Recovery on Defaulted Debt: Aggregation, Role of Debt Mix, and A Bit About Systematic Risk

Mark Carey & Michael Gordy
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How two groundhogs saw some light

- Are variations in recovery systematic? No satisfactory traction until we thought about:
- Where is the default boundary relative to the zero-net-worth point?
  - Usually, bank debtholders’ decision dominates. And their choice depends on size of claim relative to firm value. **Enormous** empirical effect on recoveries in cross section.
- What are debt instruments of a bankrupt firm?
  - Contingent claims on the value of the firm at emergence.
  - Must understand ultimate recovery to all the firm’s debt as a precursor to modeling value of individual claims.
- (Paper does not reflect our latest thinking)
- (Apologize toggle between “recovery”, “LGD” below)
Part 1 of our story: Think about the default (bankruptcy) boundary…

- Will managers and shareholders declare bankruptcy at the moment the firm is economically insolvent? Usually not…
  - They hold out-of-the-money options. They want to keep the game going, and want increased volatility.

- Will debtholders force bankruptcy at the moment of insolvency?
  - Which ones are most likely to have the legal power do so?
    - In the USA, banks and other private debt investors.
  - Given the right, how strong is the incentive?
    - Depends on seniority and size of position in debt structure.
...and the impact of bank debt share

- If bank loans are most of the firm’s debt, bankruptcy is forced when firm value is not far below the insolvency point.
  - Even if senior, banks will bear most of the losses as insolvency worsens, so they force filing sooner.
- If banks hold a small slice of the firm’s debt, it is more likely to be deeply insolvent at filing.
  - Banks’ recovery is protected by the layers of junior debt, so they will let the game go on longer.
- Bank debt most senior in USA; elsewhere?
Sketch a first passage model of default

- **Innovation:** Default (bankruptcy) at $V < V^*$, but endogenous $V^*$ chosen by senior claimant with covenants (“bank”), not the firm
  - Bank induces bankruptcy by accelerating loan but can only do so if a covenant is violated.
  - Bank may not induce at first covenant violation if benefits of waiting (fees, etc.) exceed expected losses from waiting.
  - Expected losses depend on size of bank’s position.

- **$V^*$ depends on:**
  - Total debt burden; “Mix” (share of bank debt in total debt);
  - Borrower asset value volatility; Expected path of covenant violations; Expected benefits of waiting to accelerate the loan. Higher bank debt share implies higher $V^*$ and “earlier” bankruptcy (firm value closer to solvency point).
Implication 1: Default probabilities should depend on debt mix

- Include debt mix in default prediction models (meaning share of total debt with covenants granting bankruptcy-decision control-rights).
- We recognize that other considerations are important too; relative importance is empirical question.
- We don’t yet have empirical evidence on importance of mix for PD. Large-sample data for debt mix is hard to get.
Implication 2: **Firm-level LGD related to bank loan share of firm’s debt**

- Presumes recovery is driven mainly by depth of firm’s insolvency at default.
  - We recognize other things may matter too.
- Why would banks wait to pull the plug until the point their recovery begins to be threatened? They may benefit by waiting:
  - “Relationship” factors?
  - Receive covenant waiver fees, higher spreads on the way down; perhaps improve collateral.
Implication 3: We should not be surprised that firms are deeply insolvent at filing

- That bond recoveries are so poor has long been a puzzle.
  - It is one motivation for Duffie & Lando’s accounting-quality paper (Econometrica 2001).
- Getting harder to blame it on losses during bankruptcy, e.g. Covitz Han Wilson (2006): time in bankruptcy does not affect recovery.
- In our data, mean bank debt share is 33%, mean firm-level recovery 45% (reasonable).
Part 2 of our story: Firm-level LGD

- As with any debt instrument, view defaulted debt as a contingent claim on the value of the firm, but at emergence or liquidation.
  - Bankruptcy changes legalities and nature of option.
  - U.S. system of absolute priority implies collar options.
    - Upper and lower strike determined by place in queue.
  - Absolute priority violations due to bargaining process and court oversight are minor for our work.

- Suppose Loan=50 loses 0%; Bond=100 loses 50%; Subdebt=50 loses 100%.
  - Total recovery is $100, total claims are $200, so firm-level LGD=50%
Debt instruments as collars

Whether claims are in-the-money….

- Deeply subordinated
- Contractually subordinated
- General unsecured claims
- Other secured
- Well-secured
- Lawyers

Depends on the value of the firm at emergence and debt structure.

Firm B at emergence

Firm A at emergence
Implication 1: Understanding debt structure is key to understanding instrument-level data

- Suppose every firm has many seniority classes of debt and firm-level recovery is uniformly distributed.
- Then expect recovery for most instruments to be 0% or 100%.
- In reality most U.S. firms have few classes, but instrument-level recovery is still strongly bimodal, whereas firm-level recovery is unimodal with mean near 50%.
Actual LGD Distribution: Firm-level vs instrument-level analysis

![Graph showing the distribution of LGD with different levels of analysis. The graph includes a normal kernel with a bandwidth of 6, and comparisons between Estate, Estate Roll-ups, and Instruments.]
Implication 2: First model the underlying, then model the option…

- Defaulted debt is a quite non-linear option, so Jensen’s inequality rules, e.g.,
  \[ E[\text{SeniorLGD(Firm-Recovery)}] \neq E[\text{SeniorLGD}(E[\text{Firm-Recovery}])] \]

- Simple averages of instrument values and other linear approximations could easily steer us wrong.

- Modeling of the collar-type options will be messy, filled with irritating details. Not yet clear what devils are in these details.
What implications of our view for systematic variation in recovery rates?

- Not immediately obvious that using firm-level measures, and paying attention to bank debt share, should matter for measurement of systematic variation in recovery rates. Doesn’t it all average out?
- NO. Most important: time variation in bank debt share affects annual averages.
- Many prior studies have pooled instrument-level data, omitting bank debt entirely.
- Bottom line: Extant evidence of systematic variation is less robust than it appears. 1989-91 drop in recoveries disappears entirely, 2000-2002 weaker.
Should we expect systematic variation in recovery?

- Bad macroeconomic times = worse recoveries seems so plausible, but...
- Wouldn’t banks vary bankruptcy threshold ($V^*$) with macroeconomic conditions?
- Effect could even be opposite of conventional wisdom, if regulators force banks to adopt more conservative thresholds in bad times.
- (No-bank-debt firms may be different.)
A taste of empirical work...

Focus on:

- 1) Evidence that share of bank debt in total debt matters for firm-level recovery rates.
- 2) A little bit about systematic variation in recovery rates.
Data (is for U.S. large corporate bankruptcies)

  - S&P tries to include all bankrupt firms with total debt > $50 million.
    - Subject to data availability. More complete in recent years. Court problem.
  - For each bankrupt firm, have all debt instruments.
    - We call it “firm” LGD but don’t have all claims, e.g. no LGD for trade credit. But we have all of what other studies have looked at, and usually more.
    - Firm-level LGD is dollar-weighted average of individual-debt LGDs
  - Focus on RFV measures of recoveries at emergence (not returns)
    - “Nominal” measure: Undiscounted dollars.
    - Discounted-back-to-default-date measure using Treasury term structure.
      - Maintained null hypothesis is no systematic risk.
      - Choice of discount rate does not affect qualitative results.

- We merge with Compustat for some exercises, sample size drops to 269 bankruptcies.
We have few observations before 1990

And the number of observations is often less than 30 in individual “good” years. Perhaps we should not expect results to be robust across studies.
Mean firm LGDs over time

- Red bars are simple mean (55% overall, range 42 to 61), white bars are dollar-weighted mean.
- 89-90 is worse, and 98-02. But U.S. recessions were 90-91 and 2001.
- Lot of noise in individual values, not clustered at mean.
OLS regressions predicting firm LGD

- Explanatory variables:
  - Dummies for year of bankruptcy or/and emergence
  - Other state variables: default rate, GDP growth, stock returns
  - Industry: Always include a public-utility dummy. Also try full set of industry dummies.
  - Debt mix (share of bank debt in total debt; subordinated, secured)
  - Time in bankruptcy, identity of court, prepackaged.
    - Identity of court may control for selection bias in data, not sure.
  - Other variables investigated, not much useful so far. E.g. firm size, capital structure, asset structure (Compustat subsample)
Debt structure of firm matters a lot!

- An all-bank debt firm is predicted to have an LGD that is more than 30 percentage points better than a no-bank-debt firm!
  - This effect is not driven by outliers. Looks like fairly smooth relationship over 0% to 100% bank debt interval.
  - Does not appear to be driven by banks getting paid back before bankruptcy. Pre-bankruptcy debt change positively related to firm-level LGD, not negatively.

- An all-subordinated-debt firm does 10 percentage points worse than one with none, not linear, driven mainly by all-sub-debt firms. Not sure why.
Mean LGD: Firm- vs instrument-level (no controls)

- Peaks are similar, but instrument troughs are lower, so measured “cyclical” effects likely to be bigger with instrument-level measures.
Bankruptcy-year dummies

Generally not large until 1998, then +15, statistically significant 98, 00-02. 1998 effect appears to be due to a few observations with LGD>70%, recall <20 bankruptcies in 1998.
Other measures of state of the world

- Coefficient on S&P all-corporate default rate 2.5.
  - Sample mean 1.5, peak 3.5, implies +5% systematic effect?
- Coefficient on GDP growth small, insignificant
- Coefficient on S&P 500 total return -0.23
  - Sample mean about 12, trough about -22, implies +7% systematic effect
Time pattern of other state variables

Panel B. S&P All-Corporate Default Rate and GDP Growth Rate

Panel C. S&P500 Total Return
But experience in 2000-2003 drives these results

- If we drop those years (both bankruptcies and emergences), coefficients on all of GDP growth, default rate, and equity return are smaller, not statistically significant.
- If we drop only bankruptcies of “bubble” firms (about 30 firms) results are also much weaker.
- Eye of beholder: How much should be bet on point estimates from one episode?
Main things to take away

- *Really* important to model default and recovery together. No way are they independent at the individual-name level, even if recovery turns out to be uncorrelated with default rates at the aggregate level.
- Debt structure has a huge effect on default point and on recovery (and it may be material for default probability).
- Think of defaulted debt as options on firm value at emergence. First understand ultimate firm-level LGD.
- Reasonable people may differ about importance of systematic variation in LGD for U.S. corporate debt.
  - Point estimates imply systematic variation in ultimate-recovery LGD, but standard errors are wide, and robustness not great.
  - Noisy individual LGDs make moderate systematic variation hard to detect.
- Will hybrid loans, institutional investors change behavior?
Addendum: What about post-default prices…

- Post-default prices are weakly correlated with ultimate recoveries.
- Prices are often missing in extant datasets. Because they are zero? Is incidence of missing values related to time variation in averages? We don’t know yet.
- Systematic variation might be due to supply-demand effects in market for distressed debt, rather than systematic risk in ultimate recoveries. Different implications for buy-and-hold institutions.
Market price vs discounted cashflows