# Internet Appendix: Convertible Debt Arbitrage Crashes Revisited

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This Internet Appendix provides supplemental information to "Convertible Debt Arbitrage Crashes Revisited." Section A reports estimates of the expected volume regression we use to select non-convertible debt propensity matches. Section B reports additional analysis that are not tabulated in the manuscript related to price discounts. Section C reports tests not tabulated in the manuscript related to effective spreads. Section D reports the estimates for the first-order auto-regression model used to estimate abnormal returns. Section E provides unreported results for riskless principal trades. Section F examines the trading behavior of large institutional investors by analyzing position data reported in 13-F filings.

# A Identification of Non-Convertible Debt Propensity Matches

For each convertible bond, we select the five non-convertible bonds with the closest mean expected volume over the pre-Fall 2008 period. Expected volume is calculated as the fitted value from this ordinary least squares equation:

(1)

$$ln\left(Vol_{jt}\right) = \alpha + \beta_1 ln\left(Vol_{i,t-1}\right) + \beta_2 ln\left(MktVol_t\right) + \beta_3 ln\left(MktVol_{t-1}\right) + \theta X_{jt} + \gamma_j = \epsilon_{jt}$$

where $Vol_{jt}$ is the sum of buy ($Vol_{jt}^{A}$) and sell ($Vol_{jt}^{B}$) volume for bond $j$ at week $t$, $MktVol_t$ is aggregate weekly market volume (the sum of $Vol_{jt}$ across all bonds at week $t$), $\gamma_j$ is a bond fixed effect, and $\epsilon_{jt}$ is the residual. $X_{it}$ is a set of additional control variables that includes bond rating, bond maturity, the Treasury bond spread, the credit spread, and the first lag of Zero Days. The estimates for this model are reported below in Appendix Table IA.1.

# B Price Discount Robustness Regressions

## B.1 Price discount robust regressions, Part I

This subsection reports results from three different robustness checks that evaluate three different subsamples. Panel A of Table IA.2 reports results for the subsample that excludes retail trades (transactions with notional amount less than $100,000). Panel B reports results for the subsample that only includes institutional-sized trades (transactions with notional amount greater than $1,000,000). Panel C reports results for the subsample that includes non-retail equity-like convertible debt (stock price/conversion price $> 0.65$) trades. For each subsample, we present results for the *Full Sample* and the *Expected Volume Propensity-Matched* subsample. To further evaluate the robustness of the results in the main paper, we report results for a the Fall of 2008 (Models (1) and (3)) and the twenty-day period in September 2008 when the short sale ban (*Short Sale Ban*) of financial securities was in effect (Models (2) and (4)).

We examine the *Short Sale Ban* because it covers the period of extreme uncertainty that immediately followed the collapse of Lehman Brothers. Due to concerns about continued systemic risk, the SEC implemented a short sale ban on financial stocks in September 2008 that lasted 20 days starting on September 18, 2008 and ending on October 8, 2008. This action made it increasingly difficult for convertible bond hedge funds to maintain arbitrage strategies because it impeded their ability to maintain delta neutral positions. When coupled with the retraction of rehypothecation lending, hedge funds may have sold even more convertible debt. Since it was unclear how long the ban would last, a hedge fund faced a dilemma. It could accept higher levels of basis risk in its outstanding positions or it could liquidate some or all of its holdings. Liquidation would require the hedge fund to sell convertible debt and use part of the proceeds to purchase the shares needed to unwind the associated short positions.

Alternatively, hedge funds could have reacted to the short-selling restrictions by creating "synthetic" short positions with derivatives. Such a strategy would not have been feasible for the vast majority of convertible bonds because issuers tend to be smaller firms that do not have traded options. Other strategies for hedging equity risk such as the use of bespoke over-the-counter option trades would have been equally unlikely because they would have been prohibitively expensive.[1]

The dependent variable is the price discount, which is calculated as the difference between the theoretical model price and the volume-weighted bid-ask midpoint, scaled by the volume-weighted bid-ask midpoint. The theoretical price is estimated using the Tsiveriotis Fernandes (1998) model. Each regression includes the following control variables: bond rating, bond maturity, the Treasury bond spread, the sum of buy ($Vol_{jt}^{A}$) and sell ($Vol_{jt}^{B}$) volume for bond $j$ on day $t$, and bond delta. The four models reflect estimates that use different time periods and different samples, i.e.,

- Model (1): Full sample, $PERIOD$ = Fall of 2008
- Model (2): Full sample, $PERIOD$ = Short sale ban
- Model (3): Propensity-matched sample, $PERIOD$ = Fall of 2008
- Model (4): Propensity-matched sample, $PERIOD$ = Short sale ban

Panels A, B, and C report results for different samples.

- *Panel A*. Panel A of Table IA.2 reports results for the subsample that excludes retail trades. The full sample is comprised of 686,627 transaction days for 14,082 debt issuers. Relative to the full sample used in the main paper, the non-retail subsample is reduced by 52% (1-686,627/1,427,214). The propensity-matched non-retail subsample is comprised of 34,879 transaction days for 910 debt issuers.

  The results are qualitatively similar to the full sample results reported in Table 7 of the main paper. Relative to the estimates for the Fall of 2008 reported in Table 7, Models (1) and (3) report that the incremental price

[1] Grundy et al. (2012) show that options trading during the ban is expensive.

discount associated with convertible debt in the Fall of 2008 is 26% and 40% higher when retail trades are excluded. The point estimates during the short sale ban higher are even higher. Models (2) and (4) indicate that the price discounts were 3.286% and 3.169%, respectively. This indicates that price discounts were higher when uncertainty about the financial system also was at its peak.

- *Panel B.* Panel B reports results for the subsample that only includes institutional-sized trades. The "full" sample is comprised of 303,903 transaction days for 7,785 debt issuers. The propensity-matched subsample of institutional trades is comprised of 18,500 transaction days for 576 debt issuers. The results in Panel B are qualitatively similar to the subsample that excludes retail trades in panel A of Table IA.2.

- *Panel C.* Panel C reports results for the subsample that includes non-retail equity-like convertible debt trades. The "full" sample is comprised is comprised of 685,177 transaction days for 14,065 debt issuers. The propensity-matched equity-like subsample has 33,429 transaction days for 893 debt issuers. The results in Panel C are qualitatively similar to to the results reported in Panels A and B. Regardless of the filters used to identify different subsamples, the point estimates for the models that cover the Fall of 2008 (Models (1) and (3)) are quantitatively similar to the results reported in the main paper.

The combined results in Panels A, B, and C of Table IA.2 indicate that our main results are robust to alternative sample selection criteria that has been used in the literature.

## B.2 Price discount robustness regressions - Part II

As an additional robustness check, we estimate price discounts using a return-based factor model that is similar to Harris and Piwowar (2006) and Edwards et al. (2007). We assume that the price of a trade is equal to its unobserved fundamental valuation net of a fee that the dealer charges to execute the trade (Harris et al. (2006) and Edwards et al. (2007)). This fee reflects a number of factors that include price discounts, search costs, and adverse selection costs. We decompose the realized continuously-compounded bond return ($R_{jt}$) into the return to its fundamental value ($R_{jt}^V$) and a residual return ($PD_{jt}$). The residual return captures the price discount (or premium) associated with the trades on day $t$, i.e.,

$$R_{jt} = R_{jt}^V + PD_{jt} \tag{2}$$

where $R_{jt} = ln\left(\frac{AvgPrcVol_{jt}}{AvgPrcVol_{jt-1}}\right)$ and the average volume-weighted price, $AvgPrcVol_{jt} = (A_{jt}^{VOL} + B_{jt}^{VOL})/2$. Since $AvgPrcVol$ is effectively a midpoint price, it allows us to abstract from adverse selection and search costs and isolate the price discount.

We separately estimate fundamental valuation models for straight debt and convertible debt. The model for non-convertible debt ($R_{jt}^{DV}$) includes an adjustment for the time drift between trades, an average bond index return, differences between index returns for long- and short-term bonds and for high and low credit risk bonds, and an equity market risk premium.

$$\begin{aligned} R_{jt}^{DV} - ZeroDays\,(DailyDriftRate) &= \beta_1 AvgIndexRet_t \\ &+ \beta_2 DurationDiff_t + \beta_3 CreditDiff_t + \beta_4 MktRP_t + \omega_j^{DV} + \epsilon_{jt}^{DV} \end{aligned} \tag{3}$$

where $\omega_j^{DV}$ is a firm fixed effect. The convertible debt valuation model includes the same factors as $R_{jt}^{DV}$ plus estimates of delta ($\Delta_{jt}$) and gamma ($\gamma_{jt}$) of convertible bond $j$ on trade date $t$.[2] That is,

$$\begin{aligned} R_{jt}^{CV} - ZeroDays\,(DailyDriftRate) &= \beta_1 AvgIndexRet_t \\ &+ \beta_2 DurationDiff_t + \beta_3 CreditDiff_t + \beta_4 MktRP_t \\ &+ \beta_5 \Delta_{jt} + \beta_6 \gamma_j + \omega_j + \epsilon_{jt}^{CV}. \end{aligned} \tag{4}$$

where $\omega_j^{CV}$ is a firm fixed effect.

Table IA.3 reports the estimates of the fundamental value factor models in equations (3) and (4).[3] The estimate of the price discounts are the residuals $\epsilon_{jt}^{DV}$ and $\epsilon_{jt}^{CV}$ from the associated valuation models in equations 3 and 4.

Table IA.4 reports the results of the second stage price discount regressions where the residuals from the factor model regressions are the dependent variable:

$$\begin{aligned} PD_{jt}^{EHP} = \alpha &+ \beta^{PER} iPERIOD_t + \beta^{CON} iCON_t + \beta^{PERCON} iPERIOD_t \times iCON_j \\ &+ \beta^{PERFIN} iPERIOD_t \times iFIN_j + \beta^{PERCONFIN} iPERIOD_t \times iCON_j \times iFIN_j \\ &+ \theta X_{jt} + \epsilon_{jt}. \end{aligned} \tag{5}$$

where $PD_{jt}^{EHP}$ is $-\epsilon_{jt}^{DV}$ for non-convertible debt and $-\epsilon_{jt}^{CV}$ for convertible debt, $iPERIOD$ denotes either the Fall of 2008 or the short sale ban period, and $X_{jt}$ is a set of additional control variables that control for time series variation in trading costs that are unrelated to bond type (*effective spread, bond rating, bond maturity, the Treasury bond spread, the sum of buy* ($Vol_{jt}^{A}$) *and sell* ($Vol_{jt}^{B}$) *volume for bond $j$ on day $t$, and zero days*). We multiply the residuals from the first-stage regressions by -1 to facilitate comparison to our other price discount regressions.

Models (1) and (2) report results for the Fall of 2008; Models (3) and (4) report results that estimate the incremental price discount for the period in which the short sale ban was in effect. Models (1) and (3) examine the incremental price discounts associated with all convertible debt. Since the short sale ban only applied to financial firms, we examine a separate specification in Models (2) and (4) that also estimates the incremental price discount for convertible bonds issued by financial firms.

Panels A, B, and C report results for different samples.

[2] $\Delta$ and $\gamma$ are calculated using the Tsiveriotis-Fernandes (1998) model.

[3] As a robustness check, we estimate bond-specific versions of $R_{jt}^{SDV}$ and $R_{jt}^{CV}$ and obtain qualitatively similar results.

- *Panel A* reports results for the full sample results. The sample is comprised of 75,389 transaction day observations from 2,093 issuers.

- *Panel B* reports results for the subsample that includes firms that have issued convertible debt. The sample includes convertible debt and any non-convertible debt these firms may have issued. The sample is comprised of 75,389 transaction day observations from 112 debt issuers.

- *Panel C* reports results for the subsample of financial firms that were subject to the short sale ban. The sample is comprised of 163,978 transaction day observations from 128 financial firms.

The combined results in Panels A, B, and C of Table IA.4 are qualitatively similar but economically smaller than the full sample results reported in Table 8. We also show that the results are similar for the periods covered by the Fall of 2008 and the period in which the short sale ban was in effect (Short Sale Ban).

# C Effective Spread Robustness Regressions

This section reports results from three different analyses that evaluate the robustness of our effective spread results. The volume-weighted bid-ask spread is the dependent variable. We employ the same sample selection criteria we use in Section B.1 to evaluate price discounts.

Each regression includes the following control variables: bond rating, bond maturity, the Treasury bond spread, the sum of buy ($Vol^A_{jt}$) and sell ($Vol^B_{jt}$) volume for bond $j$ on day $t$, and bond delta. The four models reflect the same time periods and subsamples descibed in Section B.1:

- Model (1): Full sample, $PERIOD$ = Fall of 2008

- Model (2): Full sample, $PERIOD$ = Short sale ban

- Model (3): Propensity-matched sample, $PERIOD$ = Fall of 2008

- Model (4): Propensity-matched sample, $PERIOD$ = Short sale ban

Panel A of Table IA.5 reports results for the subsample that excludes retail trades (transactions with notional amount less than $100,000). The full sample is comprised of 687,278 transaction days for 2,160 debt issuers. Relative to the full sample used in the main paper, the non-retail subsample is reduced by 52% (1-687,278/1,428,301). The propensity-matched non-retail subsample is comprised of 35,405 transaction days for 503 debt issuers.

The results are qualitatively similar to the full sample results reported in Table 8. Relative to the estimates for the Fall of 2008 reported in Table 8, Models (1) and (3) report that the incremental effective spread associated with convertible debt in the Fall of 2008 incrementally declines from an economically small reduction of 1.2

b.p.s to 3.0 b.p.s when retail trades are excluded. The point estimates during the short sale ban reflect a reduction of only 0.5 b.p.s.

Panel B reports results for the subsample that only includes institutional-sized trades (transactions with notional amount greater than $1,000,000). The "full" sample is comprised of 304,319 transaction days for 2,046 debt issuers. The propensity-matched subsample of institutional trades is comprised of 17,541 transaction days for 503 debt issuers. The results in Panel B are qualitatively similar to the subsample that excludes retail trades in panel A of Table IA.5.

Panel C reports results for the subsample that includes equity-like convertible debt (stock price/conversion price > 0.65) and also excludes retail trades. The "full" sample is comprised is comprised of 685,456 transaction days for 2,151 debt issuers. The propensity-matched equity-like subsample has 33,583 transaction days for 488 debt issuers. The results in Panel C are qualitatively similar to to the results reported in Panels A and B. The biggest differences is that the Fall of 2008 point estimates (Models (1) and (3)) are quantitatively similar to the results reported in the main paper.

Taking the results in Panels A, B, and C together, we conclude that the results in Table IA.5 are robust to alternative sample selection criteria that has been used in the literature.

# D Abnormal Trading Volume

This subsection provides an outline of the estimation methodology used to estimate abnormal trading volume. We use two approaches: a seasonal random walk model and a first-order vector auto-regression. The steps are as follows:

1. Sort convertible debt into two groups based on moneyness ($ITM$ and OTM).
2. Identify a propensity-matched sample of non-convertible debt by selecting the five non-convertible bonds with the closest mean *expected* weekly trading volume over the pre-Fall 2008 period.
    - Expected volume is the fitted value from an ordinary least squares regression of bond-specific weekly trading volume. The mean expected weekly volume is the average of the bond-specific fitted values over the pre-Fall 2008 period.[4]
3. The SRW and VAR models are estimated by first aggregating bond-specific weekly trading volume for each of the four bond categories: $ITM$ convertibles, $OTM$ convertibles, $ITM$ propensity-matched non-convertibles, and $OTM$ propensity-matched non-convertibles.
    - For example, trading volume for $ITM$ convertible debt is the sum of

[4]The dependent variable is log weekly volume, and the independent variables include weekly means of bond maturity, Treasury bond spread, credit spread, bond rating, lagged zero trading days, weekly aggregate log market trading volume and its lagged value, and lag weekly log volume. The model estimates are reported in the online Appendix Table IA.1. The unreported model R-squared is 0.074. We also identify propensity matches using the mean of actual weekly trading volume over the pre-Fall of 2008 period and obtain similar results in our subsequent estimations.

trading volume for all $ITM$ convertible bonds for that week. The convertible bonds can change groupings as the price of the underlying stock changes from week to week. To maintain comparability, if a convertible bond changes its moneyness grouping, the associated propensity-matched non-convertible bond also reflects the same grouping change.

4. ***SRW* model**: Abnormal volume is calculated as the percentage change in aggregate weekly volume relative to the same week from the prior year.
5. ***VAR* model**: Using aggregate weekly trading volume for each bond grouping, we estimate the $VAR$ model using data from the pre-Fall 2008 period. Table IA.6 reports the estimates for the first-order auto-regression model.[5] We estimate abnormal trading volume for the Fall of 2008 by first rolling forward the $VAR$ model using the estimated coefficients and aggregate weekly trading volume to estimate a "fitted value." Abnormal trading volume is calculated as the $VAR$ "residual" scaled by the corresponding "fitted value."

# E Riskless Principal Trading Robustness Regressions

This section considers whether the bonds issued by financial firms that were subject to the SEC's short sale ban were priced differently during the Fall of 2008. We report additional regression results for our riskless principal trading analysis. Following the main paper, we control for the endogenous effect on realized markups with a 2-stage endogenous switching model (Goldstein and Hotchkiss (2020)). In the first stage we estimate a probit model that regresses the type of trade (a dummy variable indicating whether the roundtrip trade was pre-arranged or executed in 15 minutes or less) on a set of contol variables $X_{jt}$. This allows us to make a Heckman-style correction that controls for the endogenous choice to select a riskless principal trade or have the dealer take the bond into inventory in our second-stage markup regressions..

For the first-stage probit model, Internet Appendix Table 7 extends the specification in Table 10 in the main paper so that we can examine the incremental impact on financial firms that were subject to the short sale ban during the Fall of 2008.

$$\begin{aligned} Trade\_Type_{kt} = &\ \alpha + \beta^{Fall} iF2008_t + \beta^{CON} iCON_t + \beta^{FIN} iFIN_j \\ &+ \beta^{CONFIN} iCON_j \times iFIN_j + \beta^{FallCON} iF2008_t \times iCON_j \\ &+ \beta^{FallFIN} iF2008_t \times iFIN_j + \beta^{FallCONFIN} iF2008_t \times iCON_j \times iFIN_j \\ &+ \theta X_{jt} + \epsilon_{jt}. \end{aligned} \tag{6}$$

where $X_{jt}$ is comprised of the following variables: $iF2008$ equals 1 during the Fall of 2008 and zero otherwise, $iCON$ takes the value 1 if bond $j$ is convertible and zero otherwise, $iFIN$ equals 1 if bond issuer $j$ was subject to the short sale ban, $iBigTrade$ equals 1 if the roundtrip trade was in the top 10% of dollar-volume

[5]The Akaike information criterion, Schwarz's Bayesian information criterion, and the Hannan and Quinn information criterion lag order selection statistics indicate that the optimal lag length is 1.

trades that day, the lagged volume-weighted effective spread, and the number of transactions the dealer undertakes between opening and closing an estimated position ($RoundtripLength$).

The second stage then includes the predicted value for the trade type from the first stage, along with the same regressors:

$$
\begin{aligned}
Realized\_Markup_{kt,type} = \alpha &+ \beta^{Fall} iF2008_t + \beta^{CON} iCON_t + \beta^{FIN} iFIN_j \\
&+ \beta^{CONFIN} iCON_j \times iFIN_j + \beta^{FallCON} iF2008_t \times iCON_j \\
&+ \beta^{FallFIN} iF2008_t \times iFIN_j + \beta^{FallCONFIN} iF2008_t \times iCON_j \times iFIN_j \\
&+ \theta X_{jt} + \epsilon_{jt}. \qquad (7)
\end{aligned}
$$

Model (1) reports the first stage results, and Models (2) and (3) present the results of the second stage, conditional on trade type. Model (1) shows that large roundtrip trades are more likely to be held in inventory rather than pre-arranged. Consistent with our main paper results, the significant and negative coefficient on $iF2008$ in Model (1) indicates that during Fall 2018, all bond trades became more likely to be pre-arranged. Consistent with the main paper results, the incremental tendency for non-financial bonds to be pre-arranged did not significantly change: the coefficient for the interaction between the $iF2008$ and$iCON$ is statistically insignificant ($\beta^{iF2008CON}$=-0.032, z-stat=-1.430).

Relative to other convertible debt, convertible debt issued by financial firms is less likely to be pre-arranged ($\beta^{FIN} + \beta^{CONFIN} = 0.049$, $\chi^2 = 3.55$, $pval = 0.0594$) and this tendency increased during the Fall of 2008 ($\beta^{FIN} + \beta^{CONFIN} + \beta^{FallFIN} + \beta^{FallCONFIN} = 0.245$, $\chi^2 = 10.44$, $pval = 0.0012$).

Model (1) also indicates that non-convertible bonds issued by financial firms are more likely to be pre-arranged ($\beta^{FIN} = -0.1630$) and that the effect is more pronounced during the Fall of 2008 ($\beta^{Fall} + \beta^{FallFIN} = -0.049$, $\chi^2 = 36.54$, $pval = 0.000$).

Models (2) and (3) respectively show that dealers seem to prefer pre-arranged trades during the Fall of 2008 and charge customers lower markups: the coefficient for $iF2008$ is significant and negative in Model (2), but large, positive, and significant in Model (3). Outside the Fall of 2008, convertible bonds issued by non-financial firms have an insignificant markup relative to other bonds when they are pre-arranged ($\beta^{CON} = -0.006, zstat = -1.00$), but a higher markup when they are held in inventory ($\beta^{CON} = 0.040, zstat = 2.360$).

Conditional on the decision to pre-arrange the trade with a customer, convertible bonds issued by non-financial firms are charged higher markups during the Fall of 2008 ($\beta^{CON} + \beta^{Fall} + \beta^{FallCON} = 0.055$,$\chi^2 = 544.73$, $pval = 0.000$). By contrast, convertible bonds issued by financial firms during the Fall of 2008 are not charged higher markups ($\beta^{CON} + \beta^{FIN} + \beta CONFIN + \beta^{Fall} + \beta^{FallCON} + \beta^{FallCONFIN} = 0.012$, $\chi^2 = 0.06$, $pval = 0.8040$).

The results for trades that are taken into inventory are qualitatively similar. Conditional on the decision to take the trade into inventory, convertible bonds issued by non-financial firms are charged higher markups during the Fall of 2008 ($\beta^{CON}$ +

$\beta^{Fall} + \beta^{FallCON} = 0.366$,$\chi^2 = 62.88$, $pval = 0.000$). By contrast, convertible bonds issued by financial firms during the Fall of 2008 are not charged higher markups ($\beta^{CON} + \beta^{FIN} + \beta CONFIN + \beta^{Fall} + \beta^{FallCON} + \beta^{FallCONFIN} = 0.129$, $\chi^2 = 0.77$, $pval = 0.3806$).

# F Who Is Buying Convertible Debt in the Fall of 2008?

If hedge funds were able to successfully liquidate convertible bond portfolios and avoid fire sale pricing, it is interesting to consider the buyers. Given the closed nature of the convertible debt eco-system, we predict that in normal markets, the likely buyers of convertible debt are other institutional investors who are not forced to liquidate. By contrast, if there is insufficient capacity among non-distressed hedge funds to provide the necessary liquidity, convertible debt will need to be purchased by other investors. We capture this idea in the following hypothesis:

**Hypothesis 1 (IAH1):** *Given that the market for convertible debt is populated by a relatively small number of institutional investors, non-distressed hedge funds cannot absorb convertible bond hedge fund liquidations during periods of extreme illiquidity such as that experienced in the Fall of 2008.*

Our final analysis examines the net trading activity of large institutional investors that hold convertible debt during and around the Fall of 2008. Institutional investment managers with investment discretion over more than $100 million in long positions are required to report *all* long positions quarterly. 13-F filings include convertible debt, corporate debt, warrants, and options. Since commercial versions of this data only include *equity* positions, they are not suitable for our analysis of convertible debt.

## F.1 13F data process

We examine institutional investor holdings by parsing the raw 13F reports of all institutions. Before 2013, these filings were not standardized to a machine-readable XML format, and many were submitted as raw text files. The main challenges of parsing this data have been described elsewhere, for example, in Backus, Conlon, and Sinkinson (2019). Essentially, their approach in reconstructing the 13F holdings data was to construct a Perl script that detects CUSIPs and records the number of shares reportedly held for each CUSIP filing. Then using CRSP data on common equity prices, they construct the portfolio of equity positions. Our approach is similar but targets convertible positions.

The code initially scrapes all filings (including holdings reports and amendments to reports), collects header data (e.g., reporting and filing dates, listed managers, and the name and CIK of the reporting entity), and automatically scrapes XML-formatted filings. Then, in the second stage, the code walks through each text-based filing, captures the portfolio holdings table, and stores it (with the listed table headers) in a separate raw text file. In the third stage, the code looks at each individual holdings table. It attempts to guess its format using the table header data, the position of CUSIPs in the table, and the presence of substrings indicating a portfolio value, number of shares, or any of the other standard fields listed in Internet Appendix Table 8.

Our code then presents the algorithmically-formatted table along with a menu of custom commands that permit the user to alter the spacing of columns, re-arrange headers, re-align text within the table, combine table data rows that stretch over multiple lines into a single, wide row of data, and other tools to help conform the data to a fixed-width, machine-readable table. Because different 13F filers will often adhere to their own style of formatting each quarter, our code stores the user commands that helped parse one table of portfolio data and attempts to re-apply those commands on the next 13F report submitted by that same filer (denoted by their CIK).[6] For the data used in this study, we examined filing dates from 2007Q1 to 20009Q4, comprising 134,925 filings, which produced 8,700,243 individual positions across 3,717 different unique filers.[7]

## F.2 Analysis of 13F data

Panel A of Internet Appendix Table 9 reports summary statistics for market values for the period 2007Q3 to 2009Q3. The aggregate market value of all convertible debt holdings is $15,356 million in 2007Q2. It drops to $8,207 million by 2009Q3, which is partly attributable to declining market valuations and a 22% reduction in the number of active positions, which decrease from 2,266 in 20007Q2 to 1,766 in 2009Q3. The largest combined declines in market value (-15.3%) and the number of positions (-12.1%) occurred in 2008Q3.

Panel B of Table 9 reports the relative frequency of net purchases, net sales, and net holds by quarter. The average ratio of the number of net buys to net sells is 1.84. This relatively high rate of purchases to sales likely reflects the need to purchase new securities as asset managers receive additional investor funds and reinvest proceeds from maturing securities. Table 9 also indicates that net buys, sells, and holds respectively reflect about 40.89%, 22.37%, and 36.74% of changes in the number of bonds held by large institutional investors.

Table 10 reports the aggregate amount of convertible bond purchases (Panel A) and sales (Panel B). Panel A indicates that in 2007Q3, institutional investors purchased and sold $1.5 billion of convertible debt. The net difference between purchases

[6]With the assistance of our algorithm a person is thereby able to process as many as 2,000 13F reports in 8 hours, or one report every 15 seconds, on average.

[7]To conform our methodology to Backus, Conlon, and Sinkinson (2019)'s dataset, we compare filings processed by their methodology with ours. We find that our methodology is able to add an additional 825,559 positions (totaling $2.65 Trillion per quarter), corresponding to 10.5% more observations and 9.8% more positions by market value. Looking at just convertible bond holdings, we find 40,040 additional positions, totaling $110 Billion per quarter. A total of 1,246 individual filers (CIKs) report convertible bond positions during our sample period. Among these funds, their convertible bond holdings comprise an average 2.66% of their portfolio, with 25th and 75th percentile portfolio weights of 0.41% and 11.6%.

and sales only is \$1.2 million, indicating that the ecosystem inhabited by large institutional investors was largely balanced prior to the Fall of 2008. Consistent with **H1**, Table 10 provides evidence of net selling activity during the Fall of 2008. In periods 2008Q3 and 2008Q4, there were aggregate net sales of \$448.1 million (\$154.5 + \$293.6) which represents net sales of \$2,268.9 million (\$1,076.4+\$1,192.5) and net purchases of \$1,820.7 million (\$921.9+\$898.8). Over the last two quarters of 2008, 832 positions reflected net buying, and 1,016 positions reflected net selling, indicating that a significant amount of capital flowed out of this market segment. These findings are consistent with **H1**. However, increased selling activity was persistent and extended through the third quarter of 2009, suggesting that institutional investors continued to unwind convertible bond positions as the Financial Crisis continued.[8]

# References


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[8] The U.S. National Bureau of Economic Research determined that the "'Great Recession" began in December 2007 and ended in June 2009.

IA.1: Weekly volume regression model.

The table reports an ordinary least squares regression of the natural log of weekly volume. The control variables are the the first lag of the dependent variable, the natural log of market volume, the first lag of the natural log of market volume, bond maturity, the Treasury spread, the credit spread, the first lag of Zero Days, and the bond rating. Robust standard errors are clustered by bond.

| Variable definition | Coeff. | t-stat | p-val |
|---|---|---|---|
| Lag of Ln(Volume) | 0.216 | 97.79 | 0.000 |
| Ln(Market Volume) | 0.845 | 89.20 | 0.000 |
| Lag of Ln(Market Volume) | -0.201 | -18.29 | 0.000 |
| Bond maturity | -0.026 | -2.00 | 0.046 |
| Treasury bond spread | -6.830 | -7.32 | 0.000 |
| Credit spread | -0.001 | -0.26 | 0.793 |
| Lag Zero Days | -0.002 | -4.04 | 0.000 |
| Bond rating | 0.067 | 10.07 | 0.000 |
| Observations | 513,029 | | |
| R-squared | 0.074 | | |
| Number of bond cusips | 15,543 | | |
| Bond FE | YES | | |

IA.2: Price Discount Regressions: Robustness Subsamples.

The table reports price discount regressions that includes bond fixed effects. The volume-weighted bid-ask spread is the dependent variable. Each regression includes the same set of control variables reported in Table 2. For Models (1) and (3), $PERIOD$ is the Fall of 2008 is the $PERIOD$; Models (2) and (4) use the time that the short sale ban on financial firms was in effect for $PERIOD$. Panel A reports results for the subsample that excludes retail trades (transactions with notional amount less than \$100,000). It is comprised of 687,278 transactions days. Panel B reports results for the subsample that only includes institutional trades transactions with notional amount greater than \$1,000,000. It is comprised of 304,319 transactions days. Panel C reports results for the subsample that includes equity-like convertible debt (stock price/conversion price > 0.65) and also excludes retail trades. It is comprised of 685,456 transactions days. Robust standard errors are clustered by bond.

| | Full Sample | | | | Exp. Vol. Propensity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| Variable definition | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat |
| *Panel A. Subsample excludes retail trades.* | | | | | | | | |
| iPERIOD | 0.301 | 4.93 | 0.582 | 7.02 | 0.312 | 0.98 | 0.625 | 1.76 |
| iPERIOD×iCON | 2.457 | 3.56 | 3.286 | 3.47 | 2.675 | 3.30 | 3.169 | 3.12 |
| Observations | 686,627 | | 686,627 | | 34,879 | | 34,879 | |
| R-squared | 0.026 | | 0.025 | | 0.010 | | 0.008 | |
| Number of issuer cusips | 14,082 | | 14,082 | | 910 | | 910 | |
| *Panel B. Subsample only includes institutional trades.* | | | | | | | | |
| iPERIOD | 0.136 | 1.67 | 0.540 | 4.60 | 0.100 | 0.22 | 0.608 | 1.16 |
| iPERIOD×iCON | 2.779 | 3.83 | 2.735 | 2.76 | 2.715 | 2.96 | 2.455 | 2.18 |
| Observations | 303,903 | | 303,903 | | 18,500 | | 18,500 | |
| R-squared | 0.014 | | 0.013 | | 0.011 | | 0.007 | |
| Number of issuer cusips | 7,785 | | 7,785 | | 576 | | 576 | |
| *Panel C. Subsample only includes equity-like trades and excludes retail trades.* | | | | | | | | |
| iPERIOD | 0.301 | 4.92 | 0.581 | 7.01 | 0.345 | 1.10 | 0.644 | 1.82 |
| iPERIOD×iCON | 1.437 | 2.02 | 2.358 | 2.68 | 1.481 | 1.74 | 2.172 | 2.31 |
| Observations | 685,177 | | 685,177 | | 33,429 | | 33,429 | |
| R-squared | 0.026 | | 0.026 | | 0.006 | | 0.006 | |
| Number of issuer cusips | 14,065 | | 14,065 | | 893 | | 893 | |

IA.3: Fundamental value factor model.

The table reports regressions of the fundamental valuation factor model for straight and convertible debt. The continuously compounded daily bond return is the dependent variable. The straight debt model includes control variables are the returns to the average bond index, differences between index returns to long- and short-term bonds and high and low credit risk bonds portfolios and an equity market risk premium. The convertible debt model adds the delta and gamma for the convertible bond. Robust standard errors are clustered by parent company CUSIP.

| | Models | | | |
|---|---|---|---|---|
| | Straight Debt | | Convertible Debt | |
| Variable definition | Coeff. | t-stat | Coeff. | t-stat |
| AvgIndexRet | 0.5282 | 10.85 | 0.8298 | 13.95 |
| DurationDiff | -0.1334 | -3.18 | -0.5336 | -12.44 |
| CreditDiff | -0.1632 | -5.05 | 0.0526 | 1.5 |
| MktRP | 0.0460 | 6.09 | 0.1290 | 8.29 |
| Delta | | | 0.0001 | 2.09 |
| Gamma | | | -0.0049 | -4.03 |
| Constant | 0.0002 | 5.03 | -0.0008 | -1.36 |
| Observations | 2,344,946 | | 61,596 | |
| R-squared | 0.0201 | | 0.0405 | |
| Number of CUSIPs | 2,288 | | 236 | |

IA.4: Price discount regressions: EHP robustness analysis.

The table reports price discount regressions based on the EHP factor return model. The dependent variable is the residual obtained from the fundamental factor models estimated in Table 3. Each regression includes the same set of control variables reported in Table 2. Panel A reports results for the full subsample. Panel B reports results for the subsample that only includes financial institutions subject to the short sale ban. Panel C reports results for the subsample of firms that issue convertible and non-convertible securities. Models (1) and (2) use the $PERIOD$ equal to the Fall of 2008; Models (3) and (4) use the $PERIOD$ equal to the time the short sale ban was in effect. All specifications include parent company fixed effects. Robust standard errors are clustered by parent company CUSIP.

| | Fall of 2008 | | | | Short Sale Ban Period | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| Variable definition | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat |
| *Panel A. Full sample.* | | | | | | | | |
| iCON | -0.027 | -0.17 | -0.029 | -0.19 | -0.058 | -0.36 | -0.060 | -0.37 |
| iPERIOD | 0.140 | 6.22 | 0.115 | 4.70 | -0.037 | -0.62 | -0.101 | -1.64 |
| iPERIOD×iCON | -0.475 | -3.74 | -0.467 | -3.61 | -0.310 | -1.54 | -0.246 | -1.21 |
| iPERIOD×iFIN | - | - | 0.195 | 5.92 | - | - | 0.512 | 5.04 |
| iPERIOD×iCON×iFIN | - | - | 0.576 | 0.67 | - | - | -0.462 | -2.10 |
| Observations | 1,411,723 | | 1,411,723 | | 1,411,723 | | 1,411,723 | |
| Adjusted R-squared | 0.026 | | 0.026 | | 0.025 | | 0.026 | |
| Number of firms/securities | 2,093 | | 2,093 | | 2,093 | | 2,093 | |
| *Panel B. Subsample of firms that have issued convertible debt.* | | | | | | | | |
| iCON | -0.125 | -0.79 | -0.128 | -0.81 | -0.161 | -0.99 | -0.162 | -1.00 |
| iPERIOD | 0.238 | 5.50 | 0.207 | 4.05 | 0.108 | 1.27 | 0.016 | 0.17 |
| iPERIOD×iCON | -0.563 | -4.29 | -0.549 | -4.08 | -0.454 | -2.22 | -0.363 | -1.77 |
| iPERIOD×iFIN | - | - | 0.097 | 1.23 | - | - | 0.262 | 1.75 |
| iPERIOD×iCON×iFIN | - | - | 0.705 | 0.82 | - | - | -0.136 | -0.57 |
| Observations | 75,389 | | 75,389 | | 75,389 | | 75,389 | |
| Adjusted R-squared | 0.048 | | 0.048 | | 0.047 | | 0.047 | |
| Number of firms/securities | 112 | | 112 | | 112 | | 112 | |
| *Panel C. Subsample of financial firms.* | | | | | | | | |
| iCON | -0.378 | -1.53 | | | -0.351 | -1.53 | | |
| iPERIOD | 0.309 | 13.49 | | | 0.392 | 5.08 | | |
| iPERIOD×iCON | 0.142 | 0.17 | | | -0.666 | -8.84 | | |
| Observations | 163,978 | | | | 163,978 | | | |
| Adjusted R-squared | 0.045 | | | | 0.044 | | | |
| Number of firms/securities | 128 | | | | 128 | | | |

IA.5: Effective spread regressions: Robustness subsamples.

The table reports regressions of volume-weighted effective bid-ask spreads. The volume-weighted bid-ask spread is the dependent variable. Each regression includes the same set of control variables reported in Table 5. For Models (1) and (3), $PERIOD$ is the Fall of 2008; for Models (2) and (4) $PERIOD$ is the time that the short sale ban on financial firms was in effect. Panel A reports results for the subsample that excludes retail trades (transactions with notional amount less than \$100,000). Panel B reports results for the subsample that only includes institutional trades transactions with notional amount greater than \$1,000,000. Panel C reports results for the subsample that includes equity-like convertible debt (stock price/conversion price > 0.65) and also excludes retail trades. Robust standard errors are clustered by parent company CUSIP.

| | Full Sample | | | | Exp. Vol. Propensity | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| Variable definition | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat | Coeff. | t-stat |
| *Panel A. Subsample excludes retail trades.* | | | | | | | | |
| iCON | -0.056 | -2.91 | -0.053 | -2.76 | 0.006 | 0.19 | 0.009 | 0.26 |
| iPERIOD | 0.112 | 22.40 | 0.123 | 10.30 | 0.088 | 6.56 | 0.085 | 3.53 |
| iPERIOD×iCON | -0.030 | -2.27 | -0.025 | -0.85 | -0.005 | -0.26 | 0.006 | 0.16 |
| Observations | 687,278 | | 687,278 | | 35,405 | | 35,405 | |
| R-squared | 0.082 | | 0.072 | | 0.078 | | 0.073 | |
| Number of issuer cusips | 2,160 | | 2,160 | | 503 | | 503 | |
| *Panel B. Subsample only includes institutional trades.* | | | | | | | | |
| iCON | -0.030 | -2.63 | -0.027 | -2.45 | 0.013 | 0.52 | 0.015 | 0.57 |
| iPERIOD | 0.097 | 18.84 | 0.092 | 7.15 | 0.099 | 6.26 | 0.090 | 3.17 |
| iPERIOD×iCON | -0.008 | -0.56 | 0.004 | 0.14 | -0.025 | -1.14 | -0.008 | -0.23 |
| Observations | 304,319 | | 304,319 | | 17,541 | | 17,541 | |
| R-squared | 0.089 | | 0.075 | | 0.066 | | 0.056 | |
| Number of issuer cusips | 2,046 | | 2,046 | | 442 | | 442 | |
| *Panel C. Subsample only includes equity-like trades and excludes retail trades.* | | | | | | | | |
| iCON | -0.049 | -2.17 | -0.047 | -2.10 | 0.010 | 0.32 | 0.012 | 0.36 |
| iPERIOD | 0.112 | 22.40 | 0.123 | 10.30 | 0.088 | 6.56 | 0.086 | 3.54 |
| iPERIOD×iCON | -0.035 | -2.05 | -0.021 | -0.64 | -0.020 | -1.02 | 0.012 | 0.32 |
| Observations | 685,456 | | 685,456 | | 33,583 | | 33,583 | |
| R-squared | 0.082 | | 0.072 | | 0.079 | | 0.074 | |
| Number of issuer cusips | 2,151 | | 2,151 | | 488 | | 488 | |

IA.6: Vector auto-regression of weekly dollar trading volume.

The table reports the results of an auto-regression of weekly dollar trading volume. Coefficient estimates, t-statistics, and p-values are reported in the rows. The columns represent volume groupings: In-the-money ($ITM$) convertible debt (1), out-of-the-money ($OTM$) convertible debt (2), non-convertible treatment firm bonds associated with $ITM$ convertible debt (3), and non-convertible treatment firm bonds associated with $OTM$ convertible debt (4)

| Variable definition | Statistic | ITM Converts (1) | OTM Converts (2) | ITM Treatment Non-Converts (3) | OTM Treatment Non-Converts (4) |
|---|---|---|---|---|---|
| ITM Converts | Coeff. Est. | 0.633 | 0.533 | 0.421 | 0.518 |
| | t-stat | 6.24 | 1.87 | 1.21 | 1.44 |
| | pval | 0.000 | 0.061 | 0.225 | 0.150 |
| OTM Converts | Coeff. Est. | -0.007 | 0.669 | -0.094 | -0.162 |
| | t-stat | -0.22 | 7.95 | -0.92 | -1.53 |
| | pval | 0.823 | 0.000 | 0.359 | 0.127 |
| ITM Treatment Non-Converts | Coeff. Est. | -0.007 | 0.040 | 0.524 | 0.047 |
| | t-stat | -0.17 | 0.37 | 3.94 | 0.34 |
| | pval | 0.866 | 0.714 | 0.000 | 0.732 |
| OTM Treatment Non-Converts | Coeff. Est. | 0.014 | -0.190 | -0.131 | 0.334 |
| | t-stat | 0.39 | -1.86 | -1.05 | 2.58 |
| | pval | 0.695 | 0.063 | 0.293 | 0.010 |
| Constant (000,000s) | Coeff. Est. | 1,082 | 5,136 | 11,350 | 13,380 |
| | t-stat | 1.66 | 2.82 | 5.11 | 5.81 |
| | pval | 0.096 | 0.005 | 0.000 | 0.000 |
| Observations | | 84 | 84 | 84 | 84 |

IA.7: Realized markups on dealer roundtrip trades with incremental analysis of financial firms.

The table reports endogenous switching regression results of realized dealer markups. The columns under the heading Trade Type report the first stage results from a probit model on the decision whether to pre-arrange a trade versus hold it in inventory. We consider the trade to be pre-arranged ($Trade\ Type = 0$) if a dealer trades a bond and then a dealer creates an offsetting position in the same bond within 15 minutes (at least one of those trades must also involve a customer). If the trade takes longer than 15 minutes to offset, we consider the trade to have entered the dealer's inventory, and call that $Trade\ Type = 1$ in our first stage estimation. The columns under the heading Pre-Arranged Markup and Inventory Markup report the second-stage estimation results testing the effect of the Fall of 2008 on dealers' realized markups from roundtrip trading on these bonds, conditional on the predicted value of $\widehat{Trade\ Type}$ from the first stage.

| | (1) Trade Type | | (2) Pre-Arranged Markup | | (3) Inventory Markup | |
|---|---|---|---|---|---|---|
| Variable definition | Coeff. | z-stat | Coeff. | z-stat | Coeff. | z-stat |
| Equity Trades | -0.132 | -97.670 | | | | |
| iF2008 | -0.029 | -6.960 | -0.087 | -45.820 | 0.268 | 24.330 |
| iCON | 0.554 | 76.900 | -0.006 | -1.000 | 0.040 | 2.360 |
| iFIN | -0.163 | -53.930 | -0.015 | -10.350 | -0.061 | -7.190 |
| iCONFIN | 0.211 | 8.100 | 0.027 | 1.570 | -0.014 | -0.270 |
| iF2008×iCON | -0.032 | -1.430 | 0.148 | 11.010 | 0.059 | 1.200 |
| iF2008×iFIN | -0.020 | -2.250 | -0.039 | -10.260 | 0.118 | 4.660 |
| iF2008×iCON×iFIN | 0.216 | 2.680 | -0.016 | -0.300 | -0.281 | -1.710 |
| iBigTrade | 0.078 | 27.300 | -0.010 | -7.190 | 0.078 | 10.720 |
| Lagged effective spread | 16.264 | 34.850 | 62.109 | 264.190 | 195.383 | 173.430 |
| Roundtrip length | 0.243 | 185.710 | 0.048 | 23.360 | 0.023 | 10.690 |
| Inverse Mills Ratio | | | 0.398 | 27.910 | 0.377 | 20.840 |
| Constant | | | 0.565 | 238.300 | 0.098 | 2.820 |
| Observations | 2,295,957 | | | | | |

IA.8: 13F position table fields

This table lists the table fields that are contained in a 13F filing.

| | |
|---|---|
| IssuerName | The name of the issuer |
| TitleOfClass | A short description of the security's type (e.g. "Common Stock") |
| CUSIP | A CUSIP field (6, 8, or 9 digits, potentially including spaces) |
| Valuex1000 | The stated value of the position, in thousands of dollars |
| SharesPrincipal | The number of shares for an equity position, or the principal value of fixed income holdings |
| SH_PRN | An indicator (usually "SH" or "PRN") describing field "SharesPrincipal" |
| PutCall | An indicator for put or call positions (i.e. "PUT", "CALL", or blank) |
| InvestmentDiscretion | Level of investment discretion held by the Manager |
| OtherManagers | Identifies each other Manager on whose behalf this 13F report is being filed |
| Sole | The number of shares for which the Manager exercises *sole* voting authority |
| Shared-Defined | The number of shares for which the Manager exercises *shared* voting authority |
| None | The number of shares for which the Manager exercises *no* voting authority |

IA.9: Aggregate convertible debt holdings and net trading of large institutional investors

The table reports summary data for aggregate convertible debt positions of large institutional investors. Panel A provides the aggregate market value of all convertible debt positions, the mean market value per position, and the number of unique convertible debt positions. Panel B reports summary data for the percentages of net buys (Column 2), net sells (Column 3), and net holds across all convertible bond positions as reported in Form 13-f (Column 4). Column 5 of Panel B is the ratio of net buys to net sells and is calculated as Column 2/Column 3.

*Panel A: Aggregate convertible debt holdings of large institutional investors*

| Year/ Quarter | Aggregate Market Value ('000s) | Mean Position Market Value ('000s) | Number of Unique Positions |
|---|---|---|---|
| 2007Q2 | 15,356,120 | 6,777 | 2,266 |
| 2007Q3 | 14,765,415 | 7,078 | 2,086 |
| 2007Q4 | 14,858,431 | 6,604 | 2,250 |
| 2008Q1 | 14,735,939 | 5,913 | 2,492 |
| 2008Q2 | 14,172,669 | 5,589 | 2,536 |
| 2008Q3 | 10,552,208 | 4,732 | 2,230 |
| 2008Q4 | 8,907,162 | 3,924 | 2,270 |
| 2009Q1 | 8,350,143 | 3,982 | 2,097 |
| 2009Q2 | 7,985,524 | 4,047 | 1,973 |
| 2009Q3 | 8,206,957 | 4,647 | 1,766 |

*Panel B: Net trading in convertible debt holdings of large institutional investors*

| Year/ Quarter | Net Purchases (%) | Net Sales (%) | Net Holds (%) | Buy/Sell Ratio |
|---|---|---|---|---|
| 2007Q3 | 39.69 | 21.52 | 38.78 | 1.84 |
| 2007Q4 | 43.07 | 21.33 | 35.60 | 2.02 |
| 2008Q1 | 44.70 | 21.07 | 34.23 | 2.12 |
| 2008Q2 | 40.93 | 20.74 | 38.33 | 1.97 |
| 2008Q3 | 39.33 | 22.38 | 38.30 | 1.76 |
| 2008Q4 | 44.76 | 22.86 | 32.38 | 1.96 |
| 2009Q1 | 38.67 | 25.61 | 35.72 | 1.51 |
| 2009Q2 | 39.69 | 22.81 | 37.51 | 1.74 |
| 2009Q3 | 37.20 | 22.99 | 39.81 | 1.62 |
| Average | 40.89 | 22.37 | 36.74 | 1.84 |

IA.10: Net position changes in the convertible debt holdings of large institutional investors over the period 2007Q3 to 2009Q3.

The table reports summary data for the net purchases and net sales of all convertible bond positions as reported in Form 13-f. Panels A and B respectively report market value metrics for net purchases and net sales. Panel C reports the difference between Panels A and B. Column 2 reports the aggregate market value of all net purchases (Panel A) and net sales (Panel B), Column 3 reports the average change in market value of a net purchase (Panel A) and a net sale (Panel B). Column 4 reports the median change in market value of a net purchase (Panel A) and a net sale (Panel B), and Column 5 reports the number of positions that reflect net purchases (Panel A) and net sales (Panel B).

| Year/ Quarter | Aggregate Market Value (‘000s) | Mean Position Value (‘000s) | Median Position Value (‘000s) | Number of Positions |
|---|---|---|---|---|
| | | *Panel A. Net purchases* | | |
| 2007Q3 | 1,514,340 | 3,403 | 67 | 445 |
| 2007Q4 | 1,513,056 | 3,318 | 35 | 456 |
| 2008Q1 | 1,589,462 | 3,346 | 55 | 475 |
| 2008Q2 | 1,194,905 | 2,521 | 15 | 474 |
| 2008Q3 | 921,873 | 2,119 | 10 | 435 |
| 2008Q4 | 898,850 | 2,264 | 39 | 397 |
| 2009Q1 | 828,652 | 2,002 | 95 | 414 |
| 2009Q2 | 728,743 | 1,791 | 58 | 407 |
| 2009Q3 | 758,080 | 2,088 | 44 | 363 |
| | | *Panel B. Net sales* | | |
| 2007Q3 | 1,513,144 | 3,370 | 43 | 449 |
| 2007Q4 | 2,412,178 | 5,036 | 64 | 479 |
| 2008Q1 | 1,622,264 | 3,096 | 19 | 524 |
| 2008Q2 | 1,219,892 | 2,319 | 14 | 526 |
| 2008Q3 | 1,076,393 | 2,161 | 11 | 498 |
| 2008Q4 | 1,192,464 | 2,302 | 20 | 518 |
| 2009Q1 | 906,666 | 1,695 | 17 | 535 |
| 2009Q2 | 1,015,171 | 2,256 | 31 | 450 |
| 2009Q3 | 783,698 | 1,930 | 32 | 406 |
| | | *Panel C. Net purchases - Net sales* | | |
| 2007Q3 | 1,196 | 33 | 25 | -4 |
| 2007Q4 | -899,122 | -1,718 | -30 | -23 |
| 2008Q1 | -32,802 | 250 | 36 | -49 |
| 2008Q2 | -24,987 | 202 | 1 | -52 |
| 2008Q3 | -154,520 | -42 | -1 | -63 |
| 2008Q4 | -293,614 | -38 | 19 | -121 |
| 2009Q1 | -78,015 | 307 | 78 | -121 |
| 2009Q2 | 286,429 | 465 | 27 | 43 |