



The US financial crisis and corporate dividend reactions: for better or for worse?

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Abstract

We examine how changes in dividend policy in 2008 as the financial crisis was unfolding influenced firm risk-adjusted returns in the following years. Our sample consists of NYSE- and NASDAQ-traded firms that paid dividends in 2007. We divide these firms into four groups based on their dividend policy in 2008. We find that firms that decreased or eliminated dividends in 2008 had higher risk-adjusted returns in 2009. The higher risk-adjusted return is consistent with the better corporate governance in 2007. This finding suggests that the firms that quickly reacted to the deteriorating economic conditions by cutting dividends and preserving cash were able to better weather the coming financial crisis.

Keywords Dividend policy · Financial crises · Corporate decision making · Financial flexibility

JEL Classification G32 · G35

1 Introduction

Corporate dividend policy has been the subject of finance and economic research for decades as new factors are considered in determining why firms pay dividends, why they choose to initiate dividends as well as why they choose to reduce/suspend dividends. The recent financial crisis offers a unique situation in terms of examining the dividend behavior

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of U.S. firms in the face of somewhat dire economic conditions. Generally speaking, a reduction in dividends has been viewed as a negative signal in terms of firm value. However, the financial crisis represented such a significant event not only in the U.S. but globally, that it is of interest to further examine the dividend behavior from the pre-crisis period and on throughout the crisis period.

It is the objective of this research to examine firms that reduced or eliminated their cash dividends at the beginning of the financial crisis and assess subsequent performance. Firms are categorized according to their crisis-related dividend behavior. That is, our data sample considers firms that made no changes at all in their dividend policy; those that reduced their dividends to zero; those that reduced their dividends but not totally; and finally those that actually increased their dividends. Financial returns for these four groups are followed through until the end of 2009. The methodology is designed to assess whether the changes in dividend policy during the crisis period impacted the risk-adjusted returns of the sample firms. The general conclusions show that firms that eliminated or reduced their dividends had significantly higher risk-adjusted returns in 2009, a finding somewhat contrary to traditional theory. The overall conclusion is that it was beneficial for firms to react quickly to the deteriorating economic conditions in 2008 by adjusting their dividend policy to preserve cash.

The paper will continue with a brief literature review followed by a discussion of the data utilized and then the specific empirical methodology. The results will be discussed and followed by the final conclusions and implications.

2 Related literature

The body of research regarding corporate dividend policy is very extensive and we will provide just a brief review of the more important literature. Of course, Miller and Modigliani (1961) offer the classic work in this area where they argued that firm value is unaffected by the choice of distribution methods under certain assumptions. Many others have built upon this early work with studies examining the tax effects on dividends also (see Talmor and Titman 1990; Change and Rhee 1990; Naranjo et al. 1998; Kuo and Lee 2013). Additional dividend research has considered the information content of dividends (see Healy and Palepu 1988; Gonedes 1978; Benartzi et al. 1997; Best and Best 2001). The argument in that body of work is that dividends convey information that investors use in their assessment of the overall risk and future of the firm and hence firm value. Generally speaking, decreases or omissions of dividends are viewed as conveying negative information regarding a firm's prospects for the future. Another line of research has addressed the agency relationship and how that may influence dividends. One argument is that a higher payout firms have less in retained earnings and are forced to turn to the capital markets when they need additional equity. The scrutiny of the capital market serves to mitigate any agency issues that may have developed if the firm only retained earnings. In other words, this agency effect emphasizes the role of investment bankers and analysts in insuring that management is indeed acting in the best interest of the shareholders. Rozeff (1982) examined this issue by looking at the tradeoff between agency costs and the cost of external financing. His empirical work provides evidence to support the conclusion that investment policy does indeed affect dividend policy. This was expanded and reinforced by Lloyd et al. (1986). Firms with greater investment opportunities exhibit lower dividend payout ratios. Many other studies have considered the agency issues as related to dividend policy (see for

example Easterbrook 1984; Jensen et al. 1992; Schooley and Barney 1997; Fenn and Liang 2001; Lee 2011).

Frankfurter and Wood (2002) review the conflicts among the results from earlier work on dividend policies. Their overall conclusion is that explanatory models for dividends are likely to continue to be inconclusive due to the various factors and the difficulty in capturing all the relevant factors. A more recent work by Baker et al. (2002) reexamines the dividend puzzle to see if “all the pieces now fit.” This work offers a review of much of the major research as well as discussion of the reasons for dividends and also offers results of various surveys on dividends. The general conclusion is that the many studies regarding dividends have helped in putting the “puzzle” together, but it is still not complete nor may it ever be complete. Baker et al. (2002) list the main factors from their review of the work; market imperfections, behavioral issues, firm specific characteristics, and management preferences. A more “practical” research work is by Brav et al. (2005) and is based on survey research. They survey a large number of financial executives and conduct actual interviews to gain a better understanding of the elements that determine dividends as well as stock repurchases. Their conclusions are not surprising. First, they conclude that management still hesitates to cut dividends given the perceived adverse reaction on the part of investors. That is, dividends tend to be “sticky” in the sense that firms tend to maintain existing dividend policies for long periods. In addition, many of the respondents in their survey indicated that they would have preferred to not pay dividends but once dividends were initiated they were hesitant to cut them. Another finding is that share repurchases have gained in importance given the relative flexibility of that means of distribution. Jagannathan et al. (2000) point out that financial flexibility is an important consideration when the firms make decision on payout policy. They focus on the choice between cash dividends and repurchases, finding that firms that generate stable cash flows tend to pay cash dividends while firms with unstable and uncertain cash flows tend to distribute through share repurchases. Iyer et al. (2017) confirm that managers want to maintain a flexible payout policy by using stock repurchases rather than dividend. This flexibility allows the managers to better meet future capital expenditures of the firm. The authors find that capital expenditures are significantly negatively related to repurchases, especially under financial constraints. They do not find any significant relation between capital expenditures and cash dividend payouts. Arslan-Ayaydin et al. (2014) further link the financial flexibility to investment behavior and performance of firms in Asian Countries. They find that firms with more financial flexibility have better performance during the 1997–1998 and 2007–2009 crises.

Another body of research has considered dividend changes and the reaction and reasons for such changes. Lie (2005) examines a large number of dividend decreases and omissions for the time frame 1980 to 1998. He relates the dividend changes to changes in earnings. His conclusions are that earnings generally suffer at the announcement time but then tend to recover in subsequent periods. He does find a negative stock price effect consistent with the view that the market overreacts to any negative inferences. Jensen et al. (2010) look at firms that had dividend reductions from 1967 to 2006. Their methodology considers both the standard stock return reaction to the announcement and then also a consideration of financial characteristics. As shown in much of the earlier research, there is a negative market reaction to a reduction in dividends but this is followed by a recovery in earnings after the dividend reduction period. When looking at other characteristics, they find that the earnings recovery is due to the reduction in certain other costs such as capital investments, R&D as well as the level of employment. Lacina and Zhang (2008) investigate dividend initiations of high-tech firms and non-high-tech firms. They find that

the market performance of high-tech firms after dividend initiations is better than that of non-high-tech firms. They also argue that higher liquidity of assets held by high-tech firms strengthens investor confidence and hence leads to better market reaction on the dividend initiations.

Another study by Chay and Suh (2009) empirically studies the dividend behavior of over 5000 firms from Australia, Canada, France, Germany, Japan, the UK and the U.S. Their research determines that cash flow uncertainty is a major driver of dividend policy while controlling for other relevant factors. This is consistent with the idea that uncertainty resulting from a financial crisis can indeed affect dividend policy and in a very short time frame.

More directly related to our research are works related to the financial crisis and dividends. Campello et al. (2010), using survey methodology, focus on some broader aspects of financial change during a crisis. They study how financial constraints impacted firms in terms of employment levels, capital investment, marketing and technology spending. Their survey covers 1050 CFOs in 39 countries. The results show that the above items all faced reductions in funding levels. The survey results further indicate that firms were burning cash quickly which led to dividend cuts that were greater than anticipated. Floyd et al. (2015) examine dividend paying behavior for both financial as well as industrial firms. Citing earlier evidence that dividends for industrial firms have been in something of a long run decline, they find that the reluctance to reduce dividends remains quite high (see Fatemi and Bildik 2012). In a somewhat related paper by Fuller and Goldstein (2011), dividends are found to have greater importance in declining markets. They consider the period from 1970 to 2007 and examine the stock returns for a sample of dividend paying firms as well as those not paying dividends. While their results do capture the 37-year effect, it stops short of the period of the 2008 financial crisis which is the focus of our current research. Che et al. (2018) document the effect of dividend cuts during 2008 financial crisis. They confirm a negative market reaction to dividend cuts and find that this market reaction is related to the firm's growth opportunities. Higher abnormal returns on dividend cut are found for firms with better growth opportunities.

Of direct relevance to our research is a work by Abreu and Gulamhussen (2013) on the dividend payout behavior of 462 bank holding companies in the U.S. Their findings are not surprising. Overall macroeconomic conditions do influence dividend behavior. Further, firm specific characteristics play a major role with, as expected, stronger institutions paying greater dividends. Abreu and Gulamhussen feel that their results offer continuing support for the signaling effect of dividends. In another interesting study for firms on the London Stock Exchange, Bozos et al. (2011) consider signaling effects of dividend announcements, comparing reactions between periods of economic stability and economic turmoil. They confirm the continuing information importance of dividends but do find that dividend changes and their impact are related to overall economic stability. Another study by Pathan et al. (2014) considered a large sample of dividend increase announcements by US firms for the period 1989–2012. Their general conclusions are that firms that are financially constrained actually displayed higher post increase performance relative to unconstrained firms. In explaining this finding, they suggest that there is a timing effect to dividend increase announcements made in anticipation of a seasoned equity offering. They cite this as evidence of a signaling effect for those firms. They further find that dividend-increasing firms that are also financially constrained exhibited weaker returns during the financial crisis.

Hauser (2013) asks whether corporate dividend policy changed during the recent U.S. financial crisis. Hauser used 2006 as a base year to insure that management had not yet gained

knowledge of the impending problems with our financial system. Using data from Compustat and the period 2006–2009, Hauser utilized logistic regression. In summary, he found a decline in the likelihood of dividends being paid for 2008 and 2009 *ceteris paribus*. Not surprising is his finding that dividend cuts increased during his sample period as firms preserved cash during the time of greater uncertainty. One other paper by Lee et al. (2013) considers dividend payout as well as stock repurchases during the financial crisis. Their results, like many others, are not terribly surprising. Overall, firms must exhibit a sound financial condition if they are to increase dividends in a crisis period. Further, such firms tended to continue also with stock repurchase programs. This suggests that they were not diverting funds from a repurchase plan simply to continue paying dividends. Bliss et al. (2013) examine financial policies and any adjustments made during the recent financial crisis. Specifically, they focus on credit availability and find that those firms with more leverage, greater growth and less liquidity displayed reductions in dividends. Simply stated, they find that firms paid out less but used the funds to support growth and investment.

Clearly, the more recent literature offers some insights into the dividend policy reaction to the U.S. financial crisis. Given the breadth and depth of the financial crisis, a better understanding of firm reactions is of importance in guiding corporate dividend policy. A summary view of the literature is that firms did indeed respond to the crisis through preservation of cash, reduction in capital investment, R&D, etc. Our research is designed to consider further the reaction for a broad set of firms that may have eliminated dividends, reduced dividends or actually increased dividends.

3 Data

Our sample consists of all companies trading on the NYSE and NASDAQ. To avoid biases associated with highly regulated financial companies, we exclude all companies with SIC code 6000–6999 (Finance). We use information on dividends and daily returns from CRSP, the risk-free rate and factor loadings from the Fama–French database, and fundamental data from Compustat. Institutional holding data comes from Thomson Reuters.

First, we provide basic information on dividends and stock repurchases for NYSE- and NASDAQ-traded companies from 2000 to 2015 (Table 1). The number of firms included varies from year to year. For NYSE firms, the number ranges from 1567 in 2009 to 1945 in 2000. For NASDAQ firms, the number ranges from 2221 in 2012 to 4442 in 2000. The ratio of cash dividend paying stocks traded on the NYSE was increasing until the year 2007 when it reached 62.7% of firms in our sample (i.e. 1070 firms). Starting in 2008, the ratio of dividend payers was declining. It reached the bottom of 56.77% (902 firms) in 2010 and then started to increase again recovering to 61.26% in 2012 (998 firms). For NASDAQ-traded firms, the ratio of dividend payers reached its high of 16.7% in 2008 (i.e. 424 firms), then declined to 16.0% (389 firms) in 2009 and started to increase again in 2010. The year 2009 was also the year of the lowest rate of stock repurchases for both NYSE and NASDAQ-traded stocks.

Table 1 Dividend paying and repurchasing firms

NYSE					NASDAQ			
Year	N	Cash dividends (%)	Repurchase (%)	Overlap (%)	N	Cash dividends (%)	Repurchase (%)	Overlap (%)
2000	1945	54.29	7.25	3.14	4442	8.24	8.80	0.65
2001	1872	54.17	4.38	2.35	3958	8.44	5.38	0.61
2002	1785	52.89	4.65	2.02	3387	9.21	5.82	0.74
2003	1709	57.99	3.98	2.34	2989	12.45	5.59	0.74
2004	1715	59.83	6.71	4.96	2797	14.44	5.18	1.64
2005	1728	63.43	8.04	5.84	2729	15.76	5.79	1.72
2006	1737	62.52	6.22	4.84	2683	15.32	5.29	1.38
2007	1706	62.72	5.86	4.16	2675	16.19	3.85	0.97
2008	1608	61.88	2.80	2.05	2541	16.69	3.38	0.55
2009	1567	57.18	2.04	1.08	2422	16.06	1.69	0.21
2010	1589	56.77	2.71	1.76	2362	19.18	4.15	0.51
2011	1626	58.36	3.14	2.34	2300	21.35	3.39	0.74
2012	1629	61.26	3.13	2.33	2221	27.10	4.37	0.45
2013	1683	60.01	3.03	2.08	2245	26.24	2.94	0.45
2014	1728	59.90	2.37	1.68	2408	27.41	2.74	0.66
2015	1714	60.44	2.98	1.87	2518	27.32	3.34	0.48

We use the dividend payout information (DIVAMT, RCRDDT, DISTCD) in the CRSP monthly stock file. Cash dividend is dividend with distribution code (DISTCD) starting with 1 and repurchases are distributions with code starting with 5 but not 5523

4 Grouping the firms based on their dividend policy

To examine the consequences of changes in dividend policy, we identify all firms that paid cash dividends in 2007. Our sample contains 861 dividend-paying firms on NYSE and 350 on NASDAQ (Table 2).¹ These are our sample firms and we use 2007 as the benchmark year. We use this year because the financial crisis is generally thought to have begun at the end of 2007 and it was well underway in 2008. Also, the National Bureau of Economic Research (NBER) defines the beginning of the crisis as December of 2007. So, it is unlikely firms would have had sufficient time to react to deteriorating economic conditions via dividend policy changes in 2007. In other words, we view 2007 as a “clean” year in terms of normal dividend policies.

We divide these sample firms into four groups based on their dividend policy in 2008 (Table 2). We use the dividend payout information (DIVAMT, RCRDDT, DISTCD) in the CRSP monthly stock file. Dividend policy change is proxied by changes in the total amount of dividends and frequency of dividends. Group 0 consists of firms that decreased both the amount and frequency of dividends to zero in 2008. This group represents 8.48% of the sample firms for NYSE and 8.86% for NASDAQ. Group 1 includes firms that decreased either the amount or frequency of dividends, from 2007 to 2008 (16.03% of the sample firms on NYSE and 15.71% on NASDAQ). Group 2 contains firms that made no change to their dividends (19.28% of the sample firms on NYSE

¹ This sample is smaller than the overall number of dividend paying firms in Table 1. It is because some firms were lost due to missing values in Compustat and merging CRSP and Compustat databases.

Table 2 Groups of firms based on their dividend policy

Dividend policy	Group number	Number of firms	
		NYSE	NASDAQ
Decreased to zero	0	73	31
Decreased, but not to zero	1	138	55
No change	2	166	65
Increased	3	484	199
Total		861	350

The dividend payout information comes from CRSP monthly stock file. We focus on cash payout. Companies are sorted into groups based on the change in their dividend policy from 2007 to 2008. We calculate the total amount of dividends and the frequency of dividends for each firm. Group 0 consists of firms that decreased both amount and frequency of dividends to zero in 2008. Group 1 includes firms that decreased either the amount or frequency of dividends (but not to zero). Group 2 contains firms that made no change to their dividends. Group 3 includes firms that increased either amount or frequency of their dividends

Table 3 Number of firms with repurchases in each group

Group	Change in dividend policy	2007	2008	2009	2007–2009
Panel A: NYSE					
0	Decreased to zero	1	0	0	1
1	Decreased	2	0	0	2
2	No change	2	2	3	3
3	Increased	1	1	3	3
Panel B: NASDAQ					
0	Decreased to zero	0	0	0	0
1	Decreased	1	1	0	2
2	No change	1	0	0	1
3	Increased	4	3	0	7

Repurchases are distributions with code starting from 5 but not 5523. Repurchase information comes from CRSP monthly stock file. This table shows repurchasing firms by year. The same firms may have repurchased in multiple years. Change in dividend policy refers to change in the cash dividend

and 18.57% on NASDAQ). Group 3 includes firms that increased either the amount or frequency of their dividends. This is the largest group, representing 56.21% of the sample firms on NYSE and 56.86% on NASDAQ. This is not surprising because this group represents the most typical dividend policy when firms increase their dividends over the years. To address possible distribution by stock repurchases in our sample, Table 3 reports firms in our sample that reported stock repurchases from 2007 to 2009. Only very small proportion of these firms repurchased during our study period. In fact, only 9 out of 861 NYSE firms and 10 out of 350 NASDAQ firms in our sample repurchased shares between 2007 and 2009. Therefore, we can assume that repurchases were not an important way of distribution to shareholders in our sample.

Basic characteristics of different groups are shown in Table 4. As can be seen, the group of firms that stopped paying dividends in 2008 (group 0) had on average the lowest profitability, the highest book-to-market ratios and high level of debt. These firms were also the smallest firms. Such firms were clearly encountering more difficulty related to profitability, debt, etc. and had the need to preserve cash. On the other hand, the group of firms that increased dividends in 2008 (group 3) had the highest profitability, lowest leverage, lowest book-to-market ratios and the highest market value. Average daily returns for individual groups in 2009 are also shown in Table 4. The highest daily returns were for group 0 on NYSE and group 1 on NASDAQ.

We follow all four groups until 2009 and examine whether dividend policy in the crucial year of 2008 influenced their risk-adjusted returns. Note here that the groups were created based on their dividend policy in 2008 and no further adjustments to the groups were made. That is, the assigned group number remains the same regardless of subsequent dividend changes. Changes in dividend policy in the 2009 year did not result in reclassification.

5 Differences in risk-adjusted returns among groups

We ask a question whether the changes in dividend policy in the crucial year of 2008 influenced the market performance of the firms in a following year. Therefore, we sort firms into groups based on changes in dividend policy that they had made in 2008 and examine their risk-adjusted returns in 2009. We believe that firms that quickly reacted to the upcoming financial crisis by preserving cash were able to compensate, at least to some extent, for the lack of internal and external financing sources during this crisis. For dividend-paying firms, of course, the elimination of cash dividends represents an important cash source. Therefore, we expect that firms that adjusted their dividends downward in 2008 had higher risk-adjusted returns in 2009². To estimate the risk-adjusted returns, we use the four-factor model

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_1(r_{m,t} - r_{f,t}) + \beta_2SMB_t + \beta_3HML_t + \beta_4UMD_t + \varepsilon_{i,t}, \quad (1)$$

where $r_{i,t}$ is the daily return on the asset i in 2009, $r_{f,t}$ is the risk-free rate, $r_{m,t}$ is the market return, and SMB_t , HML_t and UMD_t are the Fama–French factors representing the returns corresponding to size, book-to-market and momentum portfolios.

The average risk-adjusted returns for each group in 2009 are shown in Table 5. We test the stocks trading on NYSE and NASDAQ separately and show the results in panels A and B. The portfolio of firms that decreased their dividends or stopped paying dividends in 2008, i.e. groups 0 and 1, have positive and significant alphas in 2009 for both NYSE and NASDAQ-traded stocks. In addition, the firms that decreased dividends (group 1) have positive and significant alphas for both NYSE and NASDAQ while the firms that stopped paying dividends entirely (group 0) have alpha significant at the 10% level only for NYSE. These results suggest that reducing dividends at the beginning of financial crises was a beneficial decision that resulted in higher risk-adjusted returns in 2009.

We further test whether alphas among groups are significantly different using modified GRS test (detail is provided in the “[Appendix](#)”). The modified GRS test follows the method

² We pick 2009 as evaluating period because the dividend cut should show immediate effect on the performance. In an unreported result, we extend the evaluating period to 2009–2015. The main results hold and these results are available upon request.

Table 4 Group characteristics: means of key variables

Group	Change in dividend policy	Size	Leverage	Asset turnover	BM	Profit margin	ROE	ROA	Return	Market value
Panel A: NYSE										
0	Decreased to zero	7.7792	1.4052	0.9579	1.5212	-0.0317	-0.2076	-0.0655	0.0037	1948.99
1	Decreased	8.0617	1.7556	0.8654	0.7213	0.0181	-0.1048	-0.0074	0.0035	5069.72
2	No change	7.7868	1.9408	1.0355	0.6656	0.0114	-0.0988	-0.0069	0.0023	4849.31
3	Increased	8.4135	4.5107	0.9383	0.5793	0.0779	6.6832	0.0592	0.0018	12,483.03
Panel B: NASDAQ										
0	Decreased to zero	5.5456	3.8579	0.8057	2.5036	-0.2593	-0.6567	-0.1441	0.0030	245.74
1	Decreased	5.7611	2.8912	1.2482	1.2748	-0.1038	-0.1194	-0.0245	0.0037	867.61
2	No change	5.7154	3.0976	1.3853	0.9152	0.0075	-0.0232	-0.0047	0.0016	379.97
3	Increased	6.3336	4.4340	0.9892	0.6227	0.0426	0.1560	0.0574	0.0020	3920.71

Firm characteristics in 2009 come from Compustat. Size is the natural logarithm of total asset, leverage is total assets over total debt (estimated by total asset - total equity), asset turnover is the revenue over total assets, BM ratio is the total equity over total market value, profit margin is the net income over revenue, ROE is the net income over total equity, and ROA is the net income over total asset. Return is average daily return of stocks

Table 5 The risk-adjusted returns for each group in 2009

	Group 0: Dividends decreased to zero		Group 1: Dividends decreased		Group 2: No change in dividends		Group 3: Dividends increased		Groups 0 and 1	
	Coefficient	p value	Coefficient	p value	Coefficient	p value	Coefficient	p value	Coefficient	p value
Panel A: NYSE										
Alp	0.0019	0.0711	0.0011	0.0278	0.0003	0.1931	0.0001	0.6645	0.0012	0.0163
MPR	1.0584	<0.0001	1.0927	<0.0001	1.1214	<0.0001	1.0075	<0.0001	1.0879	<0.0001
SMB	1.0135	<0.0001	0.8395	<0.0001	0.7258	<0.0001	0.3333	<0.0001	0.8610	<0.0001
HML	0.4737	0.0006	0.2597	0.0002	0.0448	0.1678	-0.1674	<0.0001	0.2873	<0.0001
UMD	-0.3311	0.0002	-0.3697	<0.0001	-0.1858	<0.0001	-0.1599	<0.0001	-0.3643	<0.0001
R ²	0.7760		0.9276		0.7749		0.9749		0.9299	
Panel B: NASDAQ										
Alpha	0.0014	0.3543	0.0017	0.0134	-0.0002	0.6488	0.0003	0.1788	0.0016	0.0109
MPR	1.0227	0.8847	0.7575	<0.0001	0.9233	<0.0001	0.8913	<0.0001	0.6490	<0.0001
SMB	0.7853	0.0004	0.7392	<0.0001	0.8496	<0.0001	0.5389	<0.0001	0.7464	<0.0001
HML	0.1832	0.3502	-0.0700	0.4297	-0.0083	0.8524	-0.1230	0.0001	-0.0328	0.6950
UMD	-0.5049	0.0001	-0.3397	<0.0001	-0.1718	<0.0001	-0.1905	<0.0001	-0.3645	<0.0001
R ²	0.9368		0.2375		0.7715		0.9601		0.7725	

The monthly returns for each group are regressed on risk factors using the four-factor model [Eq. (1)]: $r_{i,t} - r_{f,t} = \alpha_i + \beta_1(r_{m,t} - r_{f,t}) + \beta_2SMB_t + \beta_3HML_t + \beta_4UMD_t + \varepsilon_{i,t}$. Input data are average returns of all groups and four-factor model loadings in 2009. All information comes from CRSP

Table 6 GRS test for alpha differences

Group pairs	NYSE		NASDAQ	
	Sign	GRS	Sign	GRS
Group 0–Group 1	+	0.652	–	0.0219
Group 0–Group 2	+	2.55	+	0.626
Group 0–Group 3	+	3.44*	+	0.306
Group 1–Group 2	+	2.45	+	3.71*
Group 1–Group 3	+	5.51**	+	2.67
Group 0 and 1–Group 2	+	3.09*	+	2.78*
Group 0 and 1–Group 3	+	6.47**	+	3.92**

This table reports the modified GRS test results of abnormal returns. In GRS tests, we test the difference between abnormal returns of two different groups. Sign is the sign of the difference in abnormal returns of group pairs. Detail of modified GRS tests is provided in the [Appendix](#).

***, ** and * represent significance at 1, 5 and 10% level, respectively

of Gibbons et al. (1989), and Follmann (1996) to test the difference between alphas under one universe. We find a positive and significant difference in four-factor alphas between the groups that reduced or stopped paying dividends (group 0 and 1) and groups that did not make changes to their dividend policy (group 2) or increased their dividends (group 3). This applies to both NYSE and NASDAQ exchanges (Table 6). These results support our previous findings and the notion that the firms who reduced the dividend during the 2008 crisis had significantly stronger recovery.

5.1 Robustness check with matched benchmarks

To address concerns that these differences in mid/long-run performance are due to other factors than changes in dividend policy, we use the propensity score matching to find a benchmark for each dividend payer. We match each dividend-payer with a nonpayer based on similar fundamental information. Specifically, we use the industry, size, leverage, turnover, book-to-market ratio (BM), profit margin, and return on assets (ROA) as matching criteria in 2009.

To ensure that a non-dividend payer mimics the fundamental characteristics of the dividend-payer, we first run a logistic model,

$$\begin{aligned} \text{Logit}(\text{Dividendpayer}_i = 1) = & \alpha + \beta_1 \text{Size}_i + \beta_2 \text{Leverage}_i + \beta_3 \text{Turnover}_i + \beta_4 \text{BM}_i \\ & + \beta_5 \text{Margin}_i + \beta_6 \text{ROA}_i + \varepsilon_i. \end{aligned} \quad (2)$$

Then, using the predicted value of logit regression as a score, we match each dividend-payer with the closest nonpayer within the same industry.

Table 7 reports the returns/alphas of each group and its benchmark. Our variables of interest are variables *Difference in returns* and *Difference in alphas*. *Difference in returns* is the excess return of each dividend-policy group over the excess return of its matched benchmark. *Difference in alphas* is the difference in alphas of each group and their matched benchmarks. Consistent with our previous results, the groups 0 and 1, i.e. groups

Table 7 Returns over matched benchmark

	Excess return	Benchmark excess return	Difference in excess returns	t-stat	Alpha	Benchmark alpha	Difference in alphas	t-stat
Panel A: NYSE								
Group 0	0.0050	0.0032	0.0018	1.75	0.0023	0.0010	0.0013	1.06
Group 1	0.0049	0.0035	0.0013	0.98	0.0025	0.0010	0.0016	0.99
Group 0 and 1	0.0049	0.0034	0.0014	1.17	0.0025	0.0009	0.0016	1.10
Group 2	0.0022	0.0031	-0.0008	-3.16	0.0002	0.0008	-0.0006	-2.22
Group 3	0.0017	0.0025	-0.0009	-6.89	0.0000	0.0004	-0.0004	-3.39
Panel B: NASDAQ								
Group 0	0.0031	0.0017	0.0013	0.71	0.0016	0.0003	0.0013	0.68
Group 1	0.0035	0.0030	0.0005	1.11	0.0015	0.0010	0.0005	1.03
Group 0 and 1	0.0034	0.0027	0.0006	1.34	0.0015	0.0009	0.0006	1.25
Group 2	0.0015	0.0028	-0.0013	-2.94	-0.0002	0.0012	-0.0015	-2.72
Group 3	0.0020	0.0029	-0.0009	-4.20	0.0002	0.0011	-0.0009	-2.92

We collect information for dividend payers and dividend non-payers and match them up in 2009. We use propensity score matching to find a unique benchmark from non-payers for each payer. Industry, size, leverage, asset turnover, BM and profit margin are used to match a payer to a non-payer. Matched nonpayers for each group serve as the benchmark for each group. This table reports average risk-adjusted returns of each group and its benchmark group, and the difference between them

Table 8 A comparison of sample and benchmark firms

Variable	NYSE		NASDAQ	
	Mean difference	<i>p</i> value	Mean difference	<i>p</i> value
Panel A: Differences in firm's characteristics				
Size	0.3020	<0.0001	0.0837	0.4232
BM	-0.21333	0.3811	0.00553	0.9613
Margin	0.0153	0.1435	0.0228	0.2993
Turnover	0.0625	0.0889	-0.00786	0.8807
Leverage	0.0446	0.4030	0.4045	0.2293
ROA	0.00971	0.3638	0.0204	0.1891
Panel B: Differences in returns in 2007				
Group 0	-0.00111	0.1200	-0.00204	0.0806
Group 1	-0.00037	0.1500	-0.00157	0.1712
Group 2	-0.00017	0.2300	-0.00064	0.3063
Group 3	-0.00003	0.7000	-0.00038	0.5192

This table reports the difference between sample firms and benchmark firms after the matchup: $Difference^{Size} = Size^{Sample} - Size^{Benchmark}$

Size is the natural logarithm of total assets, leverage is total assets over total debt (estimated by total asset - total equity), asset turnover is the revenue over total asset, BM ratio is the total equity over total market value, profit margin is the net income over revenue, ROE is the net income over total equity, and ROA is the net income over total asset. Returns are average daily returns

that stopped paying dividends or reduced dividends, have higher excess returns and alphas than their non-payer counterparts. Groups 2 and 3, i.e. groups that continued with their dividend policy or increased dividends, had on the other hand, significantly lower returns than their non-dividend matches.

To demonstrate that the benchmark firms are indeed similar to the sample firms we check the balance of the control variables. We report differences in control variables between the sample and benchmark firms in Table 8, panel A. The differences in all control variables are not significant at 5% level confirming that the benchmark firms are generally similar to sample firms and the matching is efficient. The only exception is the difference in size between the sample and benchmark firms on NYSE. This is because dividend payers tend to be larger and more mature companies within the industry.

Table 8, panel B reports differences in daily returns in 2007 to demonstrate that benchmark and sample firms had similar returns before the changes in dividend policy. The differences in returns are not significant for any group confirming successful matching procedure.

5.2 The effect of dividend omissions

We argue that decreasing dividends at the beginning of 2008 financial crisis was a correct decision that enabled the firms to preserve much needed cash and work through the financial crisis period. Consistent with this premise, we find that firms that stopped paying dividends or those that decreased dividends were rewarded by higher risk-adjusted returns in 2009. Empirical research documents that decreases in dividends are usually associated

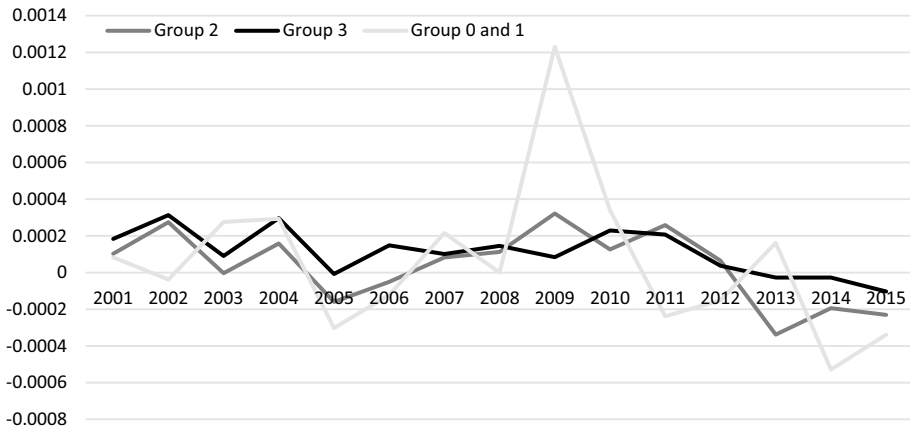


Fig. 1 Daily alpha difference in the third year, NYSE. We form 3-year sets from 1999 to 2015. First 2 years are used to classify dividend policy change groups and we calculate alphas in the third year through the four-factor model for each group in each set

with significantly lower returns surrounding the announcement day (see for example Dhillon and Johnson 1994; Michaely et al. 1995; Che et al. 2018). Therefore, higher risk-adjusted returns in a year following decrease in dividends may not be due to benefits of improved cash flows during the crisis but rather to a depressed stock price resulting from the change in dividend policy. In other words, our findings may not be specific to the severe financial crisis of 2008. Instead they may be driven by the dividend omissions and consequent recovery effect in long-run performance. To address this concern, we expand the time period and examine the effect of changes in dividend policy on risk-adjusted returns from 1999 to 2015. We use the same methodology and identify dividend-paying firms in year $t-2$. In year $t-1$, we sort these firms into groups based on changes in their dividend policy. We follow these groups and evaluate their performance in year t . The results are plotted in Fig. 1 (NYSE) and Fig. 2 (NASDAQ). As can be seen from these figures, the large increase in risk-adjusted returns for groups 0 and 1 is present only during the 2008 financial crisis, implying that higher risk-adjusted returns for firms that decreased their dividends are not driven by effects associated with dividend-omission. See Figs. 1 and 2, which cover the time period from 2001 to 2015.

6 Cross-sectional tests on returns

6.1 The effect of dividend policy change

To further support our finding, we conduct cross-sectional tests on risk-adjusted returns. We regress risk-adjusted return (alpha or average excess return) on firm characteristics and a group variable (*Group*):

$$\begin{aligned} \text{Alpha}_i = & \alpha + \beta_1 \text{Size}_i + \beta_2 \text{Leverage}_i + \beta_3 \text{Turnover}_i + \beta_4 \text{BM}_i + \beta_5 \text{Margin}_i \\ & + \beta_6 \text{ROA}_i + \gamma \text{Group}_i + \varepsilon_i. \end{aligned} \quad (3)$$

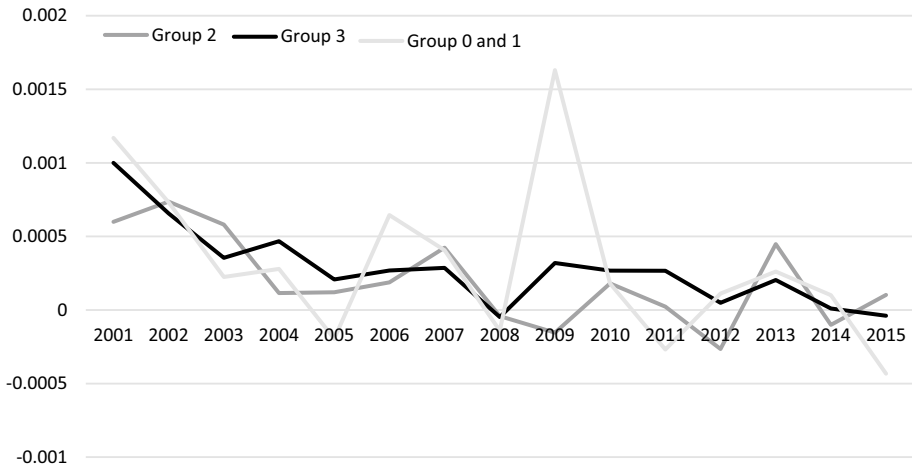


Fig. 2 Daily alpha difference in the third year, NASDAQ. We form 3-year sets from 1999 to 2015. First 2 years are used to classify dividend policy change groups and we calculate alphas in the third year through the four-factor model for each group in each set

The *Alpha* is the four-factor model alpha generated from 2009 daily returns [Eq. (1)]. We also use average excess return as another dependent variable. The control variables are firm characteristics in 2009; *Group* is the group number. We do not further expand the set of our control variables because of concern of losing more observations. Missing values in Compustat may introduce bias leading our sample towards larger firms and value firms and significantly reducing observations, especially in Group 0.

Panel A of Table 9 reports results from the full sample including NYSE observations and NASDAQ observations. All of the *Group* coefficients (γ) are negative and significant (at 1% level), indicating that alphas and excess returns are significantly higher for groups with lower group numbers, i.e. the groups that decreased or stopped paying dividends in 2008. Panel B reports similar results for NYSE firms. For NASDAQ firms, the effect of change in dividend policy is similar but weaker (panel C) with all γ coefficients negative but only three significant at 5% level and one not significant. In general, we confirm the previous results that dividend policy change in 2007 does affect the risk-adjusted returns after the crisis.

6.2 Survivorship bias

Some firms in our sample may have been acquired by other firms, gone bankrupt and delisted during our time period. Therefore, our results may suffer from survivorship bias. To address this problem, we add back missing observations and conduct the Heckman correction to the tests. First, we collect information on delisted firms and add them back into our sample prior to the date they delisted in 2009. Second, we identify those firms that are present in our 2007 sample but disappear in the 2009 sample. We calculate the inverse Mills ratio (IMR) for each observation and add IMR as an independent variable using following equations:

$$P(\text{Drop}_i = 1) = \alpha_i + \sum_{k=1}^6 \beta_k \text{Control}_{ik}^{2007} + \varepsilon_i, \quad (4)$$

Table 9 Cross-sectional tests

	Dependent variable: Alpha, 2009				Dependent variable: Excess return, 2009			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Panel A: All								
Group	-0.0008	0.00	-0.0008	0.00	-0.0010	0.00	-0.0010	0.00
Intercept	0.0023	0.00	0.0027	0.01	0.0046	0.00	0.0050	0.00
Size			0.0000	0.77			0.0000	0.66
Leverage			0.0000	0.96			0.0000	0.75
Turnover			0.0001	0.62			0.0000	0.93
BM			-0.0002	0.36			-0.0001	0.76
Profit margin			-0.0002	0.79			-0.0012	0.16
ROA			-0.0004	0.71			-0.0011	0.28
N	1037		976		1037		976	
Adj R ²	0.0097		0.0098		0.0318		0.0337	
Panel B: NYSE								
Group	-0.0009	0.00	-0.0010	0.00	-0.0011	0.00	-0.0012	0.00
Intercept	0.0027	0.00	0.0033	0.03	0.0053	0.00	0.0067	0.00
Size			0.0000	0.86			-0.0002	0.23
Leverage			0.0000	0.91			0.0000	0.82
Turnover			0.0000	0.92			-0.0001	0.79
BM			-0.0004	0.28			-0.0001	0.70
Profit margin			-0.0014	0.50			-0.0027	0.14
ROA			0.0001	0.97			-0.0005	0.75
N	734		692		734		692	
Adj R ²	0.0150		0.0090		0.0360		0.0380	
Panel C: NASDAQ								
Group	-0.0004	0.03	-0.0003	0.14	-0.0005	0.00	-0.0003	0.05
Intercept	0.0012	0.01	0.0015	0.07	0.0032	0.00	0.0023	0.00
Size			-0.0002	0.10			0.0000	0.51
Leverage			0.0000	0.94			0.0000	0.85
Turnover			0.0002	0.25			0.0000	0.94
BM			0.0003	0.15			0.0003	0.06
Profit margin			0.0001	0.88			-0.0005	0.26
ROA			0.0004	0.76			-0.0017	0.11
N	303		284		303		284	
Adj R ²	0.0125		0.0964		0.0324		0.0996	

We use cross-sectional regressions to further investigate the relationship between risk-adjusted returns and dividend policy changes

$$\text{Alpha}_i = \alpha + \beta_1 \text{Size}_i + \beta_2 \text{Leverage}_i + \beta_3 \text{Turnover}_i + \beta_4 \text{BM}_i + \beta_5 M \text{ arg } in_i + \beta_6 \text{ROA}_i + \gamma \text{Group}_i + \varepsilon_i.$$

The interested variable is *Group*, representing the dividend policy change from 2007 to 2008

$$IMR_i = \frac{\phi(\text{Predicted value}_i)}{\Phi(\text{Predicted value}_i)}, \quad (5)$$

$$Alpha_i = \alpha_i + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma Group_i + \delta IMR_i + \varepsilon_i. \quad (6)$$

Control variables include the size, leverage, turnover, BM, margin and ROA. IMR is the inverse Mills ratio, which is estimated from Eqs. (4) and (5). $\phi(\cdot)$ denotes the normal density function and $\Phi(\cdot)$ denotes the normal cumulative distribution function. Table 10 shows the results of the Heckman correction test. The Group coefficients (γ) remain negative and significant confirming that our results reported in Table 10 hold. Moreover, the effect of a change in dividend policy for NASDAQ firms is stronger after Heckman correction.

7 The managerial effort

The literature well documents the impact of corporate governance and managerial effort on firm value and performance (see for example Gompers et al. 2003; Bhagat and Bolton 2008; Bebchuk et al. 2009; Lee and Lee 2009; Leung and Horwitz 2010; Chen and Chen 2018). The general finding is that better corporate governance is associated with higher firm value and better performance. In this study, we argue that the strong recovery of groups 0 and 1 is a result of managements' fast reaction to the financial crisis. Managers, who were able to identify the coming crisis and reduce their dividends, mitigated the effect of liquidity constrains on the firm during the financial crisis. Therefore, we believe that managerial effort played a significant role in firms recovering through correctly reducing dividends during the crisis.

7.1 The cross-sectional tests and managerial effort

To test this hypothesis, we add institutional holdings as a primary variable that proxies for managerial effort and investigate the relationship between managerial effort in 2007 and the group effect on return in 2009. A large body of literature focuses on institutional investors' effort to improve corporate governance (see for example Shleifer and Vishny 1986; Bertrand and Mullainathan 2001; Velury et al. 2003). In general, institutional investors are viewed as watchdogs that push managers to make right choices. Therefore, a higher level of institutional ownership is associated with better managerial effort. That is, institutional investors bring a level of oversight and monitoring that may influence better management. We are not necessarily interested in the overall effect of the managerial effort on returns but rather in the effect of managerial effort concerning the change in dividend policy. Our argument is that decisions that led to preserving cash, such as the decision to decrease dividends, were crucial decisions at the beginning of the financial crisis and that companies benefitted from these decisions in 2009. Therefore, we test the effect of the managerial effort through a model,

$$Alpha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \varepsilon_i, \quad (7)$$

Table 10 Cross-sectional tests: Heckman correction

	Dependent variable: Alpha, 2009				Dependent variable: Excess return, 2009			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Panel A: All								
Group	-0.0008	0.00	-0.0008	0.00	-0.0011	0.00	-0.0010	0.00
Intercept			0.0076	0.13			0.0120	0.01
Size			-0.0003	0.42			-0.0005	0.14
Leverage			0.0000	0.94			0.0000	0.82
Turnover			0.0004	0.51			0.0004	0.42
BM			-0.0003	0.46			-0.0001	0.84
Profit margin			-0.0027	0.42			-0.0049	0.08
ROA			-0.0004	0.88			-0.0008	0.72
IMR	-0.0013	0.87	-0.0192	0.37	0.0030	0.65	-0.0245	0.18
Delisted firms	Yes		Yes		Yes		Yes	
N	960		950		960		950	
Adj R ²	0.0141		0.0100		0.0330		0.0394	
Panel B: NYSE								
Group	-0.0010	0.00	-0.0010	0.00	-0.0013	0.00	-0.0012	0.00
Intercept	0.0029	0.00	0.0026	0.46	0.0054	0.00	0.0048	0.11
Size			0.0000	0.90			0.0000	0.98
Leverage			0.0000	0.86			0.0000	0.98
Turnover			0.0000	0.96			-0.0001	0.66
BM			-0.0004	0.31			-0.0001	0.68
Profit margin			-0.0011	0.66			-0.0024	0.26
ROA			-0.0004	0.89			-0.0015	0.52
IMR	-0.0001	0.98	0.0029	0.83	0.0016	0.68	0.0075	0.51
Delisted firms	Yes		Yes		Yes		Yes	
N	677		673		677		673	
Adj R ²	0.0143		0.0079		0.0368		0.0375	
Panel C: NASDAQ								
Group	-0.0004	0.02	-0.0003	0.08	-0.0005	0.00	-0.0004	0.01
Intercept	0.0009	0.14	0.0038	0.17	0.0038	0.00	0.0037	0.08
Size			-0.0004	0.19			-0.0001	0.71
Leverage			0.0000	0.91			0.0000	0.79
Turnover			0.0003	0.19			0.0001	0.73
BM			0.0005	0.02			0.0006	0.00
Profit margin			-0.0003	0.67			0.0009	0.04
ROA			0.0016	0.27			-0.0005	0.64
IMR	0.0029	0.17	-0.0068	0.35	-0.0026	0.13	-0.0047	0.40
Delisted firms	Yes		Yes		Yes		Yes	
N	283		277		283		277	
Adj R ²	0.0238		0.0395		0.0456		0.1271	

We address the survival bias by adding missing observations and conducting Heckman correction. First, we collect information of delisted firms and add them back into our sample prior to the date they delisted. Second, we identified those firms that are in the 2007 sample but disappear in the 2009 sample and calculate inverse Mills ratio (*IMR*) for observations in 2009 sample through Eq. (4) and (5). Then we add *IMR* to the equation,

$$Alpha_i = \alpha_i + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma Group_i + \delta IMR_i + \epsilon_i$$

where IH is the institutional holding in 2007. Control variables include *size*, *leverage*, *turn-over*, *BM*, *Margin* and *ROA*. The dependent variables are risk-adjusted returns in 2009.

We expect better managerial decisions concerning the dividend policy to be reflected in a negative and significant coefficient on the interaction term ($Group_i IH_i^{2007}$). Consistent with our expectations, the interaction coefficients are negative and significant at 5% level for the full sample (panel A of Table 11). After the interaction term is added into the model, the Group coefficient loses its significance and becomes positive. This finding implies that the effect of dividend policy change on future recovery is indeed associated with managerial effort during the crisis. We find similar results for NYSE firms (Table 11, panel B). The results for NASDAQ firms are weaker (panel C), probably due to smaller sample size.

Changes in dividend policy may also be related to changes in institutional ownership as institutional investors adjust their portfolio according to their cash flow needs. Therefore, we report the average institutional holdings for each group in 2007, 2008 and 2009 (Table 12, panels A and B). For the NYSE firms, the institutional holding levels are highest for group 0, i.e. the group of firms that stopped paying dividends and lowest for group 3, i.e. the group that increased their dividends. For NASDAQ firms, the levels of institutional holdings are just opposite with the lowest institutional holdings for the group of firms that stopped paying dividends (group 0) and the highest for the groups that continued or increased their dividends (groups 2 and 3). We find that institutional ownership in groups 0 and 1, i.e. the groups omitting or reducing dividends, decreased during the financial crises. Specifically, the institutional ownership decreased from 86 to 70% for group 0 and from 79 to 71% for group 1 on NYSE. The decrease in institutional ownership for groups that did not decrease dividends, i.e. the groups 2 and 3 decreased as well but not so substantially (from 79 to 71% for group 2 and from 73 to 69% for group 3).

Table 12, panels C and D reports alphas for each group in 2007, 2008 and 2009. In 2007 and 2008, the alphas are lower for firms reducing dividends, but they are not significant. During the financial crises the stock prices of the vast majority of firms were dropping. We cannot make any meaningful conclusions about the effect of dividend changes within this short time interval. We address this concern in Sect. 5.2 by examining the effect of changes in dividend policy on risk-adjusted returns from 1999 to 2015 (Figs. 1, 2). We find strong evidence that our findings are not driven by other events accompanying omission of dividends and are specific only to the financial crises.

As a second proxy for quality of corporate governance we use the entrenchment index proposed by Bebchuk et al. (2009). This index is composed of six corporate provisions that were shown to have influence on firm valuation. Four of these provisions affect shareholder voting power (staggered boards, limits to shareholder amendments of bylaws, supermajority requirements for mergers and supermajority requirements for charter amendments). The remaining two provisions are provisions that affect likelihoods of hostile takeovers, i.e. poison pills and golden parachutes. The corporate governance data are from the MSCI database.

We follow loosely the method of Masulis et al. (2007) and identify the firms with a “dictatorship” governance. We define the “dictatorship” firms as firms with the entrenchment index equal or higher than 4. In general, these firms are firms with weak protection for shareholders and/or strong hostile antitakeover provisions. Therefore, managers of these firms face lower pressure from the market for corporate control and are likely to have worse or less effective management. We run a regression:

Table 11 Effect of corporate governance on future performance of each group

	Dependent variable: Alpha, 2009				Dependent variable: Excess return, 2009			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Panel A: All								
IH	0.0002	0.77	0.0044	0.03	0.0012	0.05	0.0065	0.00
IH*Group		-0.0018	0.03			-0.0022	0.00	
Group	-0.0008	0.00	0.0005	0.46	-0.0009	0.00	0.0007	0.22
Intercept	0.0026	0.01	-0.0005	0.79	0.0044	0.00	0.0006	0.68
Size	0.0000	0.75	0.0000	0.71	-0.0001	0.36	-0.0001	0.32
Leverage	0.0000	0.98	0.0000	0.82	0.0000	0.62	0.0000	0.85
Turnover	0.0001	0.66	0.0001	0.60	-0.0001	0.63	-0.0001	0.73
BM	-0.0002	0.35	-0.0003	0.30	-0.0001	0.77	-0.0001	0.67
Profit margin	-0.0002	0.81	-0.0004	0.68	-0.0013	0.13	-0.0015	0.08
ROA	-0.0004	0.73	-0.0003	0.79	-0.0009	0.38	-0.0008	0.44
N	959		959		959		959	
Adj R ²	0.0092		0.0131		0.0376		0.0465	
Panel B: NYSE								
IH	0.0006	0.56	0.0070	0.06	0.0013	0.16	0.0088	0.01
IH*Group		-0.0026	0.07			-0.0030	0.02	
Group	-0.0010	0.00	0.0011	0.36	-0.0011	0.00	0.0013	0.22
Intercept	0.0028	0.12	-0.0022	0.50	0.0056	0.00	-0.0002	0.93
Size	0.0000	0.90	0.0000	0.84	-0.0002	0.28	-0.0002	0.23
Leverage	0.0000	0.96	0.0000	0.81	0.0000	0.69	0.0000	0.89
Turnover	0.0000	0.97	0.0000	0.93	-0.0001	0.63	-0.0001	0.67
BM	-0.0004	0.26	-0.0005	0.15	-0.0002	0.60	-0.0003	0.34
Profit margin	-0.0013	0.57	-0.0011	0.61	-0.0028	0.15	-0.0027	0.16
ROA	0.0000	0.98	0.0000	0.98	-0.0004	0.81	-0.0004	0.81
N	679		679		679		679	
Adj R ²	0.0089		0.0120		0.0403		0.0471	
Panel C: NASDAQ								
IH	-0.0005	0.39	0.0015	0.33	0.0002	0.62	0.0022	0.08
IH*Group		-0.0009	0.17			-0.0008	0.09	
Group	-0.0003	0.14	0.0002	0.62	-0.0003	0.05	0.0002	0.58
Intercept	0.0016	0.06	0.0003	0.79	0.0023	0.00	0.0011	0.28
Size	-0.0001	0.28	-0.0001	0.35	0.0000	0.71	0.0000	0.58
Leverage	0.0000	0.99	-0.0000	0.94	0.0000	0.83	0.0000	0.91
Turnover	0.0002	0.18	0.0002	0.16	0.0000	0.91	0.0000	0.97
BM	0.0003	0.20	0.0003	0.19	0.0003	0.05	0.0003	0.05
Profit margin	0.0001	0.83	0.0000	0.97	-0.0005	0.25	-0.0006	0.18
ROA	0.0002	0.87	0.0004	0.75	-0.0017	0.13	-0.0015	0.18
N	280		280		280		280	
Adj R ²	0.0228		0.0261		0.0728		0.0792	

We test the effect of management on the return effect of dividend policy changes. We use institutional holding as a measure of managers' effort in 2007

Table 11 (continued)

$$Aplha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \varepsilon_i$$

Table 12 Levels of institutional holdings and risk-adjusted returns by group in 2007, 2008 and 2009

	Year 2007		Year 2008		Year 2009	
	IH (%)		IH (%)		IH (%)	
Panel A: Institutional holdings: NYSE						
Group 0	86		70		71	
Group 1	79		72		72	
Group 2	79		75		74	
Group 3	73		69		68	
Panel B: Institutional holdings: NASDAQ						
Group 0	51		46		49	
Group 1	58		54		50	
Group 2	66		63		61	
Group 3	61		59		57	
	Year 2007		Year 2008		Year 2009	
	Alpha	p value	Alpha	p value	Alpha	p value
Panel C: Alphas: NYSE						
Group 0	-0.0003	0.43	-0.0023	0.06	0.0019	0.07
Group 1	0.0000	0.98	-0.0007	0.09	0.0011	0.03
Group 2	0.0002	0.17	0.0004	0.17	0.0003	0.19
Group 3	0.0003	0.01	0.0004	0.17	0.0001	0.66
Panel A: Alphas: NASDAQ						
Group 0	0.0006	0.05	-0.0015	0.17	0.0014	0.35
Group 1	0.0000	1.00	-0.0011	0.07	0.0017	0.01
Group 2	0.0003	0.09	0.0003	0.35	-0.0002	0.65
Group 3	0.0004	0.00	0.0002	0.65	0.0003	0.18

The monthly returns for each group are regressed on risk factors using the four-factor model (Eq. 1):

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_1 (r_{m,t} - r_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{i,t}$$

$$Aplha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 Dictatorship_i^{2007} + \gamma_3 Group_i Dictatorship_i^{2007} + \varepsilon_i \tag{8}$$

where *Dictatorship* is a dummy variable equal to one if the firm is categorized as a dictatorship firm, zero otherwise. Control variables are *size*, *leverage*, *turnover*, *BM*, *Margin* and *ROA*.

Our expectation is that better managerial decisions will be reflected in a significant and positive coefficient on the interaction term (*Group_iDictatorship_i²⁰⁰⁷*). The results are shown in Table 13. Consistently with our expectations, the interaction coefficient is positive and significant for the NYSE sample. The results for NASDAQ are not significant, likely due to a small sample size.

Table 13 The effect of corporate governance on future performance by group: alternative measure of quality of corporate governance

	NYSE				NASDAQ			
	Excess return		Alpha		Excess return		Alpha	
	Coefficient	p value	Coefficient	p value	Coefficient	p value	Coefficient	p value
Dictatorship	-0.0034	0.0090	-0.0039	0.0099	-0.0001	0.9402	-0.0007	0.5466
Dictatorship*Group	0.0011	0.0387	0.0013	0.0307	-0.0001	0.8455	0.0002	0.5896
Group	-0.0016	<0.0001	-0.0015	0.0001	-0.0003	0.0981	-0.0003	0.1253
Intercept	0.0081	<0.0001	0.0049	0.0032	0.0022	0.0023	0.0016	0.0705
Size	-0.0001	0.2770	0.0000	0.9465	0.0001	0.3723	-0.0001	0.1500
Leverage	0.0000	0.8788	0.0000	0.8707	0.0000	0.8255	0.0000	0.9283
Turnover	-0.0001	0.7538	0.0000	0.9623	0.0000	0.7672	0.0002	0.2465
BM	-0.0001	0.6213	-0.0004	0.2473	0.0003	0.0703	0.0003	0.1843
Profit margin	-0.0028	0.1249	-0.0015	0.4776	-0.0005	0.2539	0.0001	0.8389
ROA	-0.0003	0.8335	0.0002	0.9062	-0.0018	0.1057	0.0004	0.7880
N	692		692		283		283	
Adj R ²	0.0468		0.0174		0.0711		0.1750	

We test the effect of management on the return effect of dividend policy changes. We define dictatorship firms (*Dictatorship*=1) as firms with Entrenchment index ≥ 4 and democracy firms (*Dictatorship*=0) as firms with Entrenchment index ≤ 3

$$Alpha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 Dictatorship_i^{2007} + \gamma_3 Group_i Dictatorship_i^{2007} + \epsilon_i.$$

Alphas and excess returns in 2009 are dependent variables, firms’ fundamentals in 2009 are control variables

Overall our results indicate that managers that face more pressure from institutional investors or the market for corporate control were more likely to make better decisions about their dividend policy during the financial crises.

7.2 Persistence of institutional holdings

The managerial effort may have affected returns in 2009 through two channels. First, management that reduced dividends at the beginning of crisis preserved cash that benefited the firm during and after crisis. Second, the management that was effective in 2007 kept the position and remained effective in 2009. Because institutional holdings (a proxy for managerial effort) may not change dramatically year to year, the better returns in 2009 may not be due to fast managerial reaction to the upcoming crisis but rather to good corporate governance in 2009.

To address this concern, we use a two-stage regression to exclude the effect of institutional holdings in 2009. The first stage regression is:

$$Alpha_i = \alpha + \beta IH_i^{2009} + u_i. \tag{9}$$

The residuals of the first regression are then used in the second stage to exclude the effect of corporate governance in 2009:

$$\hat{u}_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \epsilon_i. \tag{10}$$

Table 14 Effect of corporate governance on future performance of each group: the persistence effect of institutional holding

	Dependent variable: Residual, alpha				Dependent variable: Residual, average excess return			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Panel A: All								
IH	0.0009	0.00	0.0031	0.00	0.0009	0.00	0.0031	0.00
IH*Group			-0.0009	0.00			-0.0009	0.00
Group	-0.0004	0.00	0.0002	0.25	-0.0004	0.00	0.0002	0.25
Intercept	0.0008	0.02	-0.0008	0.19	0.0008	0.02	-0.0008	0.19
Size	-0.0001	0.00	-0.0001	0.00	-0.0001	0.00	-0.0001	0.00
Leverage	0.0000	0.40	0.0000	0.24	0.0000	0.40	0.0000	0.24
Turnover	0.0002	0.04	0.0002	0.03	0.0002	0.04	0.0002	0.03
BM	-0.0003	0.00	-0.0003	0.00	-0.0003	0.00	-0.0003	0.00
Profit margin	0.0001	0.71	0.0000	0.94	0.0001	0.71	0.0000	0.94
ROA	-0.0003	0.48	-0.0002	0.56	-0.0003	0.48	-0.0002	0.56
N	934		934		934		934	
Adj R ²	0.0720		0.0824		0.0720		0.0824	
Panel B: NYSE								
IH	0.0016	0.00	0.0060	0.00	0.0017	0.00		0.00
IH*Group			-0.0018	0.00			-0.0024	0.00
Group	-0.0005	0.00	0.0010	0.00	-0.0007	0.00	0.0012	0.00
Intercept	0.0003	0.55	-0.0033	0.00	0.0020	0.00	-0.0027	0.01
Size	-0.0001	0.10	-0.0001	0.06	-0.0002	0.00	-0.0002	0.00
Leverage	0.0000	0.27	0.0000	0.11	0.0000	0.63	0.0000	0.92
Turnover	0.0001	0.18	0.0001	0.13	0.0000	0.67	0.0000	0.79
BM	-0.0004	0.00	-0.0005	0.00	-0.0002	0.12	-0.0003	0.01
Profit margin	0.0005	0.43	0.0005	0.35	-0.0013	0.06	-0.0012	0.07
ROA	-0.0001	0.80	-0.0001	0.79	-0.0006	0.32	-0.0006	0.30
N	668		668		668		668	
Adj R ²	0.1154		0.1434		0.1902		0.2257	
Panel C: NASDAQ								
IH	0.0002	0.76	0.0016	0.25	0.0004	0.45	0.0023	0.07
IH*Group			-0.0006	0.26			-0.0008	0.10
Group	-0.0003	0.08	0.0001	0.87	-0.0003	0.04	0.0002	0.64
Intercept	0.0008	0.27	-0.0001	0.94	-0.0004	0.59	-0.0016	0.11
Size	-0.0001	0.14	-0.0001	0.19	0.0001	0.39	0.0001	0.29
Leverage	0.0000	0.83	0.0000	0.77	0.0000	0.83	0.0000	0.92
Turnover	0.0003	0.09	0.0003	0.08	0.0001	0.61	0.0001	0.56
BM	0.0000	0.89	0.0000	0.88	0.0003	0.09	0.0003	0.08
Profit margin	0.0001	0.80	0.0001	0.91	-0.0005	0.32	-0.0006	0.23
ROA	-0.0002	0.86	-0.0001	0.95	-0.0016	0.14	-0.0014	0.20
N	266		266		266		266	
Adj R ²	0.0196		0.0205		0.0704		0.0766	

Table 14 (continued)

We test the effect of management on the return effect of dividend policy changes controlling the persistence effect of institutional holding. We use institutional holding as a measure of managers' effort in 2007. A two-stage regression is used to exclude the effect of institutional holding in 2009. Alphas and excess returns in 2009 are dependent variables in first stage regressions,

$$Alpha_i = \alpha + \beta IH_i^{2009} + u_i.$$

Results of first stage regressions are reported in Table 16. Residual from first stage is the dependent variable in second stage

$$\hat{u}_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \epsilon_i$$

The results are reported in Table 14. The coefficients on interaction term ($Group_i IH_i^{2007}$) (except one for NASDAQ) remain negative and significant (at 10% level). These results confirm our argument that fast managerial reaction regarding dividends during crisis contributed to better market performance during recovery period.

7.3 The performance over matched benchmarks

We use institutional holdings as a proxy for managerial effort but other factors may also affect returns, dividend policy and institutional holdings at the same time. To address a possible endogeneity issue, we exclude the effect of these factors by matching each firm in our sample with a similar firm that did not pay dividends in 2007 and therefore is not included in our sample (a benchmark firm). The benchmark firm should react to similar factors as the matched firm. To find a benchmark firm, we estimate a logit regression using firm's characteristics in 2009.

$$Logit(Dividendpayer_i = 1) = \alpha + \beta_1 Size_i + \beta_2 Leverage_i + \beta_3 Turnover_i + \beta_4 BM_i + \beta_5 Margin_i + \beta_6 ROA_i + \beta_7 IH_i + \epsilon_i. \tag{11}$$

With the predicted value of logit regression, we match each of our sample firms with the closest nonpayer within the same industry. Then we exclude the effect of potential other factors by calculating the excess risk-adjusted returns,

$$Excess\ Aplha_i = Aplha_i - Aplha_i^{Benchmark}, \tag{12}$$

$$Excess\ Aplha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \epsilon_i. \tag{13}$$

The coefficients on interaction term ($Group_i IH_i^{2007}$) are still negative and significant for full sample and NYSE (panels A and B of Table 15). For NASDAQ firms the results are weaker with coefficients being negative but not significant. In general, these results support the argument that a change in dividend policy during crisis positively affected future performance because of managerial efforts at that time. The effect of such dividend change is concentrated mainly in the NYSE sample.

Table 15 Effect of corporate governance on future performance by group: performance over matched benchmarks

	Dependent variable: Excess alpha, 2009				Dependent variable: Excess return, 2009			
	Model 1		Model 2		Model 3		Model 4	
	Coefficient	p value	Coefficient	p value	Coefficient	p value	Coefficient	p value
Panel A: All								
IH	-0.0001	0.00	0.0056	0.00	0.0006	0.39	0.0072	0.00
IH*Group			-0.0024	0.00			-0.0027	0.00
Group	-0.0005	0.00	0.0013	0.00	-0.0006	0.00	0.0014	0.00
Intercept	-0.0013	0.24	-0.0056	0.01	-0.0011	0.25	-0.0061	0.00
Size	0.0002	0.04	0.0002	0.04	0.0002	0.09	0.0002	0.10
Leverage	0.0000	0.87	0.0000	0.86	0.0000	0.73	0.0000	0.71
Turnover	0.0002	0.47	0.0002	0.42	0.0001	0.57	0.0002	0.49
BM	0.0000	0.65	0.0000	0.51	0.0000	0.46	0.0000	0.31
Profit margin	0.0002	0.83	0.0000	0.97	-0.0007	0.46	-0.0009	0.34
ROA	0.0002	0.85	0.0002	0.86	-0.0001	0.92	-0.0001	0.91
N	935		935		935		935	
Adj R ²	0.0085		0.0059		0.0087		0.0197	
Panel B: NYSE								
IH	-0.0006	0.19	0.0049	0.00	-0.0001	0.86	0.0070	0.00
IH*Group			-0.0022	0.00			-0.0029	0.00
Group	-0.0004	0.00	0.0014	0.00	-0.0005	0.00	0.0018	0.00
Intercept	-0.0017	0.02	-0.0060	0.00	-0.0019	0.03	-0.0076	0.00
Size	0.0002	0.01	0.0002	0.01	0.0001	0.13	0.0001	0.14
Leverage	0.0007	0.00	0.0006	0.00	0.0008	0.00	0.0008	0.00
Turnover	0.0003	0.04	0.0003	0.03	0.0004	0.02	0.0004	0.02
BM	-0.0001	0.00	-0.0001	0.00	0.0000	0.82	0.0000	0.62
Profit margin	0.0012	0.20	0.0012	0.17	0.0004	0.70	0.0005	0.62
ROA	-0.0005	0.37	-0.0007	0.23	-0.0009	0.17	-0.0011	0.09
N	673		673		673		673	
Adj R ²	0.0677		0.0861		0.0757		0.0471	
Panel C: NASDAQ								
IH	-0.0007	0.48	0.0028	0.30	0.0002	0.80	0.0035	0.16
IH*Group			-0.0015	0.16			-0.0014	0.16
Group	-0.0001	0.79	0.0008	0.27	-0.0002	0.40	0.0005	0.39
Intercept	-0.0017	0.20	-0.0039	0.06	-0.0020	0.09	-0.0041	0.03
Size	0.0002	0.32	0.0002	0.26	0.0002	0.15	0.0003	0.11
Leverage	0.0000	0.80	0.0000	0.85	0.0000	0.84	0.0000	0.89
Turnover	0.0004	0.23	0.0004	0.20	0.0001	0.64	0.0002	0.58
BM	0.0000	0.82	0.0000	0.96	0.0000	0.56	0.0000	0.68
Profit margin	-0.0004	0.65	-0.0006	0.55	-0.0009	0.29	-0.0011	0.22
ROA	0.0022	0.34	0.0025	0.28	0.0008	0.71	0.0011	0.61
N	262		262		262		262	
Adj R ²	0.0122		0.0198		0.0186		0.0263	

We test the effect of management on the return effect of dividend policy changes. We use institutional holding as a measure of managers' effort in 2007. Institutional holding comes from Thomson Reuters

$$Excess\ Aplha_i = Aplha_i - Aplha_i^{Benchmark}$$

$$Excess\ Aplha_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \epsilon_i$$

Table 16 The persistence effect of institutional holding: results of first stage regression

	Alpha		Average excess return	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Panel A: All				
Intercept	-0.0010	0.0000	-0.0005	0.0000
IH 2009	0.0014	0.0000	0.0027	0.0000
N	8971		8971	
Adj R ²	0.0049		0.0016	
Panel B: NYSE				
Intercept	-0.0011	0.0000	-0.0006	0.0000
IH 2009	0.0014	0.0000	0.0027	0.0000
N	5767		5767	
Adj R ²	0.0069		0.0022	
Panel C: NASDAQ				
Intercept	-0.0009	0.0000	-0.0005	0.0000
IH 2009	0.0013	0.0000	0.0026	0.0600
N	3204		3204	
Adj R ²	0.0022		0.0008	

8 Conclusions

Overall, the objective of this research is to examine the effect of dividend behavior during the period of recent U.S. financial crisis. Given the critical decline in economic activity, many firms felt the need to preserve cash and took action to insure sufficient cash levels to survive the crisis. We examine firms that made no changes in dividends, those that eliminated dividends totally, those that reduced but did not totally eliminate dividends and then finally those that actually increased dividends. Overall, we find that firms that were able to quickly react to deteriorating economic conditions in 2008 by adjusting their dividend policy had higher risk-adjusted returns in the subsequent year. Reducing dividends is usually seen as a “bad” signal by the market and followed by negative market reaction. Under exceptionally adverse market conditions, however, a reduction in dividends may signal the ability of managers to quickly react to the changing market conditions and the firms may be rewarded by the market in a long run. Hence, earlier works on the signaling hypothesis may have had some element of time specificity. That is, the results may be driven by financial crises for instance. Clearly, the U.S. financial crisis has been the most significant since the Great Depression with many of the belief that corporate decision-making may have been permanently altered. The dividend payout decision is but one area in which the resulting changes are of interest. That is, despite any negative connotations, many firms felt they had to reduce or eliminate their cash dividends. We further looked at a longer time period to provide more evidence of firm reaction. More research will be needed of course to trace the longer run implication of many of the corporate policy changes that may have occurred since 2008.

Appendix: Modified GRS test

Gibbons et al. (1989) provide their GRS test on abnormal returns. The null hypothesis of GRS test is all α_s equal to zero. In our work, we want to compare abnormal returns between groups. Therefore, we make a modification to GRS test. Following Morrison (2005), we have

$$H_0 : \alpha_i - \alpha_j = 0 \quad \text{or} \quad R'\alpha = 0$$

$$\sqrt{\frac{T}{1 + \hat{\theta}}} \hat{\alpha} \sim N\left(\sqrt{\frac{T}{1 + \hat{\theta}}} \alpha, \Sigma\right). \tag{14}$$

$$\sqrt{\frac{T}{1 + \hat{\theta}}} R'\hat{\alpha} \sim N\left(\sqrt{\frac{T}{1 + \hat{\theta}}} R'\alpha, R'\Sigma R\right). \tag{15}$$

$R'\hat{\alpha}$ and $R'\Sigma R$ are independent. $(T - 2)R'\Sigma R$ follows Wishart distribution. Then apply GRS's conclusion,

$$F = \frac{T(T - N - K)}{N(T - 2)} \frac{(R'\hat{\alpha})' (R'\hat{\Sigma}R)^{-1} (R'\hat{\alpha})}{1 + \hat{\theta}^2} \sim F_{N, T-N-K}. \tag{16}$$

N is the number of restriction, which is 1 in our tests. K is the number of factors, which is 4 since we use four-factor model. $\hat{\theta} = \hat{\mu}'_f \hat{\Omega}^{-1} \hat{\mu}_f$, where $\hat{\mu}_f$ is the sample mean of factor loadings and $\hat{\Omega}$ is the max-likelihood estimation of covariance matrix of factor loadings.

We are interested whether alpha of one group is significantly larger than alpha of another group.

$$H_1 : \alpha_i - \alpha_j > 0 \quad \text{or} \quad R'\alpha > 0.$$

Null is rejected when $F < F_{2a, N, T-N-K}$ and $\alpha_i - \alpha_j > 0$ (Follmann 1996) (Table 16).

We test the effect of management on the return effect of dividend policy changes controlling the persistence effect of institutional holding. We use institutional holding as a measure of managers' effort in 2007. A two-stage regression is used to exclude the effect of institutional holding in 2009. Alphas and excess returns in 2009 are dependent variables in first stage regressions

$$Alpha_i = \alpha + \beta IH_i^{2009} + u_i.$$

Residual from first stage is the dependent variable in second stage.

$$\hat{u}_i = \alpha + \sum_{k=1}^6 \beta_k Control_{ik}^{2009} + \gamma_1 Group_i + \gamma_2 IH_i^{2007} + \gamma_3 Group_i IH_i^{2007} + \epsilon_i.$$

The interested variable is *Group* and its interaction term with institutional holding. Results of the second stage regression are reported in Table 14.

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