6} + \beta_2 \text{SIZE}_{i,t-6} + \beta_3 \text{BM}_{i,t-6} + \beta_4 \text{RET}_{i,t-30,t-6} + e_{i,t}, \tag{4}$$

where the dependent variable, NIT, represents net insider purchases over the previous 6 months divided by total shares outstanding. The other independent variables are described in the Appendix. We estimate 6 regressions, one for each half-year period.

The results in Table 8 show that net insider purchases are significantly larger for financial firms than for nonfinancial firms in 4 of the 6 regressions, after other determinants of insider trading are controlled for. The estimated FIN coefficient is positive for all 6 regressions, and its magnitude ranges from an insignificant 0.03 in Dec. 2008 to a significant 0.10 in Dec. 2007. These multivariate results are consistent with the univariate results, both of which confirm that corporate insiders of financial firms were trading more optimistically in their company stock than were their nonfinancial firm counterparts. Thus, contrary to the view that bank executives exploited their privileged inside information before and during

[12] Because corporate executives receive large option and stock grants (and due to liquidity and diversification concerns), insiders tend to be net sellers of their companies' stocks. Consequently, one cannot interpret the net selling by financial firm insiders during the first half of our sample period alone as evidence of superior information about the impending financial crisis. A comparison of financial firm insider trading with nonfinancial firm insider trading is more revealing about the abnormal trading of financial firm insiders.

TABLE 8

Cross-Sectional Regressions of Insider Trading

Table 8 estimates the following cross-sectional regression:

$$NIT_{i,t-6,t} = \beta_0 + \beta_1 FIN_{i,t-6} + \beta_2 SIZE_{i,t-6} + \beta_3 BM_{i,t-6} + \beta_4 RET_{i,t-30,t-6} + e_{i,t},$$

where NIT is the ratio of net insider dollar purchases (dollar purchases minus dollar sales) over the previous 6 months divided by the firm's market capitalization, FIN is an indicator variable for financial firms, SIZE is market capitalization, BM is the book-to-market ratio, and $RET_{t-30,t-6}$ is the cumulative return from month $t-30$ through month $t-6$. Data sources and detailed variable definitions are described in the Appendix. The variables BM and SIZE are expressed in natural logarithms. Our sample includes only common stocks (those with a share code of 10 or 11 in the CRSP). Two firms with stock prices above $1,000 are excluded from the analysis. The numbers in parentheses are *t*-statistics. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Date	Intercept	FIN	$RET_{t-30,t-6}$	SIZE	BM	Adjusted R^2
Jun 2006	−0.38**	0.09**	−0.08***	0.01*	0.12*	1.68%
	(−2.53)	(2.27)	(−5.74)	(1.67)	(1.94)	
Dec 2006	−0.19	0.03	−0.03***	0.00	0.05	0.15%
	(−1.35)	(0.84)	(−2.37)	(0.60)	(0.83)	
Jun 2007	−0.28**	0.09***	−0.07***	0.01	0.03	1.34%
	(−2.09)	(2.76)	(−5.25)	(1.23)	(0.60)	
Dec 2007	0.05	0.10***	−0.08***	−0.01	0.10*	2.60%
	(0.44)	(3.22)	(−6.35)	(−1.05)	(1.90)	
Jun 2008	0.13	0.06**	−0.05***	−0.01	0.02	1.03%
	(1.17)	(2.28)	(−3.77)	(−1.45)	(0.40)	
Dec 2008	0.43***	0.02	−0.02	−0.02***	0.09	0.93%
	(2.99)	(0.43)	(−0.97)	(−3.56)	(1.62)	

the financial crisis, our results show that these executives are net accumulators of company stock relative to executives in the nonfinancial sector.

Before ending this section, we also note that although our results indicate that insiders were unaware of the impending crisis, they do not necessarily mean that insiders are completely uninformed. Insiders could be informed, particularly with respect to firm-specific information, but still be relatively unaware of the systemic risks faced by their firms leading up to and during the financial crisis.

IV. Conclusions

This study examines the degree to which the recent financial crisis was anticipated by three categories of informed market participants: institutional investors, financial analysts, and corporate insiders. The Great Recession (2007–2008 financial crisis) offers a unique opportunity to examine the underlying dynamics of a catastrophic financial collapse. Unlike with the Great Depression, financial data on the major market participants from the Great Recession are abundant and publicly available. This data-rich environment should yield a much deeper understanding of the underlying processes of severe financial crises than was generated in the roughly 8 decades since the start of the Great Depression. The purpose of this study is to examine the behavior of informed market participants before and during the 2007–2008 financial crisis. In addition to analyzing the abilities of institutional investors, financial analysts, and corporate insiders to anticipate an impending collapse, our empirical results have direct implications for regulatory changes designed to prevent future collapses.

Our empirical results show that institutional investors and financial analysts exhibit some awareness of the impending crisis in their preference for nonfinancial

stocks over financial stocks. Institutional investors underweighted financial firms relative to nonfinancial firms, and financial analysts gave consistently lower recommendations for financial firms compared with nonfinancial firms. These analyst-related results are consistent with Piotroski and Roulstone's (2004) claim that financial analysts have an information advantage at the industry level.

Although institutions and analysts could see the industry-level "forest" and act accordingly, bank executives appear to have focused on individual firm-level "trees." Our results show that the executives of financial firms were buying more and selling less of their own companies than were the executives of nonfinancial firms, both before and during the financial crisis. Our finding that financial firm managers were net purchasers during the height of the crisis casts considerable doubt on Johnson's (2011) knave narrative, as well as on proposed regulations designed to prevent future crises by curtailing knave behavior.

Appendix. Data Sources and Variable Definitions

Our study combines data from several sources. We obtain data on quarterly institutional holdings from the TFN 13F database. We obtain analyst recommendations from the IBES database. Insider trading data are from the TFN Insider database. Book values of common equity and common stock dividends are from Compustat. The SIC code, price, return, shares outstanding, and volume information are from the CRSP monthly database.

Our sample includes only common stocks (CRSP share code 10 or 11) for the period from Jan. 2006 through Dec. 2008. Following the definition from the SEC Emergency Order of Sept. 18, 2008, we identify financial firms as those with the following SIC codes: 6000, 6011, 6020–6022, 6025, 6030, 6035–6036, 6111, 6140, 6144, 6200, 6210–6211, 6231, 6282, 6305, 6310–6311, 6320–6321, 6324, 6330–6331, 6350–6351, 6360–6361, 6712, and 6719. The variables used throughout the article are as follows:

IO: Institutional ownership, fraction of shares outstanding held by institutional investors, from the TFN 13F database and the CRSP.

ΔIO: Change in institutional ownership between two consecutive quarters.

REC: Consensus analyst recommendation of all analysts following a firm, based on the most recent recommendation issued by an analyst in the prior 12 months, from the IBES.

ΔREC: Change in consensus analyst recommendation between 2 consecutive months.

NIT: Ratio of net insider dollar purchases (dollar purchases minus dollar sales) over the previous 6 months divided by the firm's market capitalization, from the TFN Insider database and the CRSP. We include only trades by the firm's management (role code = CEO, CFO, CO, CB, P, D, VP, and O) and exclude option-related trades.

FIN: Indicator variable that takes a value of 1 if a firm is classified as a financial firm based on the SEC Emergency Order of Sept. 18, 2008.

SIZE: Market capitalization, calculated as share price times shares outstanding, from the CRSP.

AGE: Firm age, the number of months since the first return appeared in the CRSP.

DP: Dividend yield, calculated as the ratio of common dividends divided by share price, from Compustat and the CRSP. Winsorized at the 99th percentile.

BM: Book-to-market ratio, calculated using book value of equity for the fiscal year ended in year $t - 1$, divided by market capitalization as of Dec. 31 of year $t - 1$, from Compustat and the CRSP. Winsorized at the 1st and 99th percentiles.

PRC: End-of-month share price from the CRSP.

TURN: Average monthly share turnover (monthly share trading volume divided by total shares outstanding) over the preceding 3 months, from the CRSP.

VOL: Return volatility, standard deviation of monthly returns over the previous 24 months, from the CRSP.

SP500: Indicator variable that equals 1 if a firm belongs to the S&P 500 Index, from the CRSP.
$RET_{t-3,t}$: Cumulative return over the past 3 months, from the CRSP.
$RET_{t-12,t-3}$: Cumulative return between month $t-12$ and month $t-3$, from the CRSP.
$RET_{t-30,t-6}$: Cumulative return between month $t-30$ and month $t-6$, from the CRSP.

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