Stock buybacks and credit default swap spread changes

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Abstract

The authors investigate whether the effects of stock buyback announcements on credit default swap (CDS) spread changes for US firms depend on macroeconomic conditions. The authors find that abnormal CDS spreads increase for small-sized firms announced to repurchase a higher share ratio during the normal period. In contrast, abnormal CDS spreads decrease for big-sized firms regardless of the magnitude of the repurchase ratio during the crisis period. The results of this study suggest that the wealth transfer effect dominates the signaling effect for small-sized firms with higher target ratios during the normal period. In contrast, the signaling effect is stronger for bondholders of big-sized firms during the crisis period.

Keywords Stock buyback, CDS, Wealth transfer, Signaling

Paper type Research paper

1. Introduction

Previous studies (e.g. Dann, 1981; Vermaelen, 1981; Ikenberry *et al.*, 1995) report positive abnormal returns to stockholders following stock buyback announcements. Some studies focus on the signaling and wealth transfer effects among the various possible explanations for these abnormal returns. The signaling effect implies that buyback announcements give a signal or information about the firm; therefore, bond and stock prices will move in the same direction. In contrast, the wealth transfer effect implies that buybacks can transfer wealth from bondholders to stockholders. The reason is that stock buyback reduces a firm's assets which generate a drop in the value related to bondholders' claims. Representative studies on these two effects are Maxwell and Stephens (2003) and Jun *et al.* (2009). Maxwell and Stephens (2003) find that stock buyback announcements positively impact stock prices but negatively impact bond prices, supporting the wealth transfer effect. However, they cannot exclude the signaling effect because they find that firm value also increases around open-market share buyback announcements. Jun *et al.* (2009) use a larger dataset of 336 open market share repurchases from 1991 to 2002, and examine a methodology to enhance the power to test the

JEL Classification — G12, G14

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two effects. They obtain results consistent with the positive signaling effect and some supporting the wealth transfer effect.

In the above articles, changes in bondholders' wealth are measured by changes in abnormal bond returns or yield spread changes. Recently, Sun *et al.* (2021) insist that credit default swap (CDS) spreads are better and cleaner for measuring bondholders' wealth than bond returns or yield spreads [1]. Utilizing CDS spread changes, they examine the signaling and wealth transfer effects around payout announcements. However, they mainly focus on dividend cuts and dividend raises and simply deal with stock buybacks. They document that CDS spreads substantially increase following dividend cuts announcements but weakly react to announcements of dividend raises or stock buybacks.

We investigate whether the effects of stock buyback announcements on CDS spread changes depend on the macroeconomic conditions in US markets. Our research motivation is as follows. First, Sun *et al.* (2021) report that there are no significant CDS spread changes around buyback announcements and that they do not significantly respond to buyback announcements even during economic recessions. However, the authors define recession periods as 2001, 2002, 2008 and 2009; thus, a more delicate definition of recession periods is required. Second, Floyd *et al.* (2015) report that buybacks by industrial firms grew to more than twice as large as dividends by 2007, and the aggregate buyback amount peaked at $453 bn in 2007 and sharply dropped to $312 bn in 2008 and to $130 bn in 2009. Bliss *et al.* (2015) also document that during the 2008–2009 credit crisis period, a sharp decline in payout ratios is driven primarily by a large reduction in buybacks, while a small decline is found in the dividend payout ratio [2]. Thus, the analysis of buyback announcements during the global financial crisis is important. Third, Lee *et al.* (2020) provide evidence that many buyback announcements are mainly motivated by fundamentals-based factors such as undervaluation in the period 1994–2001. In contrast, nonfundamentals-based factors such as managerial self-interest are more critical in the 2002–2006 and 2007–2014 subsample periods. Hence, examining the effects of buyback announcements during the global financial crisis as the recession period after 2002 is better for capturing the recent propensity of buybacks during economic recessions.

For this purpose, we analyze the reaction of CDS spreads to buyback announcements across the pre-crisis and crisis periods, focusing on the recent global crisis period. Additionally, we examine the reactions across the short-term and mid-term windows because the CDS market can respond slowly over the mid-term horizon. Further, we perform portfolio analysis to investigate whether the reactions of CDS spread to stock buyback announcement are affected by firm characteristics. Portfolios are classified as high repurchase ratio firms and low repurchase ratio firms then sub-classified as small-sized firms and big-sized firms. Finally, we conduct regressions to examine whether our conclusions inferred from the univariate analysis are maintained after controlling for variables related to the properties of buyback firms, variables determining CDS spread changes, and to investigate the direct relationship between cumulative abnormal stock returns and abnormal CDS spread changes.

Although CDS spreads should be a better measure than bond returns or yield spreads for bondholders' wealth, few studies explore the impacts of buyback announcements on bondholders utilizing CDS spread changes; Sun *et al.* (2021) and DelFavero (2018) can only be found. Sun *et al.* (2021) examine the effect of payout policies on credit risk by observing CDS spread changes around payout announcements. However, they focus more on dividend policies than on stock buyback policies and analyze the impacts of macroeconomic conditions with simply defined recession periods. DelFavero (2018) investigated CDS spread changes for 53 firms within the S&P 100 index over the sample period from 2011 to 2018. He finds significant average abnormal CDS spread changes around buyback announcements. However, he cannot find any significant relationship with the stock

buyback percentage, debt to assets ratio and market capitalization in his multivariate regression model.

Our study makes several contributions to the literature. First, this study investigates the effects of stock buyback announcements on CDS spread changes under more delicately defined macroeconomic conditions. Consequently, we find that abnormal CDS spreads increase for small-sized firms announced to repurchase a higher ratio of shares during the normal period. In contrast, abnormal CDS spreads decrease for big-sized firms, regardless of whether the repurchase ratio is high or low during the crisis period. Our results are inconsistent with Sun *et al.*'s (2021) conclusion that buyback plays a negligible information role for bondholders. Therefore, it provides managers with policy implications to consider macroeconomic conditions when deciding on stock buyback. Second, we examine the reactions of the CDS spread across the mid-term and short-term windows. In contrast to Sun *et al.* (2021), to observe CDS spread changes over a 15-day trading day event window as the main analysis interval, we add a one-month event window and two-month event window to observe medium-term effects. Hence, we can consider delayed responses when the CDS spread may not respond efficiently in a short time.

The main empirical results of this study are summarized as follows: First, when we observe the raw CDS spread changes, small-sized firms that announced a higher percentage of shares show significantly positive changes during both normal and crisis periods.

Second, abnormal CDS spread changes show surprisingly different patterns compared with raw CDS spread changes. When big-sized firms announce buyback during the crisis period, abnormal CDS spreads decrease over the medium-term horizons. In contrast, when small-sized firms announce buying back a higher percentage of shares during the normal period, abnormal CDS spreads increase. The results suggest that the signaling effects of stock buybacks may dominate the wealth transfer effects for big-sized firms during the crisis period. In contrast, the wealth of bondholders may strongly transfer to stockholders for small-sized firms with higher repurchase ratios during the normal period.

Third, when we regress two-week abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing firms' characteristics, the cumulative abnormal stock returns coefficient is positive during the normal period. It is negative for low repurchase ratio firms during the crisis period, even though they are marginally significant. The results indicate that the bondholders' wealth may transfer to stockholders over a short-term horizon during the normal period. Buyback announcements improve the short-term performance of stocks and bonds for firms that buy back a lower ratio of shares during the crisis period.

Finally, when we regress two-month abnormal CDS spread changes on the same variables, the coefficient of cumulative abnormal stock returns is positive and strongly significant for firms with high repurchase ratios during the normal period. In contrast, this is negative and substantially significant for firms with high repurchase ratios but not for firms with low repurchase ratios during the crisis period.

Taken together, we conclude that bondholders' gains may transfer to stockholders for small-sized firms that announced to buyback a higher ratio of shares during the normal period. Meanwhile, during the crisis period, the positive signaling effect is overwhelming both for stocks and bonds over the short-term horizon for big-sized firms announced to buyback lower repurchase ratios and over the medium-term horizon for big-sized firms announced to buyback higher repurchase ratios.

The remainder of this paper is organized as follows. Section 2 describes the data of stock buyback and CDS and reveals the research methodology. Section 3 investigates whether firm characteristics or economic states impact the CDS market responses. Additionally, we conduct regressions to examine whether stock buybacks mainly provide a signaling effect or a wealth transfer effect to bondholders. Finally, in Section 4, we concludes the paper.

2. Data and methodology

2.1 Data

We obtain open-market stock buyback announcements from the Securities Data Corporation (SDC) Platinum database over the sample period from April 2006 to April 2009 to focus on performance during both the normal and crisis periods. We then match the return data from the Center for Research in Security Prices (CRSP) with accounting data from Compustat. We limit our sample to common stocks. Our sample covers 1,675 stock buyback announcements (for 1,167 firms) made during our sample period.

We use CDS data on USD-denominated debt with a modified restructuring clause and five years of maturity. We obtain daily CDS spread quotes and sector and credit rating [3] information for 776 firms over the sample period from Markit. After matching the stock buyback announcement data with the CDS data, our final sample includes 343 stock buyback announcements (for 247 firms). We collect CDS spread quotes from March 2006 to May 2009 to allow us to observe the CDS spread of our sample firms for one month before and after their buyback announcements.

2.2 Summary statistics

Table 1 shows summary statistics for stock buybacks over the sample period. Panel A reports the characteristics of the stock buybacks announcement. We divide the sample period into two sub-periods, the pre-crisis and crisis periods, to examine whether the performance of firms that announced buybacks during the normal period is different from that of firms that announced buybacks during the global financial crisis. The pre-crisis period is from April 2006 to April 2007, and the crisis period is from May 2007 to April 2009. The repurchase ratio (Rep. ratio) is the percentage of shares targeted for buyback at the announcement date and is designated as a percentage of outstanding shares. The firm's size (Firm size) is measured by the natural logarithm of the market value of equity. In addition to the number of firms (N. of Firms), the number of repurchase announcements (N. of Rep.) is counted, reflecting the several repurchases of a firm. The entries in Panel A show statistics such as the cross-sectional average, median and standard deviation for the repurchase ratio and size of the firm.

	Rep. ratio (%)					Firm size					N. of	N. of
	Mean	Median	Std	Max	Min	Mean	Median	Std	Max	Min	Rep	Firms
Panel A: Stock repurchase firms												
Pre-crisis	6.94	5.26	5.89	80.26	0.15	15.68	13.94	16.73	19.27	8.91	596	543
Crisis	7.79	5.94	8.14	100.00	0.49	15.58	13.38	16.95	19.77	9.37	1,079	850
Total	7.49	5.70	7.43	100.00	0.15	15.62	13.53	16.88	19.77	8.91	1,675	1,167
Panel B: Stock repurchase firms with CDS spread												
Pre-crisis	8.35	6.59	7.93	80.26	0.40	16.78	16.03	17.25	19.27	13.39	152	134
Crisis	8.75	7.18	8.70	100.00	0.91	17.04	16.16	17.68	19.77	12.39	191	156
Total	8.57	7.03	8.36	100.00	0.40	16.93	16.11	17.54	19.77	12.39	343	227

Note(s): Panel A provides the summary statistics for stock repurchases announced over the period from April 2006 to April 2009. The repurchase ratio (Rep. ratio) is the percentage of shares targeted for buyback at the announcement date. The size of firm (Firm size) is measured by the natural logarithm of the market value of equity. In addition to the number of firms (N. of Firms), the number of repurchase announcements (N. of Rep.) is counted, reflecting the several repurchases of a firm. The entries in Panel A show the cross-sectional averages and the cross-sectional median for the repurchase ratio and firm size. The pre-crisis period is from April 2006 to April 2007, and the crisis period is from May 2007 to April 2009. Panel B provides the summary statistics for firms that announced buybacks and have CDS spread quotes over the period from April 2006 to April 2009

Table 1.
Summary statistics for stock repurchase firms

Panel B reports the characteristics of firms that announced buybacks and have CDS spread quotes over the sample period.

In Panel A of Table 1, the average and median repurchase ratios are 7.49 and 5.7%, respectively. The average and median repurchase ratios (7.79 and 5.94%, respectively) during the crisis period are greater than those during the pre-crisis period (6.94 and 5.26%, respectively). The average and median firm sizes are 15.62 and 13.53, respectively. The average and median firm sizes (15.68 and 13.94) during the pre-crisis period are not much different from those (15.58 and 13.38) during the crisis period.

Compared to Panel A, the stock repurchases for firms with CDS spreads in Panel B exhibit a higher average repurchase ratio and a larger average firm size of 8.57% and 16.93, respectively, compared with 7.49% and 15.62 in Panel A. However, patterns such as greater average repurchase ratios during the crisis period and similar average firm size between the pre-crisis and crisis periods are maintained. Additionally, during the crisis period, the number of repurchase announcements is 191, greater than the 152 during the pre-crisis period. However, considering the horizon of the subsamples, the number of repurchase announcements is about eight per month on average during the crisis period. This is much less than about 12 per month on average during the pre-crisis period. This is consistent with Lee *et al.* (2020), who reported that the number of buybacks decreased in downward markets.

Table 2 presents summary statistics for stock repurchase firms' CDS spreads across sectors and ratings. This table shows the cross-sectional averages of the mean (Mean), the

	Panel A: Full sample period					Panel B: Repurchase month				
	Mean (%)	Std (%)	Max (%)	Min (%)	N. of obs	Mean (%)	Std (%)	Max (%)	Min (%)	N. of obs
Industry										
Basic Materials	1.57	2.74	49.82	0.12	21,704	1.15	1.58	6.96	0.15	555
Consumer Goods	2.18	11.18	252.76	0.06	30,544	1.11	1.64	9.60	0.09	804
Consumer Services	2.27	5.81	210.13	0.05	49,854	1.11	1.27	6.43	0.06	1,324
Financials	1.70	4.11	93.46	0.06	43,398	0.63	0.85	4.84	0.09	1,154
Health Care	0.96	1.43	12.72	0.03	19,422	0.67	0.70	2.87	0.06	455
Industrials	1.13	3.14	102.91	0.05	54,574	0.60	0.55	3.19	0.06	1,426
Oil and Gas	1.41	1.45	10.66	0.04	8,349	1.05	0.85	2.91	0.05	213
Technology	1.56	1.66	13.02	0.05	17,452	1.33	1.13	5.00	0.05	473
Telecommunication	1.92	1.79	13.83	0.15	5,731	1.64	1.18	3.94	0.38	153
Utilities	0.92	1.03	6.24	0.11	7,614	0.57	0.48	2.68	0.19	202
Rating										
AAA	0.65	1.29	10.22	0.03	1,836	0.33	0.26	0.61	0.06	43
AA	0.43	0.62	7.47	0.04	11,241	0.18	0.13	0.82	0.05	457
A	0.80	1.45	30.42	0.05	49,919	0.42	0.53	4.39	0.09	1,987
BBB	1.17	2.11	54.07	0.08	76,395	0.70	0.65	5.35	0.15	2,693
BB	2.85	5.09	102.91	0.29	33,724	1.86	1.38	6.96	0.35	1,091
B	4.72	6.53	72.49	0.51	14,560	2.54	1.25	6.40	0.69	362
CCC	29.09	51.07	252.76	0.48	1,415	4.74	4.42	9.60	0.49	44
D	107.35	18.70	120.57	94.13	2					
Unknown	1.30	0.82	2.95	0.36	2,248	1.75	0.82	2.95	0.75	82
Total	1.64	5.25	252.76	0.03	258,642	0.90	1.14	9.60	0.05	6,759

Note(s): This table shows the cross-sectional averages of the mean (Mean), the cross-sectional standard deviation (Std), maximum (Max) and minimum (Min) of stock repurchase firms' daily CDS spreads across 10 sectors and eight ratings. The last column reports the number of observations (N. of obs.) for each sector and each rating. The last row reports the average statistics for 343 repurchase cases in total. Panel A reports the summary statistics during full sample period (from March 2006 to May 2009) and Panel B reports the summary statistics for the CDS spreads over each firm's repurchase announcement month

Table 2.
Summary statistics for stock repurchase firms' CDS spreads across sectors and ratings

cross-sectional standard deviation (Std), maximum (Max) and minimum (Min) of stock repurchase firms' daily CDS spreads across 10 sectors and eight ratings. The last column reports the number of observations (N. of obs.) for each sector and each rating. The last row reports the average statistics for 343 repurchase cases in total. Panel A reports the summary statistics from March 2006 to May 2009, and Panel B reports the summary statistics for the CDS spreads during each repurchase announcement month.

The cross-sectional average of CDS spreads (164 bps) in Panel A is about 1.8 times that (90 bps) in Panel B. Across all industries and ratings, the cross-sectional averages of CDS spreads over the full sample period are greater than those during the announcement month. The results imply that firms mainly announce repurchases when their credit qualities, measured by CDS spreads, are better.

2.3 Methodology

We calculate CDS spread changes based on the below equation.

$$\Delta CDS_i[-t,\ t] = CDS_{i,r+t} - CDS_{i,r-t} \tag{1}$$

$CDS_{i,r+t}$ is the CDS spread for firm i at date $(r + t)$, where r is the announcement date, and $CDS_{i,r-t}$ is the CDS spread for firm i at date $(r-t)$. $\Delta CDS_i[-t,\ t]$ is the change in CDS spread for firm i during the $(2t+1)$ day announcement window. Following the methodology of Sun *et al.* (2021), we set $[-7, 7]$, that is, the two-week event window, as the main analysis interval.

However, there are some differences from the methodology of Sun *et al.* (2021) in terms of generating CDS spread changes. First, we add $[-14, 14]$ and $[-30, 30]$, which are one-month event windows and two-month event windows, respectively, as analysis intervals to observe medium-term effects because the CDS spread may not efficiently respond in a short time. Second, for simplicity, when we count t, we consider calendar days rather than trading days. Third, when there are no matching CDS spread at date $(r + t)$, we use the CDS spread on the latest day in the interval $[0, t]$ for $CDS_{i,r+t}$. When there are no matching CDS spread at date $(r-t)$, we use the CDS spreads on the oldest day in the interval $[-t, -1]$ for $CDS_{i,r-t}$. This is because some firms exist in which CDS spreads are not continuously quoted for all trading days.

Next, we compute the abnormal CDS spread (ACDS) using the index-adjusted method. Greatrex (2009) calculates ACDS by subtracting the equally weighted average CDS spread for all firms in the same rating group from the corresponding CDS spread on the announcing firm in her earnings announcement event study: We follow Greatrex's (2009) methodology, but construct the index somewhat differently, as follows:

$$\Delta ACDS_i[-t,\ t] = (CDS_{i,r+t} - CDS_{i,r-t}) - (IND_{r+t} - IND_{r-t}) \tag{2}$$

$\Delta ACDS_i[-t,\ t]$ is the abnormal CDS spread change for individual firm i during the $(2t+1)$ day announcement window. IND_{r+t} is the equal-weighted average CDS spread at date $(r + t)$ for all firms that do not repurchase stocks during the full sample period and are in the same industry as the corresponding repurchase firm at the announcement date r [4]. All firms in our sample are classified into 10 industry categories, as shown in Table 2.

3. Empirical results

In this section, we perform portfolio analysis and subsample analysis to investigate whether reactions are affected by firm characteristics or economic states. Portfolios are classified as high repurchase ratio firms (H) and low repurchase ratio firms (L), then sub-classified as small-sized firms (S) and big-sized firms (B). Cases with repurchase ratios greater than 7.49% are classified into the group with high repurchases, and others are regarded as having low

repurchases. The critical point of 7.49% is the mean repurchase ratio of all buyback cases over the sample period, as Panel A of Table 1 shows. Firm size is classified based on the natural logarithm of the market value of equity on the announcement date. The critical point of firm size is 15.62, which is the mean firm size of all buyback cases over the sample period, shown in Panel A of Table 1. We also analyze the reaction of CDS spreads to stock buyback announcements across short- and mid-term windows and across the pre-crisis and crisis periods. Finally, we conduct regressions to examine whether stock buybacks mainly provide a signaling effect or a wealth transfer effect to bondholders.

3.1 Univariate analysis of CDS spread changes

Table 3 reports the cross-sectional average and median of CDS spread changes (unit: %) and their *p*-values. Each column of [−7, 7], [−14, 14], and [−30, 30] shows the statistics of CDS spread changes before and after one week, two weeks and one month of stock repurchase announcement, respectively. Median values and their *p*-values are italicized. Sub-total (Sub T) shows the statistics for the H or L portfolio. The last column shows the number of repurchase cases (#obs) [5]. Panels A, B and C show statistics over the full sample period, during the pre-crisis and during the crisis period.

Panel A of Table 3 presents three main findings. First, the average CDS spread changes in total are 0.026%, 0.066% and 0.167% for each [–7, 7], [–14, 14] and [–30, 30] window, respectively, and significant at the 5% significance level for the [–7, 7] window and at the 1% significance level for the [–14, 14] and [–30, 30] event windows, respectively. Even though our sample size is small, our results are consistent with those of Sun *et al.* (2018) [6], who found that the CDS market shows a significantly positive response to buyback announcements on average. The authors use 1,248 repurchase cases from 417 firms over the sample period from 2001 to 2014. In a univariate analysis, Sun *et al.* (2018) report that the five-year CDS spread changes are 0.01 and 0.009% over 15 trading-day event windows and 11 trading-day event windows, respectively, and these spread changes are significant at the 5% significance level.

Second, the average and median spread changes for the H portfolio are significant across all event windows, in contrast to those for the L portfolio. In particular, the H-S portfolio shows positively significant spread changes, whereas the H-B portfolio shows insignificant spread changes, except for the median over the [–30, 30] event window.

Third, the average and median of spread changes over the [–30, 30] event window are positive and strongly significant across all portfolios, except for the average of the H-B portfolio. This means the CDS market reacts over the medium-term rather than the short-term horizon.

Panel C shows patterns similar to Panel A during the crisis period, with averages of CDS spread changes in the total of 0.043%, 0.108% and 0.269% for the [–7, 7], [–14, 14] and [–30, 30] windows, respectively. They are significant at the 5% significance level for the [–7, 7] window and at the 1% significance level for the [–14, 14] and [–30, 30] event windows. On average, the H-S portfolio shows positive spread changes across all event windows. Across all portfolios, the average and median spread changes over the [–30, 30] event window are positive and significant. However, these results may be due to the increasing trend in CDS spreads in the entire market during the crisis period.

On the other hand, Panel B during the pre-crisis period shows somewhat different patterns from Panel A. Spread changes are significant for the [–30, 30] event window. In contrast, these are insignificant for the [–7, 7] and [–14, 14] windows. Only the H-S portfolio shows significantly positive spread changes for the [−14, 14] window. Even for the [–30, 30] window, significantly positive spread changes were found only in the H-S and L-B portfolios among the four portfolios.

		[−7, 7]	*p*-values	[−14, 14]	*p*-values	[−30, 30]	*p*-values	# obs
Panel A: Full Sample period								
H	S	0.083**	0.014	0.217***	0.002	0.394***	0.002	77
		*0.000**	*0.051*	*0.015****	*0.000*	*0.067****	*<0.0001*	
	B	−0.008	0.681	0.003	0.899	0.050	0.107	70
		0.002	*0.209*	*0.000*	*0.229*	*0.007****	*0.009*	
	sub T	0.031*	0.090	0.094***	0.005	0.196***	0.001	147
		*0.000***	*0.045*	*0.002****	*0.001*	*0.019****	*<0.0001*	
L	S	0.058	0.130	0.062	0.297	0.206**	0.041	75
		0.000	*0.771*	*0.000*	*0.848*	*0.007***	*0.028*	
	B	0.002	0.857	0.030	0.185	0.110***	0.003	83
		0.000	*0.249*	*0.003**	*0.072*	*0.011****	*0.001*	
	sub T	0.021	0.169	0.041	0.102	0.143***	0.001	158
		0.000	*0.388*	*0.000*	*0.170*	*0.009****	*<0.0001*	
Total		0.026**	0.030	0.066***	0.001	0.167***	*<0.0001*	305
		*0.000***	*0.045*	*0.001****	*0.001*	*0.013****	*<0.0001*	
Panel B: the pre-crisis period								
H	S	0.034	0.120	0.084**	0.028	0.123***	0.002	29
		0.000	*0.226*	*0.000**	*0.092*	*0.061****	*0.002*	
	B	−0.007	0.571	−0.009	0.482	−0.007	0.702	36
		0.000	*0.761*	*0.000*	*0.935*	*0.002*	*0.915*	
	sub T	0.009	0.427	0.027	0.111	0.043**	0.024	65
		0.000	*0.374*	*0.000*	*0.324*	*0.004**	*0.055*	
L	S	−0.008	0.449	−0.040	0.292	−0.005	0.925	34
		−0.001	*0.118*	*0.000*	*0.541*	*0.007*	*0.666*	
	B	0.001	0.878	0.014	0.426	0.040*	0.097	31
		0.000	*0.545*	*0.000*	*0.597*	*0.007**	*0.081*	
	sub T	−0.003	0.694	−0.007	0.692	0.023	0.358	65
		0.000	*0.581*	*0.000*	*0.936*	*0.007*	*0.110*	
Total		0.003	0.650	0.009	0.477	0.032**	*0.041*	130
		0.000	*0.854*	*0.000*	*0.471*	*0.005****	*0.009*	
Panel C: the crisis period								
H	S	0.117**	0.033	0.304***	0.008	0.570***	0.007	48
		0.000	*0.103*	*0.035****	*0.001*	*0.126****	*<0.0001*	
	B	−0.008	0.800	0.012	0.741	0.097*	0.076	34
		0.008	*0.238*	*0.016*	*0.125*	*0.068****	*0.001*	
	sub T	0.047	0.125	0.144**	0.011	0.311***	0.002	82
		*0.001**	*0.070*	*0.020****	*0.001*	*0.072****	*<0.0001*	
L	S	0.120	0.102	0.157	0.149	0.402**	0.032	41
		0.000	*0.373*	*0.000*	*0.782*	*0.036***	*0.011*	
	B	0.003	0.884	0.041	0.257	0.156***	0.009	52
		0.000	*0.331*	*0.011*	*0.095*	*0.027****	*0.007*	
	sub T	0.039	0.143	0.077*	0.064	0.232***	0.001	93
		0.000	*0.151*	*0.001**	*0.088*	*0.029****	*0.000*	
Total		0.043**	0.033	0.108***	0.002	0.269***	*<0.0001*	175
		*0.000***	*0.021*	*0.009****	*0.000*	*0.042****	*<0.0001*	

Note(s): This table reports the cross-sectional average and median of CDS spread changes (unit: %) and their *p*-values. Each column of [−7, 7], [−14, 14] and [−30, 30] shows the statistics before and after one week, two weeks and one month of stock repurchase announcement, respectively. Median values and their *p*-values are italicized. Portfolios are classified as high repurchase ratio firms (H) and low repurchase ratio firms (L), then sub-classified as small-sized firms (S) and big-sized firms (B). The classification of firm size is based on the natural logarithm of the market value of equity on the announcement date. Repurchases with announced repurchase ratio larger than 7.49% are classified into the group of high repurchases, and others are regarded as low repurchases. The critical point of firm size is 15.62. The last column shows the number of repurchase cases (#obs) for each portfolio. Sub-total (Sub T) shows the statistics for H or L portfolio. Panels A, B and C show statistics over the full sample, during the pre-crisis and the crisis period

Table 3.
CDS spread changes

Therefore, when we observe the raw CDS spread changes, we find that small-sized firms that announced a higher percentage of shares show significantly positive changes during both normal and crisis periods. In addition, the reaction of the CDS market to buyback announcements is stronger over the mid-term horizon than the short-term horizon, regardless of the economic state.

3.2 Univariate analysis of abnormal CDS spread changes

Table 4 presents the cross-sectional mean and median of abnormal CDS spread changes around stock repurchase announcements for each portfolio. Abnormal CDS spreads are computed by subtracting the average CDS spreads for firms that do not repurchase during the full sample period and are within the same industry as the corresponding repurchase firm at the announcement date from the corresponding CDS spread on the announcing firm. The 305 cases that announced stock repurchase from April 2006 to April 2009 with having CDS spread are assigned to a portfolio among two firm sizes by two repurchase ratio portfolios. Sub-total (Sub T) shows the statistics for the H or L portfolio. Median values and their *p*-values are italicized. Panels A, B and C show statistics over the full sample, during the pre-crisis and during the crisis period [7].

The abnormal CDS spread changes in Panel A of Table 4 show surprisingly different patterns compared with the raw CDS spread changes in Panel A of Table 3. The main findings are as follows. First, averages (median) of abnormal CDS spread changes in total are −0.065%, −0.09% and −0.168% (−0.007%, −0.017% and −0.037%) for each [–7, 7], [–14, 14] and [–30, 30] windows. Both the averages and medians are highly significant at the 1% significance level across all windows. This result implies strong signaling effects on bondholders, which is inconsistent with Sun *et al.*'s (2018) conclusion that buyback plays a negligible information role for bondholders [8].

Second, the average and median of the abnormal spread changes for the L portfolio are highly significant across all event windows, in contrast to the raw spread changes for the L portfolio in Panel A of Table 3. In particular, we cannot find significant abnormal spread changes for the H-S and L-S portfolios. In contrast, the L-B portfolio shows substantially significant negative abnormal spread changes across all the event windows. Additionally, the H-B portfolio shows significantly negative abnormal spread changes for medium-term horizons, that is, [–14, 14] and [–30, 30] windows.

Panel C for the crisis period shows similar patterns to Panel A. Averages (medians) of abnormal CDS spread changes in total are −0.102%, −0.172% and −0.333% (−0.038%, −0.108%, and −0.195%) for each [–7, 7], [–14, 14] and [–30, 30] windows. Averages (medians) are substantially significant at the 1% significance level across all windows. Also, the average and median abnormal spread changes for the L-B portfolio are negative and significant across all event windows. Additionally, the H-B portfolio shows significantly negative abnormal spread changes for medium-term horizons. The results imply that when big-sized firms announce buyback during the crisis period, abnormal CDS spreads decrease over the medium-term horizons regardless of whether the repurchase ratio is high or low.

In contrast, Panel B for the pre-crisis period shows different patterns from Panel A. For all event windows, abnormal spread changes are insignificant and only H-S portfolios among the four portfolios show significantly positive spread changes. This result means that when small-sized firms announce a buyback of a higher percentage of shares during the normal period, abnormal CDS spreads increase.

Hence, when we observe abnormal CDS spread changes, the results provide evidence that the signaling effects of stock buybacks may dominate wealth transfer effects for big-sized firms during the crisis period. In contrast, bondholders' wealth may transfer to stockholders for small-sized firms during the normal period. These results are inconsistent with the

		[−7, 7]	*p*-values	[−14, 14]	*p*-values	[−30, 30]	*p*-values
Panel A: Full sample period							
H	S	−0.027	0.624	0.020	0.779	−0.020	0.857
		−0.012	*0.733*	*0.006*	*0.858*	*0.013*	*0.958*
	B	−0.028	0.217	−0.121***	0.003	−0.153**	0.011
		−0.001	*0.558*	*−0.036****	*0.000*	*−0.054****	*0.003*
	sub T	−0.028	0.284	−0.062*	0.095	−0.098*	0.090
		−0.003	*0.461*	*−0.020***	*0.011*	*−0.028***	*0.030*
L	S	−0.021	0.586	−0.065	0.420	−0.131	0.368
		−0.005	*0.823*	*0.020*	*0.798*	*−0.010*	*0.456*
	B	−0.135***	0.002	−0.140***	0.008	−0.278***	0.010
		*−0.022****	*0.000*	*−0.023****	*0.006*	*−0.048****	*0.001*
	sub T	−0.097***	0.002	−0.115***	0.009	−0.229***	0.008
		*−0.015****	*0.002*	*−0.015***	*0.021*	*−0.044****	*0.002*
Total		−0.065***	0.002	−0.090***	0.002	−0.168***	*0.002*
		*−0.007****	*0.007*	*−0.017****	*0.001*	*−0.037****	*0.000*
Panel B: the pre-crisis period							
H	S	0.087*	0.073	0.087*	0.082	0.119*	0.085
		*0.039***	*0.023*	*0.055***	*0.013*	*0.057**	*0.057*
	B	−0.016	0.488	−0.013	0.803	0.072	0.291
		0.000	*0.760*	*−0.006*	*0.364*	*0.015*	*0.507*
	sub T	0.023	0.326	0.025	0.509	0.089*	0.069
		0.011	*0.226*	*0.009*	*0.391*	*0.020**	*0.083*
L	S	0.033	0.274	0.058	0.391	0.129	0.266
		0.000	*0.951*	*0.023*	*0.313*	*0.033*	*0.278*
	B	−0.100	0.175	−0.012	0.884	−0.043	0.642
		0.000	*0.601*	*0.000*	*0.981*	*−0.018*	*0.418*
	sub T	−0.050	0.290	0.015	0.794	0.022	0.760
		0.000	*0.647*	*0.004*	*0.494*	*−0.012*	*0.862*
Total		−0.016	0.563	0.019	0.573	0.054	*0.226*
		0.006	*0.588*	*0.006*	*0.248*	*0.013*	*0.199*
Panel C: the crisis period							
H	S	−0.103	0.224	−0.024	0.831	−0.108	0.537
		−0.061	*0.103*	*−0.110*	*0.387*	*−0.158*	*0.329*
	B	−0.039	0.307	−0.211***	0.000	−0.343***	0.000
		−0.002	*0.537*	*−0.144****	*0.000*	*−0.236****	*<0.0001*
	sub T	−0.067	0.114	−0.128**	0.030	−0.239***	0.010
		*−0.028**	*0.094*	*−0.123****	*0.001*	*−0.190****	*0.000*
L	S	−0.069	0.316	−0.175	0.211	−0.373	0.151
		−0.010	*0.681*	*−0.042*	*0.254*	*−0.164**	*0.083*
	B	−0.160***	0.003	−0.227***	0.001	−0.433***	0.010
		*−0.080****	*<0.0001*	*−0.095****	*0.000*	*−0.201****	*0.000*
	sub T	−0.131***	0.002	−0.211***	0.001	−0.415***	0.003
		*−0.044****	*0.001*	*−0.093****	*0.000*	*−0.201****	*<0.0001*
Total		−0.102***	0.001	−0.172***	<0.0001	−0.333***	*0.000*
		*−0.038****	*0.000*	*−0.108****	*<0.0001*	*−0.195****	*<0.0001*

Note(s): Entries of table show the cross-sectional mean and median of abnormal CDS spread changes before and after stock repurchase announcements for each portfolio. Abnormal CDS spreads are computed by subtracting the average CDS spreads for firms that do not repurchase during the full sample period and are within the same industry as the corresponding repurchase firm at the announcement date from the corresponding CDS spread on the announcing firm. Median values and their *p*-values are italicized. The 305 cases that announced stock repurchase from April 2006 to April 2009 with having CDS spread around announcement date are assigned to a portfolio among two firm sizes by two repurchase ratio portfolios. Each column of [−7, 7], [−14, 14] and [−30, 30] shows the statistics for before and after one week, two weeks, and one month of stock repurchase announcement, respectively. Sub-total (Sub T) shows the statistics for H or L portfolio. Panels A, B, and C show statistics over the full sample, during the pre-crisis, and crisis period

Table 4.
Abnormal CDS spread changes

insignificant relationship between CDS spread changes and stock buybacks reported by Sun *et al.* (2021).

3.3 Regression analysis

The purpose of regression analysis is to examine whether our conclusions inferred from the univariate analysis are maintained after controlling for variables related to the properties of buyback firms and variables determining CDS spread changes. It is also to observe the direct relationship between cumulative abnormal stock returns and abnormal CDS spread changes. Thus, we perform regressions of abnormal CDS spread changes on the following variables:

3.3.1 Variables. Here, we describe the data and method to measure the explanatory regression variables.

(1) Cumulative abnormal stock returns *(CumRet[0, t])*

Cumulative abnormal stock returns from the repurchase announcement date to seven days (*CumRet[0, 7]*) and from the repurchase announcement date to 30 days (*CumRet[0, 30]*) are computed based on the market model utilizing the value-weighted returns of the CRSP index. We estimate the market model using the past one-year window as:

$$Ret_{i,t} = \beta_{0,i} + \beta_{1,i} \times Ret_{m,t} + \varepsilon_{i,t} \tag{3}$$

where $Ret_{i,t}$ is the daily stock return of firm i on day t, and $Ret_{m,t}$ is the daily value-weighted return of CRSP index m on day t. Next, abnormal stock returns (*ARet*) are computed as

$$ARet_{i,t} = Ret_{i,t} - \widehat{\beta}_{0,i} - \widehat{\beta_{1,i}} \times Ret_{m,t} \tag{4}$$

Finally, we calculate the cumulative abnormal stock returns over the t-day window (*CumRet[0, t]*) as:

$$CumRet[0,\ t]_i = \sum_{s=0}^{s=t} ARet_{i,s} \tag{5}$$

The sign of the coefficient of this variable can indicate whether wealth transfer effects or signaling effects exist for bondholders. In detail, it is well-known that cumulative abnormal stock return after a buyback announcement is generally positive. Thus, if the coefficient of *CumRet[0, t]* is significantly positive, the wealth transfer effect might dominate. However, if the coefficient of *CumRet[0, t]* is significantly negative, the signaling effects might be superior.

(2) Size of the firm (*lnME*)

Firm size is calculated using the natural logarithm of the market value of equity on the announcement date. Lakonishok and Vermaelen (1990) document that when firm size is smaller, stock prices react more to buyback announcements, and the signaling effects for future profit are strong. We expect a positive relationship between abnormal changes in CDS spreads and firm size.

(3) Repurchase ratio (*Ratio*)

The repurchase ratio is the percentage of shares announced for a repurchase. It is measured as the percentage of outstanding shares. Previous literature (Ikenberry *et al.*, 1995; Maxwell and Stephens, 2003) reports that stock performance after

buyback announcements is better for firms with higher repurchase ratios. We indirectly capture whether the performance of bonds, which are the underlying asset of CDS, is also better for firms with higher repurchase ratios.

(4) Leverage ratio *(LEV)*
According to Kim *et al.* (2017), the leverage ratio (*LEV*) is computed as the book value of debt divided by the sum of the book value of debt and the market value of equity, where the book value of debt is "long-term debt" plus "debt in current liabilities" plus "preferred stock." Many studies (Ericsson *et al.*, 2009; Doshi *et al.*, 2013; Galil *et al.*, 2014; Kim *et al.*, 2017) document that one of the main determinants of CDS spread changes is leverage ratio. Maxwell and Stephens (2003) mention that because buyback increases the leverage ratio, buyback announcements enhance financial risk more for firms with higher leverage ratios. This idea supports the wealth transfer hypothesis. On the other hand, according to the signaling hypothesis, in the case of firms with higher leverage ratios, the signaling effects of buyback announcements are stronger for bondholders and stockholders because of higher financial risk.

(5) Noninvestment grade dummy *(N-INV)*
Following Maxwell and Stephens (2003), the measure of risk to bondholders is calculated using an indicator variable representing that the rating of the firm's senior debt is the noninvestment grade at the time of the announcement. We collected rating data from Markit. We expect that the signaling effects are stronger for noninvestment grade firms because they are believed to have smaller reserves to buyback stocks; thus, the buybacks of noninvestment grade firms are more surprising.

(6) Log of CDS liquidity *(lnLiq)*
Previous literature (Tang and Yan, 2007; Bongaerts *et al.*, 2011; Tang and Yan, 2013) reports that CDS spread changes are not fully explained by structural variables such as leverage ratio and that the unexplained parts can be associated with CDS liquidity. Thus, we include CDS liquidity variables. The liquidity of the CDS contract for each firm is measured by the natural logarithm of the CDS market depth or the number of quote contributors for the corresponding five-year CDS spread at the announcement date. We collected CDS depth data from Markit. Firms with fewer quote contributors seem to have lower liquidity.

Table 5 presents summary statistics of independent variables of regression. This table presents the variables' cross-sectional statistics such as average, median and standard deviation. Panels A, B and C show statistics over the full sample period, during the pre-crisis and during the crisis period.

In Panel A of Table 5, the averages of *CumRet[0, 7]* and *CumRet[0, 30]* are positive, at 0.92 and 0.34%, respectively. The average *N-INV* is 0.23, which means that our sample includes many more investment grade firms than noninvestment grade firms.

Compared with Panel B, the firms in Panel C exhibit greater cumulative abnormal stock returns over the short-term horizon, lower cumulative abnormal stock returns over the mid-term horizon, greater leverage ratio, lower risk to bondholders and higher CDS liquidity. These summary statistics indicate that firms repurchased during the crisis period may have somewhat different characteristics from those repurchased during the normal period.

3.3.2 Regression results for two-week abnormal CDS spread changes. Table 6 presents cross-sectional regression results of two-week abnormal CDS spread changes. To control for possible time-fixed effects, we include year dummy variables. Panel A to C presents the

		CumRet[0, 7] %	CumRet[0, 30] %	lnME	RATIO	LEV	N-INV	lnLIQ
Panel A: full sample period								
All firms	Mean	0.93	0.34	16.13	8.79	0.23	0.23	1.90
	Median	0.45	0.23	16.16	7.23	0.18	0.00	2.20
	Stdev	4.52	8.13	1.29	8.76	0.18	0.42	0.70
	Max	35.36	42.01	19.77	100.00	0.95	1.00	2.84
	Min	−12.44	−36.01	12.39	0.40	0.00	0.00	0.69
High ratio firms	Mean	1.07	1.28	16.06	13.96	0.24	0.27	1.85
	Median	0.67	1.48	16.12	11.64	0.17	0.00	2.13
	Stdev	4.46	7.90	1.37	10.59	0.20	0.44	0.72
	Max	17.75	17.75	19.33	100.00	0.95	1.00	2.84
	Min	−12.44	−29.73	12.39	7.52	0.00	0.00	0.69
Low ratio firms	Mean	0.81	−0.46	16.20	4.32	0.22	0.20	1.95
	Median	0.32	−0.39	16.22	4.44	0.19	0.00	2.23
	Stdev	4.58	8.25	1.22	1.82	0.16	0.40	0.69
	Max	35.36	42.01	19.77	7.49	0.87	1.00	2.82
	Min	−8.61	−36.01	12.86	0.40	0.00	0.00	0.69
Panel B: the pre-crisis period								
All firms	Mean	0.35	0.90	16.14	8.67	0.22	0.25	1.89
	Median	0.01	0.60	16.12	7.24	0.17	0.00	2.14
	Stdev	4.55	7.37	1.16	8.41	0.18	0.43	0.69
	Max	35.36	42.01	19.27	80.26	0.91	1.00	2.77
	Min	−9.24	−14.28	13.39	0.40	0.00	0.00	0.69
High ratio firms	Mean	0.06	1.26	16.13	13.58	0.23	0.27	1.77
	Median	0.30	1.89	16.17	10.85	0.17	0.00	1.86
	Stdev	3.56	6.89	1.28	10.12	0.21	0.45	0.73
	Max	7.92	17.75	19.27	80.26	0.91	1.00	2.77
	Min	−9.24	−14.28	13.39	7.53	0.00	0.00	0.69
Low ratio firms	Mean	0.61	0.58	16.15	4.33	0.22	0.23	1.99
	Median	−0.19	−0.60	16.09	4.51	0.18	0.00	2.27
	Stdev	5.29	7.81	1.06	1.74	0.15	0.43	0.64
	Max	35.36	42.01	18.94	7.42	0.67	1.00	2.74
	Min	−6.14	−13.70	14.02	0.40	0.02	0.00	0.69
Panel C: the crisis period								
All firms	Mean	1.36	−0.07	16.13	8.88	0.23	0.22	1.92
	Median	0.86	0.19	16.22	7.20	0.19	0.00	2.23
	Stdev	4.46	8.64	1.39	9.04	0.18	0.41	0.72
	Max	19.87	26.39	19.77	100.00	0.95	1.00	2.84
	Min	−12.44	−36.01	12.39	0.91	0.00	0.00	0.69
High ratio firms	Mean	1.83	1.29	16.00	14.24	0.24	0.27	1.92
	Median	1.74	0.90	16.08	12.09	0.18	0.00	2.25
	Stdev	4.92	8.64	1.44	10.99	0.19	0.44	0.71
	Max	17.75	17.48	19.33	100.00	0.95	1.00	2.84
	Min	−12.44	−29.73	12.39	7.52	0.00	0.00	0.69
Low ratio firms	Mean	0.96	−1.22	16.23	4.31	0.23	0.17	1.92
	Median	0.57	0.10	16.33	4.43	0.19	0.00	2.22
	St.dev	4.01	8.52	1.34	1.90	0.18	0.38	0.73
	Max	19.87	26.39	19.77	7.49	0.87	1.00	2.82
	Min	−8.61	−36.01	12.86	0.91	0.00	0.00	0.69

Note(s): This table presents the cross-sectional statistics of regression variables. Cumulative abnormal stock returns from the repurchase announcement date to seven days (CumRet[0, 7]) and those from the repurchase announcement date to 30 days (CumRet[0, 30]) are computed based on market model utilizing value-weighted returns of CRSP index. The size of the firm (lnME) is the natural logarithm of market value of equity at the announcement date. The repurchase ratio (RATIO) is the percentage of shares repurchased. The leverage ratio (LEV) is computed as book value of debt divided by the sum of book value of debt and market value of equity, where book value of debt is "long-term debt" plus "debt in current liabilities" plus "preferred stock". The measure of the risk to bondholders (N-INV) is calculated using an indicator variable representing that the senior debt rating of the firm at the time of the announcement is noninvestment grade. The liquidity of CDS contract (CDS_LIQ) for each firm is measured by the natural logarithm of CDS market depth – the number of quote contributors – at the announcement date

Table 5.
Summary statistics of regression variables

	Model 1 All firms	Model 2 High ratio firms	Model 3 Low ratio firms
Panel A: full sample period			
C	−0.660***	−0.480	−0.778
	(0.000)	(0.316)	(0.157)
CumRet[0, 7]	−0.244	−0.150	−0.130
	(0.591)	(0.79)	(0.857)
lnME	0.000	−0.020	0.011
	(0.403)	(0.438)	(0.726)
RATIO	0.003	0.001	−0.001
	(0.245)	(0.578)	(0.944)
LEV	−0.118	−0.050	−0.252
	(0.333)	(0.708)	(0.320)
N-INV	0.176***	0.112*	0.227**
	(0.001)	(0.098)	(0.020)
lnLIQ	0.006	0.025	0.016
	(0.863)	(0.548)	(0.784)
Year dummies	YES	YES	YES
adj. R^2	6.9%	2.9%	5.2%
Panel B: the pre-crisis period			
C	0.152	0.525	0.583
	(0.194)	(0.206)	(0.489)
CumRet[0, 7]	1.027*	0.614	1.325
	(0.092)	(0.388)	(0.173)
lnME	0.000	−0.031	−0.029
	(0.656)	(0.239)	(0.567)
RATIO	0.003	−0.002	0.035
	(0.323)	(0.463)	(0.102)
LEV	−0.008	0.048	−0.266
	(0.961)	(0.673)	(0.522)
N-INV	0.093	0.088	0.075
	(0.18)	(0.161)	(0.567)
lnLIQ	−0.081*	0.013	−0.091
	(0.068)	(0.77)	(0.34)
Year dummies	YES	YES	YES
adj. R^2	7.7%	3.4%	8.0%
Panel C: the crisis period			
C	−0.786***	−0.463	−0.872
	(0.000)	(0.531)	(0.193)
CumRet[0, 7]	−1.360**	−0.364	−2.375**
	(0.041)	(0.663)	(0.044)
lnME	0.000	−0.027	0.008
	(0.550)	(0.529)	(0.848)
RATIO	0.003	0.005	−0.013
	(0.350)	(0.194)	(0.395)
LEV	−0.201	−0.294	−0.150
	(0.271)	(0.28)	(0.643)
N-INV	0.231***	0.157	0.286*
	(0.007)	(0.178)	(0.059)
lnLIQ	0.079*	0.058	0.105
	(0.08)	(0.382)	(0.156)
Year dummies	YES	YES	YES
adj. R^2	9.1%	−1.0%	12.4%

Note(s): Panel A to C presents the cross-sectional regression coefficients and *p*-values (parenthesis) of two-week abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing firm's own characteristics over the full sample period, and during the pre-crisis and crisis period, respectively. To control for possible time fixed effects, we include year dummy variables. Regression model 1 is the results for all sample firms, model 2 is for firms with high repurchase ratios and model 3 is for firms with low repurchase ratios

Table 6.
Cross-sectional regression results of two-week abnormal CDS spread changes

cross-sectional regression coefficients and *p*-values (parenthesis) of two-week abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing the firm's characteristics. Panels A, B and C show the results over the full sample period, pre-crisis, and crisis period, respectively. Regression model 1 is the results for all sample firms, model 2 is for firms with high repurchase ratios and model 3 is for firms with low repurchase ratios.

In Panel A of Table 6, the cumulative abnormal stock return coefficients are not statistically significant across all models. However, the cumulative abnormal stock returns coefficient is positive and marginally significant in model 1 in Panel B. This result suggests that bondholders' wealth may transfer to stockholders over a short-term horizon during the normal period.

In contrast, the cumulative abnormal stock returns coefficient is negative and significant at the 5% level in models 1 and 3 in Panel C. This is consistent with our finding that the average and median abnormal spread changes for the total, sub-total of L and L-B portfolios are negative and substantially significant over the short-term window in Panel C of Table 4. Hence, we can conclude that buyback announcements improve the short-term performance of stocks and bonds for firms with a lower share ratio during the crisis period.

Additionally, in Panels A and C of Table 6, the coefficients of the noninvestment grade dummy are significantly positive at the 1% significance level in model 1. The results indicate that bondholders' wealth decreases more due to buyback events for firms with lower credit quality. This finding is consistent with Maxwell and Stephens' (2003) finding that wealth transfer is superior to the signal related to the buyback of firms with noninvestment grade bonds. In addition, in Panel C of Table 6, the coefficient of the log of CDS liquidity is significantly positive in models 1 and 3. This means that during the crisis period, for firms with higher CDS liquidity, the gain of bondholders decreases more. The reason might be that CDSs with higher liquidity react more sensitively because of concerns regarding wealth transfer due to buyback events.

3.3.3 Regression results for two-month abnormal CDS spread changes. Table 7 presents cross-sectional regression results of two-month abnormal CDS spread changes. To control for possible time-fixed effects, we include year dummy variables. Panel A to C presents the cross-sectional regression coefficients and *p*-values (parenthesis) of two-month abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing firm's characteristics. Panels A, B and C show the results over the full sample period, pre-crisis and crisis period, respectively. Regression model 1 is the results for all sample firms, model 2 is for firms with high repurchase ratios and model 3 is for firms with low repurchase ratios.

In Panel A of Table 7, similar to the results in Panel A of Table 6, the cumulative abnormal stock returns coefficients are not statistically significant across all models. However, in Panel B, the coefficients of cumulative abnormal stock returns are positive and significant at the 1% significance level in model 1 and at the 5% significance level in model 2. Considering that the H-S portfolio shows significantly positive spread changes in Panel B of Table 4, the results may come from small-sized firms. This can be interpreted as the gains of bondholders transferring to stockholders for small-sized firms that announced a higher ratio of shares during the normal period.

Meanwhile, in Panel C of Table 7, we find somewhat different patterns from those in Panel C of Table 6. The coefficient of cumulative abnormal stock returns is significantly negative in model 2 [9] but not in model 3. This is consistent with our finding that the average and median abnormal spread changes for the H-B portfolio are negative and substantially significant over the medium-term horizons in Panel C of Table 4. Thus, it can be inferred that the result comes from big-sized firms and that the medium-term

	Model 1 All firms	Model 2 High ratio firms	Model 3 Low ratio firms
Panel A: full sample period			
C	−1.253	0.486	−1.715
	(0.157)	(0.633)	(0.253)
CumRet[0, 30]	0.015	−1.036	0.958
	(0.982)	(0.134)	(0.388)
lnME	0.003	−0.049	0.019
	(0.955)	(0.372)	(0.827)
RATIO	0.002	−0.003	0.000
	(0.691)	(0.528)	(0.999)
LEV	−0.121	0.030	−0.588
	(0.710)	(0.914)	(0.404)
N-INV	0.261*	0.175	0.286
	(0.076)	(0.219)	(0.285)
lnLIQ	0.135	0.055	0.286*
	(0.125)	(0.538)	(0.07)
Year dummies	YES	YES	YES
adj. R^2	4.4%	3.7%	4.4%
Panel B: the pre-crisis period			
C	0.533	0.289	0.803
	(0.469)	(0.727)	(0.569)
CumRet[0, 30]	1.600***	1.498**	1.481
	(0.010)	(0.04)	(0.185)
lnME	−0.017	−0.009	−0.027
	(0.705)	(0.86)	(0.75)
RATIO	0.005	0.004	0.016
	(0.377)	(0.422)	(0.637)
LEV	−0.108	−0.159	0.078
	(0.677)	(0.482)	(0.915)
N-INV	−0.004	0.026	−0.048
	(0.972)	(0.838)	(0.822)
lnLIQ	−0.080	−0.027	−0.151
	(0.298)	(0.763)	(0.322)
Year dummies	YES	YES	YES
adj. R^2	3.6%	−1.2%	−1.7%
Panel C: the crisis period			
C	−1.439	0.507	−2.011
	(0.296)	(0.742)	(0.37)
CumRet[0, 30]	−1.008	−2.308**	0.368
	(0.311)	(0.027)	(0.83)
lnME	−0.006	−0.064	0.014
	(0.940)	(0.479)	(0.913)
RATIO	0.003	−0.004	−0.003
	(0.770)	(0.656)	(0.952)
LEV	−0.276	−0.024	−0.878
	(0.633)	(0.966)	(0.414)
N-INV	0.435*	0.328	0.509
	(0.091)	(0.174)	(0.316)
lnLIQ	0.308**	0.126	0.526**
	(0.031)	(0.37)	(0.038)
Year dummies	YES	YES	YES
adj. R^2	2.1%	2.0%	1.5%

Note(s): Panel A to C presents the cross-sectional regression coefficients and *p*-values (parenthesis) of two-month abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing firm's own characteristics over the full sample period, and during the pre-crisis and crisis period, respectively. To control for possible time fixed effects, we include year dummy variables. Regression model 1 is the results for all sample firms, model 2 is for firms with high repurchase ratios and model 3 is for firms with low repurchase ratios

Table 7.
Cross-sectional regression results of two-month abnormal CDS spread changes

performances of stocks and bonds are improved for big-sized firms that announced a higher ratio of shares during the crisis period. Therefore, taken together with Tables 4–7, we conclude that during the crisis period, the positive signaling effect is overwhelming for stocks and bonds over the short-term horizon for big-sized firms that announced to buyback lower repurchase ratios and over the medium-term horizon for big-sized firms announced to buyback higher repurchase ratios.

Similar to models 1 and 3 in Table 6 for the short-term horizon, significantly positive coefficients of log of CDS liquidity and noninvestment grade dummy are maintained even over the medium-term horizon during the crisis period.

Only time-fixed effects are controlled in Table 7, but industry-fixed effects can also be concerned. Hence, we perform a robustness test by including both year and industry dummy variables to control for possible time- and industry-fixed effects. Table 8 presents the robustness test results for two-month abnormal CDS spread changes.

In Panel B of Table 8, the coefficients of cumulative abnormal stock returns are positive and significant at the 1% significance level in model 1 and at the 5% significance level in model 2. In Panel C of Table 8, the coefficient of cumulative abnormal stock returns is negative and significant in model 2. These results confirm that our main findings are valid even after controlling for both time- and industry-fixed effects.

4. Conclusion

This study examines whether the effects of stock buyback announcements on CDS spread changes depend on macroeconomic conditions utilizing US data. Using a dataset of approximately 300 buyback cases for US firms, we analyze the reaction of CDS spreads to buyback announcements across the pre-crisis and crisis periods, focusing on the recent global crisis.

Furthermore, we examine the reactions across the short-term and mid-term window because the CDS market may reflect the information content inefficiently and thus, react slowly. We also perform a portfolio analysis to investigate whether the reactions of CDS spreads to stock buyback announcements are affected by firm characteristics. Finally, we conduct regressions to investigate the direct relationship between cumulative abnormal stock returns and abnormal CDS spread changes.

We find that abnormal CDS spreads increase for small-sized firms announced to repurchase a higher share ratio during the normal period. In contrast, abnormal CDS spreads decrease for big-sized firms during crises. In particular, they decrease over the short-term horizon for big-sized firms targeting a lower repurchase ratio and over the medium-term horizon for big-sized firms targeting a higher repurchase ratio.

Our results prove that the wealth transfer effect dominates the signaling effect for small-sized firms that announced a higher ratio of shares during the normal period and that the positive signaling effect is stronger for bondholders of big-sized firms during the crisis period. Our results are contrary to the findings of Sun *et al.* (2021) of the insignificant abnormal CDS spread changes around buyback announcements, even during economic recessions. Hence, our results suggest policy implications that managers should consider macroeconomic conditions when making stock buyback decisions.

Overall, our findings provide the following economic meanings regarding buybacks and CDS spreads. Bliss *et al.* (2015) argue that during the period 2008–2009, firms reduced payouts because they tend to save cash as a substitute form of external funding. Contrary to the general trend of payout reduction during the credit crisis, some firms aggressively announce stock buybacks. Such behavior can represent a manager's strong confidence, and thus the market would react positively. In particular, buybacks by big-sized firms with relatively more stable cash retention can give positive signals to both stock and CDS markets.

	Model 1 All firms	Model 2 High ratio firms	Model 3 Low ratio firms
Panel A: full sample period			
C	−0.448	0.242	−0.304
	(0.642)	(0.846)	(0.849)
CumRet[0, 30]	−0.089	−0.975	1.217
	(0.892)	(0.176)	(0.269)
lnME	−0.020	−0.037	−0.045
	(0.704)	(0.520)	(0.611)
RATIO	0.004	−0.006	−0.003
	(0.475)	(0.306)	(0.943)
LEV	−0.228	0.418	−1.096
	(0.525)	(0.220)	(0.132)
N-INV	0.316*	0.150	0.479
	(0.051)	(0.354)	(0.102)
lnLIQ	0.166*	0.062	0.419**
	(0.065)	(0.505)	(0.010)
Year and Industry dummies	YES	YES	YES
adj. R^2	5.7%	2.5%	10.2%
Panel B: the pre-crisis period			
C	1.139	−0.088	1.679
	(0.153)	(0.909)	(0.321)
CumRet[0, 30]	1.635***	1.599**	1.789
	(0.009)	(0.015)	(0.131)
lnME	−0.011	−0.009	−0.010
	(0.816)	(0.839)	(0.917)
RATIO	0.008	0.004	0.040
	(0.146)	(0.361)	(0.322)
LEV	−0.222	−0.056	−0.430
	(0.465)	(0.825)	(0.602)
N-INV	0.028	0.086	0.055
	(0.833)	(0.496)	(0.837)
lnLIQ	−0.102	0.040	−0.163
	(0.19)	(0.608)	(0.348)
Year and Industry dummies	YES	YES	YES
adj. R^2	5.8%	31.7%	−3.8%
Panel C: the crisis period			
C	−0.465	−0.677	−0.674
	(0.76)	(0.705)	(0.776)
CumRet[0, 30]	−1.372	−2.477**	0.633
	(0.173)	(0.029)	(0.709)
lnME	−0.050	−0.029	−0.067
	(0.554)	(0.778)	(0.613)
RATIO	0.006	−0.006	−0.011
	(0.505)	(0.542)	(0.835)
LEV	−0.390	0.491	−1.444
	(0.521)	(0.437)	(0.187)
N-INV	0.532*	0.343	0.919*
	(0.051)	(0.197)	(0.098)
lnLIQ	0.364**	0.163	0.687***
	(0.012)	(0.271)	(0.008)
Year and Industry dummies	YES	YES	YES
adj. R^2	6.3%	3.6%	11.0%

Note(s): Panel A to C presents the cross-sectional regression coefficients and *p*-values (parenthesis) of two-month abnormal CDS spread changes on cumulative abnormal stock returns and additional variables related to repurchasing firm's own characteristics over the full sample period, and during the pre-crisis and crisis period, respectively. To control for possible time- and industry-fixed effects, we include year and industry dummy variables. Regression model 1 is the results for all sample firms, model 2 is for firms with high repurchase ratios and model 3 is for firms with low repurchase ratios

Table 8.
Robustness test results

On the other hand, buyback announcements by small-sized firms may not have significant effects on CDS spreads because small-sized firms with relatively less stable cash retention can be exposed more to the increasing cost shock of external funding.

According to Lakonishok and Vermaelen (1990), stock price responses more positively to buyback announcements by smaller size of firms. However, our results indicate that during normal period, positive reactions in stock market may be accompanied by negative reactions in CDS market (an increase in abnormal CDS spreads) especially for smaller size of firms targeted at higher repurchase ratios. It can be interpreted as that the stock price may be boosted by the transfer of bondholder's wealth when small-sized firm announces the excessive buyback.

Our findings also are related to the delayed reactions in CDS market. Hilscher *et al.* (2015) conclude that information generally flows from the equity market to the CDS market. This is since informed traders actively trade in the equity market, whereas liquidity-based trading takes place in the CDS market. We find that there are more significant responses of CDS spread to buyback announcements in the mid-term horizon than the short-term horizon, which is consistent with the findings of Hilscher *et al.* (2015).

Notes

1. Sun *et al.* (2021) state why CDS spread is the more proper measure for firms' credit risk as follows. First, the bond price is affected by noncredit risk factors such as funding costs and liquidity, but the CDS spread mainly affected by credit risk factors. Second, the CDS market has higher liquidity than the bond market, and thus CDS market reflects more rapidly credit risk changes. Third, CDS contracts are standardized, while bonds have heterogeneous features because some of them include embedded options, guarantees, and so on.
2. Bliss *et al.* (2015) provide evidence supporting the view that the credit crisis increased the cost of external financing, leading many firms to turn to payout reductions as a substitute form of financing.
3. Markit provides the credit rating as the average of S&P and Moody's ratings.
4. Lee *et al.* (2020) calculate the abnormal buy-and-hold stock returns by subtracting average buy-and-hold stock returns on the industry, size and B/M-matched firms from the corresponding buy-and-hold stock returns on repurchase firms. Considering Lee *et al.* (2020)'s methodology, we subtract the average CDS spreads on industry-matched firms from the corresponding CDS spreads on buyback firms to generate abnormal CDS spreads.
5. In Table 3, the total number of repurchase cases is 305. This is less than 343 in Panel B of Table 2 since we exclude the cases in which no CDS spread exists over the interval $[-t, -1]$ or no CDS spread over the interval $[0, t]$ or no CDS spread over both intervals.
6. This study is the early version of Sun *et al.* (2021). Appendix AI.9 in Sun *et al.* (2021) shows no significant CDS spread changes over the 15-day trading day announcement window for a subsample of industrial firms and a subsample of financial firms. In contrast, Sun *et al.* (2018) show that the significant CDS spread changes over the same window for total sample firms.
7. Coro *et al.* (2013) define the global crisis period as April 2007 to July 2009. Considering their definition, we change the starting point of crisis period into April 2007 and reproduce Table 4. We confirm that the results for abnormal CDS spread changes are not much changed even after adjusting the definition of crisis period.
8. Sun *et al.* (2018) and Sun *et al.* (2021) do not directly generate the abnormal CDS spread changes. Instead, they perform regression of CDS spread changes on dummy variable of buyback while including firms that do not have buyback announcement six months before or after a buyback event as the control group. They find that the coefficient of the buyback dummy variable is not significant.
9. In Panel C of Table 5, the average of *CumRet[0, 30]* is −0.07%. However, the average of this variable for the H portfolio is 1.29%.

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