# A Online Appendix — Further Robustness Tests

This Online Appendix contains results from robustness tests that are not included in the main body of the paper.

## A.1 Time-varying holdings by insurers

In our baseline specifications, we include the fraction of all insurers' holdings of the amount outstanding in 2006 ($\text{InsFrac2006}_b$) interacted with time as a control variable because insurers were potentially different from other securities lenders. As a robustness check, we replaced $\text{InsFrac2006}_b$ with the fraction measured at the end of each year $y$ ($\text{InsFrac}_{bt}^{y}$). Tables 10 and 11 show the results and are analogous to Tables 2 and 3 in the main text. The results are similar to our baseline results. This is not surprising because insurers' holdings vary more across bonds than across years. The between-variation in $InsFrac_{bt}^{y}$ measured by the standard deviation across our sample of 18,000 corporate bonds is 0.25. By contrast, the within-variation of the same sample is only 0.07.

## A.2 Additional results using restricted sample

Tables 12, 14, and 13 report analogous results to those in Tables 5, 6, and 7 of the main text using the restricted sample of bonds that are held by insurers at the end of 2010.

## A.3 Price dispersion unconditional dynamics

We repeat the analysis in section 5.2 excluding the 32 bond-level control variables interacted with time. With only quarterly dummy variables in addition to the bond and month fixed effects, we obtain results that are *unconditional* on any bond characteristics. We used the same three subsamples that we analyzed in Figure 3. The first subsample contains those corporate bonds that are held by insurance companies excluding AIG. The second subsample contains those corporate bonds that are held predominantly by AIG (defined as AIG holdings greater than 40 percent). Figure 11 plots the coefficients on the quarterly dummy variables. The blue diamonds, green squares, and red circles are the point estimates, respectively, from the regressions using bonds predominantly held by AIG, using bonds that are held by insurers other than AIG, and using bonds not held by any insurer. The horizontal lines drawn through each symbol are the 95 percent

confidence intervals. Figure 11a shows that the price dispersion increased the most for bonds predominantly held by AIG. The coefficients labelled "post2009Q1" in Figures 11b and 11c show that, after an adjustment period, most of the overall increase in price dispersion stems from an increase in price dispersion in client-dealer trades. That is, although the increase in price dispersion in dealer-dealer trades remains positive and significant after the initial impact of the shock, it is far smaller than the increase in price dispersion in client-dealer trades.

**Table 10: Effect of AIG's collapse on corporate bond market liquidity—robustness tests.** This table reports tests of the difference-in-differences strategy described in Sections 3 and 4 of the main text. The tests are the same as those reported in Table 2 replacing $\text{InsFrac2006}_b$ with the fraction of bond $b$ held at the end of each year $y$ by insurers with bond lending programs ($\text{InsFrac}_{by}$). In columns 1 and 2, the dependent variable is the liquidity of bond $b$ in month $t$, measured using the average realized spread. In columns 3 and 4, the dependent variables are the fraction of the amount outstanding that is available to lend and the fraction that is actually lent, respectively. The dependent variable in column 5 is the rebate rate on the cash collateral reinvestment income. And the dependent variable in column 6 is the ratio of the volume traded to the amount outstanding. The main explanatory variables are the fraction of bond $b$ held at the end of 2006 by AIG ($\text{AIGFrac2006}_b$) interacted with year fixed effects. In addition to $\text{InsFrac}_b$ interacted with month fixed effects, all tests include month and bond fixed effects and bond characteristics interacted with time fixed effects. The bond characteristics are credit rating, amount outstanding, issue amount, bond type, residual maturity, time since issuance, and a dummy variable for whether the bond is held by any insurer. Standard errors two-way clustered by bond and month are reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

| Dependent variable | (1) Liquidity | (2) Liquidity | (3) Availability | (4) Lending | (5) Rebate rate | (6) Volume |
|---|---|---|---|---|---|---|
| $\text{AIGFrac2006}_b \times 2008$ | -0.0711** | -0.0675** | -0.0113* | -0.00641 | 0.0645 | 0.000672 |
| | (0.0319) | (0.0317) | (0.00653) | (0.00690) | (0.0503) | (0.000707) |
| $\text{AIGFrac2006}_b \times 2009$ | -0.159*** | -0.156*** | -0.0766*** | -0.0530*** | -0.264*** | -0.00195** |
| | (0.0378) | (0.0379) | (0.00927) | (0.00470) | (0.0681) | (0.000801) |
| $\text{AIGFrac2006}_b \times 2010$ | -0.104*** | -0.102*** | -0.0615*** | -0.0541*** | -0.235*** | -0.00149 |
| | (0.0347) | (0.0347) | (0.0111) | (0.00529) | (0.0510) | (0.000924) |
| Bond and Month FE | Y | Y | Y | Y | Y | Y |
| Bond characteristics × time | Y | Y | Y | Y | Y | Y |
| $\text{InsFrac}_{by}$ × Month | N | Y | Y | Y | Y | Y |
| Observations | 150,451 | 150,451 | 150,451 | 150,451 | 127,356 | 150,449 |
| $R^2$ | 0.283 | 0.511 | 0.963 | 0.706 | 0.987 | 0.604 |

Source: Authors' calculations based on data from TRACE, Markit Securities Finance, NAIC statutory filings, and Mergent FISD.

**Table 11: Effect of AIG's collapse on corporate bond market liquidity—robustness tests.** This table reports tests of the difference-in-differences strategy described in Sections 3 and 4 of the main text. The tests are the same as those reported in Table 2 replacing $\text{InsFrac2006}_b$ with the fraction of bond $b$ held at the end of each year $y$ by insurers with bond lending programs ($\text{InsFrac}_{by}$). In column 1, the dependent variable is the liquidity of bond $b$ in month $t$, measured using the average realized spread. In columns 3 and 4, the dependent variables are the fraction of the amount outstanding that is available to lend and the fraction that is actually lent, respectively. The dependent variable in column 5 is the rebate rate on the cash collateral reinvestment income. And the dependent variable in column 6 is the ratio of the volume traded to the amount outstanding. The main explanatory variables are the fraction of bond $b$ held at the end of year $y$ by AIG ($\text{AIGFrac}_{by}$) interacted with year fixed effects. In addition to $\text{InsFrac}_b$ interacted with month fixed effects, all tests include month and bond fixed effects and bond characteristics interacted with time fixed effects. The bond characteristics are credit rating, amount outstanding, issue amount, bond type, residual maturity, time since issuance, and a dummy variable for whether the bond is held by any insurer. Standard errors reported in parentheses are two-way clustered by bond and month. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

| Dependent variable | (1) Liquidity | (2) Availability | (3) Lending | (4) Rebate rate | (5) Volume |
|---|---|---|---|---|---|
| $\text{AIGFrac2006}_b \times 2008$ | -0.0386 | -0.00288 | -0.0127 | 0.113** | -0.000667 |
| | (0.0459) | (0.00830) | (0.00797) | (0.0470) | (0.000866) |
| $\text{AIGFrac2006}_b \times 2009$ | -0.127*** | -0.0781*** | -0.0584*** | -0.230*** | -0.00212** |
| | (0.0474) | (0.0117) | (0.00597) | (0.0806) | (0.000931) |
| $\text{AIGFrac2006}_b \times 2010$ | -0.0763* | -0.0673*** | -0.0609*** | -0.184*** | -0.00191* |
| | (0.0422) | (0.0137) | (0.00654) | (0.0447) | (0.00102) |
| Bond and Month FE | Y | Y | Y | Y | Y |
| Bond characteristics × time | Y | Y | Y | Y | Y |
| $\text{InsFrac}_{by}$ × Month | Y | Y | Y | Y | Y |
| Observations | 83,928 | 83,928 | 83,928 | 75,659 | 83,928 |
| $R^2$ | 0.518 | 0.969 | 0.694 | 0.990 | 0.577 |

Source: Authors' calculations based on data from TRACE, Markit Securities Finance, NAIC statutory filings, and Mergent FISD.

**Table 12: Effect of AIG's collapse on corporate bond market liquidity—robustness tests.** This table reports tests of the difference-in-differences strategy described in Sections 3 and 4 of the main text. The tests are the same as those reported in Table 3 switching the control variable calculation from 2006 to 2007. In column 1, the dependent variable is the liquidity of bond $b$ in month $t$, measured using the negative average realized spread. In columns 3 and 4, the dependent variables are the fraction of the amount outstanding that is available to lend and the fraction that is actually lent, respectively. The dependent variable in column 5 is the rebate rate on the cash collateral reinvestment income. And the dependent variable in column 6 is the ratio of the volume traded to the amount outstanding. The main explanatory variables are the fraction of bond $b$ held in 2007 by AIG ($\text{AIGFrac2007}_b$) interacted with year fixed effects. All tests include month and bond fixed effects, the fraction of bond $b$ held in 2007 by insurers with bond lending programs ($\text{InsFrac2007}_b$) interacted with month fixed effects, and bond characteristics interacted with time fixed effects. The bond characteristics are credit rating, amount outstanding, issue amount, bond type, residual maturity, time since issuance, and a dummy variable for whether the bond is held by any insurer. Standard errors reported in parentheses are two-way clustered by bond and month. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

| Dependent variable | (1) Liquidity | (2) Availability | (3) Lending | (4) Rebate rate | (5) Volume |
|---|---|---|---|---|---|
| $\text{AIGFrac2007}_b \times 2008$ | -0.0998** | -0.0157** | -0.00713 | 0.0820 | -0.00135 |
| | (0.0464) | (0.00776) | (0.00728) | (0.0578) | (0.00105) |
| $\text{AIGFrac2007}_b \times 2009$ | -0.142*** | -0.0814*** | -0.0485*** | -0.159** | -0.00133 |
| | (0.0389) | (0.0105) | (0.00528) | (0.0665) | (0.000998) |
| $\text{AIGFrac2007}_b \times 2010$ | -0.101** | -0.0641*** | -0.0500*** | -0.152*** | -0.00140 |
| | (0.0403) | (0.0121) | (0.00564) | (0.0486) | (0.00107) |
| Bond and Month FE | Y | Y | Y | Y | Y |
| Bond characteristics × time | Y | Y | Y | Y | Y |
| $\text{InsFrac2007}_b \times$ Month | Y | Y | Y | Y | Y |
| Observations | 103,906 | 103,906 | 103,906 | 93,762 | 103,906 |
| $R^2$ | 0.523 | 0.964 | 0.682 | 0.990 | 0.575 |

Source: Authors' calculations based on data from TRACE, Markit Securities Finance, NAIC statutory filings, and Mergent FISD.

**Table 13: Effect of AIG's collapse on corporate bond market liquidity—robustness tests.** This table reports tests of the difference-in-differences strategy described in Sections 3 and 4 of the main text. The tests are the same as those reported in Table 3 including as a control variable the fraction of each bond $b$ held by AIG at the end of each year $y$ ($\text{AIGFrac}_{by}$). In column 1, the dependent variable is the liquidity of bond $b$ in month $t$, measured using the negative average realized spread. In columns 3 and 4, the dependent variables are the fraction of the amount outstanding that is available to lend and the fraction that is actually lent, respectively. The dependent variable in column 5 is the rebate rate on the cash collateral reinvestment income. And the dependent variable in column 6 is the ratio of the volume traded to the amount outstanding. The main explanatory variables are the fraction of bond $b$ held at the end of year $y$ by AIG ($\text{AIGFrac}_{by}$) interacted with year fixed effects. All tests include month and bond fixed effects, the fraction of bond $b$ held at the end of year $y$ by insurers with bond lending programs ($\text{InsFrac2007}_{by}$) interacted with month fixed effects, and bond characteristics interacted with time fixed effects. The bond characteristics are credit rating, amount outstanding, issue amount, bond type, residual maturity, time since issuance, and a dummy variable for whether the bond is held by any insurer. Standard errors two-way clustered by bond and month are reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

| Dependent variable | (1) Liquidity | (2) Availability | (3) Lending | (4) Rebate rate | (5) Volume |
|---|---|---|---|---|---|
| $\text{AIGFrac}_{by}$ | -0.141*** | -0.0160 | -0.00550 | -0.0295 | -0.000101 |
| | (0.0391) | (0.00963) | (0.00454) | (0.0516) | (0.000790) |
| $\text{AIGFrac2006}_b \times 2008$ | -0.0654 | -0.0170* | -0.0159** | 0.0833* | -0.000714 |
| | (0.0479) | (0.00940) | (0.00782) | (0.0464) | (0.000862) |
| $\text{AIGFrac2006}_b \times 2009$ | -0.163*** | -0.0842*** | -0.0591*** | -0.234*** | -0.00219** |
| | (0.0479) | (0.0130) | (0.00603) | (0.0761) | (0.000920) |
| $\text{AIGFrac2006}_b \times 2010$ | -0.152*** | -0.0740*** | -0.0628*** | -0.197*** | -0.00199* |
| | (0.0503) | (0.0160) | (0.00674) | (0.0500) | (0.00109) |
| Bond and Month FE | Y | Y | Y | Y | Y |
| Bond characteristics × time | Y | Y | Y | Y | Y |
| $\text{InsFrac2006}_b \times$ Month | Y | Y | Y | Y | Y |
| Observations | 83,631 | 83,631 | 83,631 | 75,422 | 83,631 |
| $R^2$ | 0.518 | 0.968 | 0.694 | 0.991 | 0.578 |

Source: Authors' calculations based on data from TRACE, Markit Securities Finance, NAIC statutory filings, and Mergent FISD.

**Table 14: Effect of AIG's collapse on corporate bond market liquidity—robustness tests.** This table reports tests of the difference-in-differences strategy described in Sections 3 and 4 of the main text. The tests are the same as those reported in Table 3 switching the control variable calculation from 2006 to the end of each year. In column 1, the dependent variable is the liquidity of bond $b$ in month $t$, measured using the negative average realized spread. In columns 3 and 4, the dependent variables are the fraction of the amount outstanding that is available to lend and the fraction that is actually lent, respectively. The dependent variable in column 5 is the rebate rate on the cash collateral reinvestment income. And the dependent variable in column 6 is the ratio of the volume traded to the amount outstanding. The main explanatory variables are the fraction of bond $b$ held at the end of year $y$ by AIG ($\text{AIGFrac}_{by}$) interacted with year fixed effects. All tests include month and bond fixed effects, the fraction of bond $b$ held at the end of year $y$ by insurers with bond lending programs ($\text{InsFrac}_{by}$) interacted with month fixed effects, and bond characteristics interacted with time fixed effects. The bond characteristics are credit rating, amount outstanding, issue amount, bond type, residual maturity, time since issuance, and a dummy variable for whether the bond is held by any insurer. Standard errors two-way clustered by bond and month are reported in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

| Dependent variable | (1) Liquidity | (2) Available | (3) Lending | (4) Rebate rate | (5) Volume |
|---|---|---|---|---|---|
| $\text{AIGFrac}_{by}$ | 0.0239 | 0.0334*** | 0.0348*** | 0.0618 | 0.000636 |
| | (0.0358) | (0.00951) | (0.00516) | (0.0519) | (0.000921) |
| $\text{AIGFrac}_{by} \times 2008$ | -0.0847* | -0.00625 | -0.00720 | 0.112** | -0.000555 |
| | (0.0466) | (0.00795) | (0.00689) | (0.0539) | (0.000889) |
| $\text{AIGFrac}_{by} \times 2009$ | -0.203*** | -0.0831*** | -0.0473*** | -0.123*** | -0.000397 |
| | (0.0399) | (0.00993) | (0.00513) | (0.0364) | (0.000812) |
| $\text{AIGFrac}_{by} \times 2010$ | -0.142** | -0.0757*** | -0.0624*** | -0.305*** | -0.000106 |
| | (0.0586) | (0.0141) | (0.00643) | (0.0567) | (0.00100) |
| Bond and Month FE | Y | Y | Y | Y | Y |
| Bond characteristics × time | Y | Y | Y | Y | Y |
| $\text{InsFrac}_{by}$ × Month | Y | Y | Y | Y | Y |
| Observations | 103,474 | 103,474 | 103,474 | 93,409 | 103,474 |
| $R^2$ | 0.524 | 0.966 | 0.683 | 0.990 | 0.576 |

Source: Authors' calculations based on data from TRACE, Markit Securities Finance, NAIC statutory filings, and Mergent FISD.

**Figure 11: The dynamics of price dispersion at a quarterly frequency.** The three panels of this figure show coefficient plots from regressions using as dependent variables the price dispersion among all trades, interdealer trades, and dealer-client trades, respectively. These panels show the unconditional change in corporate bond securities lending because these specifications contain only the quarterly dummy variables to reveal the dynamics. The data are divided into three mutually exclusive subsamples. The first subsample contains those corporate bonds that are held by insurance companies excluding AIG. The second subsample contains those corporate bonds that are held predominantly by AIG (defined as AIG holdings greater than 40 percent). Price dispersion is the monthly average of the daily difference between high and low bond prices. The point estimates from the regressions using the first, second, and third subsamples are denoted by blue diamonds, green squares, and red circles, respectively. The horizontal lines drawn through each symbol are the 95 percent confidence intervals. Source: NAIC Statutory Filings and TRACE.