Sticky Leverage

by Gomes, Jermann and Schmid

discussion by Saki Bigio

October 2013
GE Model with three appealing features

- Endogenous persistence (sticky) in leverage
- Debt-overhang $\implies$ Debt is too costly, equity too..
- Debt deflation $\implies$ random shock to nominal debt (policy)

Application: How big is the power of debt deflation?
Agenda

- Outline Model
- Main Force
  - What drives sticky leverage?
- Quant Result and Relevance of Policy Exercise
Environment

- Single Family Economy: Continuum of Firms

- Household’s:
  - Labor
  - Assets: Equity & Risky Bonds

- Standard Consumption-Savings
Firms

- Hold $k$
- $y = Ak^\alpha h^{1-\alpha}$
- Return-to-Capital: $R = \max A \left( \frac{k}{h} \right)^\alpha - wh$

- Net-Profits $\pi = R - z$.
  - $z \sim F, E[z] = 0$.
  - **Simplification**: $z$ independent of labor

- Evolution of Capital: $k' = i + (1 - \delta) k$
Firm Finance

- Dividends: \( \text{div} \)

- Defaultable (Leland-Toft) Debt: \( b \)
  - Tax-Deductible Coupon \( c = 1 \)
  - Principle payment: outstanding debt \( \lambda \)
  - Outstanding debt: \( (1 - \lambda) \)

- New debt issuance:
  \[
  b' = n + (1 - \lambda) b
  \]
Flow of funds:

\[ \text{div} + i = (1 - \tau) \pi (z) k - ((1 - \tau) c + \lambda) \frac{b}{\mu} + \tau \delta k + p (b') n \]

- **Net-of-tax Profits**
- **Financial Expense**
- **Tax Credit**
- **Debt Issuance**

Re-writing:

\[ \text{div} + i = \tilde{\pi} (z) k - (1 - \tau_d) \lambda \frac{b}{\mu} + p (b') n \]

- **Operating Profits**
- **financial expense**
- **Debt Issuance**

(discussion by Saki Bigio)
Firm’s Problem

Firm’s problem:

\[ V (z, M, k, b) = \max_{\text{div}, i, n} \left\{ 0, \text{div} + \beta ME \left[ V (z', M', k', b') \right] \right\} \]

subject to

\[ \text{div} + i = \tilde{\tau} (z) k - (1 - \tau_d) \frac{b}{\mu} + p (b') n \]

\[ b' = n + (1 - \lambda) b \]

\[ k' = i + (1 - \delta) k \]
The firm’s problem:

\[
V(z, M, k, b) = \max_{\text{div, } i, n} \left\{ 0, \text{div} + \beta ME \left[ V(z', M', k', b') \right] \right\}
\]

subject to:

\[
\text{div} + k' = (\tilde{\pi}(z) + (1 - \delta)) k - (1 - \tau_d) \frac{b}{\mu} + p(b') \left( b' - (1 - \lambda) \frac{b}{\mu} \right)
\]

- **Cash Flow = CF**
- **Liability Increase**

\[
div + k' = CF_t(z, k, b) + p(b') \left( b' - (1 - \lambda) \frac{b}{\mu} \right)
\]
Value upon non-default:

\[
CF_t(z, k, b) - k' + p(b') \left( b' - (1 - \lambda) \frac{b}{\mu} \right) + \beta ME \left[ V(z', M', k', b') \right]
\]
Homotheticity

- Nice (AGGREGATION) in $K$:

$$V(z, M, k, b) = V(z, M, 1, l) \cdot k$$

- ...conditional on survival:

$$k \left[ CF_t(z, l) - g + p(l') \left( l'g(k) - (1 - \lambda) \frac{l}{\mu} \right) + \beta \mathbb{E} \left[ V(z', M', l') g \right] \right]$$

- Conditional on not defaulting, choice of $(g, l')$ independent of $z$.
  - Linearity $\rightarrow$ inject equity to same scale and leverage
  - Differ in dividend decision
Focus on decisions...

\[
\max_{g,l} -g + p(l') \left( l' g (k) - (1 - \lambda) \frac{l}{\mu} \right) + \beta \mathbb{E} \left[ V (z', M', l') \right] g
\]

Note that choice of \( l' \):
- Linearity \( \rightarrow \) inject equity to same scale and leverage
- Differ in dividend decision

Important Role for Maturity: generates *sticky leverage*
Role of Maturity

- **Short-Term Debt:**
  \[ B^S: 1, 0, 0, \ldots \]

- **Long-Term Debt:**
  \[ B^{LT}: \lambda, \lambda (1 - \lambda), \lambda (1 - \lambda)^2, \ldots \]

- **Steady-State, Frictionless Prices:**
  \[ p\left(B^S\right) = \beta \quad \text{and} \quad p\left(B^{LT}\right) = \beta \frac{\lambda}{(1 - (1 - \lambda) \beta)}. \]

- Borrow one dollar today in A debt:
  Payments: \((1, \beta^{-1})\)

- Replicate s-Debt with LT-Debt Strategy:
  Payments: \((1, \beta^{-1})\)
Role of Maturity

- Presence: taxes and default
- Driver of Sticky Leverage?
- **Taxes** → don’t change argument above...
- **Default option:** \( p(B^S) = \beta \Pr[z > z^* (B^S)] \).
  - Not an issue per-se
  - If with LT-debt you can commit to default in same history...

- **Hold-up problem:**
  - Coupon: payed in goods
  - Face value: firm’s new debt affects repurchase
  - So if you were to refinance replicating s debt...
There is a **beautiful** mechanism

Needs to be fleshed-out in paper!

Forget about bankruptcy cost → default 0.5% x 50% loss is small

Instead, mechanism operates this way:

- Deflation $\uparrow$ raises debt
- High debt, rates high $\rightarrow$ force not to borrow
- High debt, rates high $\rightarrow$ force not to repay (hold up)
- You don’t want to inject equity either $\rightarrow$ risk and dilution are high

**Incentives to:**

- Introduce **debt covenants**
- **Renegotiate debt:** ex-ante and ex-post
- Convenant seem very common place (Sufi)

(discussion by Saki Bigio)
Quantitative Results

- Why are their macro effects large?
- Other models with financial frictions can’t do it…(ask Urban)
- In other models, firm is constrained
  - Invests little
  - Has incentives to inject equity but doesn’t have possibility
- Here, firm wants to take away resources
  - Won’t want to take more debt
  - Wants to pay-out dividends
- Y falls a lot because \( I_t < 0 \)!
  - \( C_t \) is increasing a lot because people are eating capital
  - Is this true?
- Capital irreversibility (ask Lars)

(discussion by Saki Bigio)
Debt Deflation Policy

- Authors look at effects of inflation
- Fine for helicopter drops
- ...however, I dispute a CB’s ability to stimulate inflation, especially during crisis
- I really dislike this approach
  - Here, they appeal to a Fisher equation and FED moving nominal rate
  - ...without modeling actual banks and policy tools is odd
  - Who’s euler equation are you moving?
  - Is that euler equation not distorted?
  - How’s the FED doing this and buying from whom?
Conclusions

- Great framework
- Unfair emphasis on mechanics
- I wouldn’t take quant or policy recs seriously
  - Not just now