Discussion of “Time Inconsistency and Financial Covenants” by Haotian Xiang

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Overview

- Long-term debt is a key source of external funds for firms
  64% of flow of new debt in 2018

- Borrowing long-term comes with commitment problems
  cannot commit not to issue more debt in the future
  De Marzo and He (2017), Coase (1972)
  depresses debt and equity values ex-ante

- This paper says covenants can help address this problem
  market value of equity/book value of debt
  accelerate debt at par
  theoretical analysis + quantitative evaluation
1. The simple model
$J^*(b_1) = \max_b q(b)(b - b_l) + \int_{z \geq z_d} \left\{ (1 - \tau)z - (1 + (1 - \tau)c)b \right\} dF(z)$

s.t. $q(b) = (1 + c)(1 - F(z_d))$

$z_d = \frac{1 + (1 - \tau)c}{1 - \tau}b$

the firm only borrows to maximize the value of the tax shield

$b_1$ is legacy debt

$b - b_1$ is new issued debt

both trade at price $q(b)$
Final period, legacy debt

\[ \tau c(1 - F(z_d)) = (b - b_1) \left( -\frac{\partial q}{\partial b}(b) \right) \]

Equityholders only care about the revaluation **new** debt \((b - b_1)\)
Two-period model: no commitment

\[ I^{(NC)}_\lambda = \max_b q_\lambda(b)b + \int_{z \geq z_d} \left\{ (1 - \tau)z - (\lambda + (1 - \tau)c)b + J^* \left( (1 - \lambda)b \right) \right\} dF(z) \]

s.t.

\[ q_\lambda(b) = (1 - F(z_d)) \left\{ \lambda + c + (1 - \lambda)q^* \left((1 - \lambda)b\right) \right\} \]

\[ z_d = \frac{\lambda + (1 - \tau)c}{1 - \tau} b - \frac{1}{1 - \tau} J^* \left((1 - \lambda)b\right) \]

Assumptions:

fraction \( \lambda \) matures today, \( 1 - \lambda \) tomorrow

equityholders may fund the firm between periods at unit cost

In second (last) period, same FOC as the one-period firm with legacy debt
Two-period model: commitment

\[ I^{(C)}_\lambda = \max_q q_1 b_1 + \int_{z_1 \geq z_{d,1}} \left\{ (1 - \tau)z_1 - (\lambda + (1 - \tau)c)b_1 + J(z_1) \right\} dF(z_1) \]

s.t. \[ [\lambda_1] \quad q_1 \leq \int_{z_1 \geq z_{d,1}} \left\{ \lambda + c + (1 - \lambda)q_2(z_1) \right\} dF(z_1) \]

\[ [\lambda_2(z_1)] \quad q_2(z_1) \leq \left\{ 1 - F(z_{d_2}(z_1)) \right\} (1 + c) \]

and

\[ J(z_1) = q_2(z_1)(b_2(z_1) - (1 - \lambda)b_1) + \int_{z_2 \geq z_{d,2}(z_1)} \left\{ (1 - \tau)z_2 - (1 + (1 - \tau)c)b_2(z_1) \right\} dF(z_2) \]

Maximize over \( q_1, b_1, \{q_2(z_1), b_2(z_1)\} \)

\( z_{d,1} \) and \( z_{d,2}(z_1) \) are defined as before (cannot commit not to default)
Debt choice with commitment

\[
\tau c(1 - F(z_{d,2})) = (1 + c) f(z_{d,2}) \frac{\partial z_{d,2}}{\partial b_2} b_2 = - \frac{\partial q_2}{\partial b_2}
\]

Equityholders with commitment care about the revaluation of total debt \( b_2 \).

Unlike the case without commitment

The choice of debt is independent of \( b_1 \) and \( z_1 \):

\[
z_{d,2}(z_1) = z_{d,2}, \quad b_2(z_1) = b_2
\]
The effects of lacking commitment

Assume:

\[ 1 - F(z) = \exp \left( -\frac{z}{\mu} \right) \]

Then:

\[ b_2^C = \frac{(1 - \tau)}{1 + (1 - \tau)c} \frac{\tau c}{1 + c} \mu \]

\[ b_2^{NC}(b_1) = \frac{(1 - \tau)}{1 + (1 - \tau)c} \frac{\tau c}{1 + c} \mu + b_1 \quad ( > \max (b_2^C, b_1)) \]

\[ q_2^C = (1 + c) \exp \left( -\frac{\tau c}{1 + c} \right) \]

\[ q_2^{NC}(b_1) = (1 + c) \exp \left( -\frac{\tau c}{1 + c} \right) \exp \left( -\frac{1 + (1 - \tau)c b_1}{1 - \tau} \frac{1}{\mu} \right) \]
What do covenants do?

- **Trigger:** \[(1 - \tau)z_1 - (\lambda + (1 - \tau)c)b_1 + J\left((1 - \lambda)b_1\right) \leq \kappa b_1\]

- Between periods 1 and 2

- Equityholders must pay \(\alpha b_1\) to debtholders, with net effect:

\[
\underbrace{(\Delta q)(b_2 - b_1)}_{>0} + \underbrace{(\tilde{q} - 1) \alpha b_1}_{\geq 0}
\]

- Two possibilities

1. \(\tilde{q} > 1\): positive transfer to equityholders (debt relief)

2. \(\tilde{q} \ll 1\): negative transfer to equityholders (debt punishment)

- Debt relief can dominate and exacerbate the commitment problem ex-ante
Comment 1: debt maturity

The problem with commitment has a closed-form solution:

\[
\mathcal{I}_\lambda^{(C)} = \left\{ \frac{1}{2} + \frac{1}{2} \frac{1 + c + (1 - \lambda)(q_2^{(C)} - 1)}{1 + (1 - \tau)c + (1 - \lambda)(q_2^{(C)} - 1)} \frac{q_2^{C}}{1 + (1 - \tau)c} \right\} \times 2(1 - \tau)\mu
\]

This is increasing in \(\lambda\) so long as \(q_2^{(C)} > 1\) — which holds in this model.

In other words, in this model, **short-term debt is always better than long-term debt with commitment**
Comment 1: debt maturity

- Why? Cash flows from rolling over debt

\[ q_2^{(C)} \lambda b - \lambda b = (q_2^{(C)} - 1) \lambda b \]

- So why not borrow short-term, instead of covenants?

Aguiar, Amador, Hopenhayn and Werning (2016)

or, with covenants: always accelerate?

- To be fair, this depends on \( q_2^{(C)} - 1 > 0 \) (no discounting)

narrow in on cases where the short-term debt equilibrium is worse than the commitment equilibrium with long-term debt?
Comment 2: which covenants?

- The model assumes
  a specific trigger (threshold for market/book)
  a specific form of restructuring (acceleration of principal at par)

- Ideally, pay existing bondholders the difference between
  the bond price if there had been no issuance
  the bond price after new issuance

- Not observable, and hard to compute. But are there other, better rules?
  feasible rules, i.e. depend only on, say, EBITDA, \( b_l \) and \( q_-(b_l) \)
  bond price falls below a certain threshold?
  Hatchondo, Martinez, and Sosa-Padilla (2015)
2. The complicated model
Comments on the complicated model

- It’s complicated
  - risk-shifting
  - capital adjustment costs
  - dilution and restructuring costs
  - persistent shocks
  ...

- Complicated is good, but it’s hard to think through all the mechanisms
  - plus, they interact with each other independently of commitment
    - isolate the effects of some important ones — restructuring costs?

- Missing: what if equity issuance is not frictionless?
3. The quantitative implications
- Covenant violation frequency is targeted to be 0.015 per quarter

  that number seems low
  Chava and Roberts (2009, table 3): 15% of obs. are in violation
  but maybe I’m confused — violations in the model don’t persist
  almost all violations in the model lead to restructurings

  implications of violations for other covenant-relevant ratios?
  debt/EBITDA, net worth, interest coverage

- Restructuring costs $f$ are important to the welfare implications

  they are calibrated to 0.25% of book assets
  is this small/large? evidence?

  without $f$, covenants are welfare-decreasing ex-ante
  why? (doesn’t seem to be the case in the simple model)
  how is this consistent with the hump-shape in $\kappa$?
4. Conclusion
Conclusion

- This is a very ambitious paper and I really enjoyed reading it

- It’s challenging, so help the reader more
  
  sharper theoretical results (two-period?)
  
  streamline and clarify discussion of the quantitative implications