Discussion of “Sticky Leverage” by Joao Gomes, Urban Jermann and Lukas Schmid

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Summary

- Provide a tractable DSGE model with dynamic capital structure choice and finite maturity nominal debt
Main Results

- **When inflation is exogenous:**
  - Unanticipated changes in inflation have real effects, even without sticky prices or wages
  - When debt is long-lived, there is debt overhang $\Rightarrow$ reduce investment
  - Leverage is a slow-moving state variable $\Rightarrow$ persistence and propagation

- **A standard Taylor rule helps stabilize the economy**
  - In response to a negative productivity or wealth shock, CB raises inflation $\Rightarrow$ mitigate debt overhang
Large literature on one period nominal debt
  - Deflation raises the real burden of debt and worsens economic activity (Fisher (1933))
  - Debt overhang reduces investment (Myers (1977))

Miao and Wang (2010): RBC model (propogation)

Bhamra, Fisher and Kuehn (2011)
  - Infinite maturity nominal debt
  - No investment
  - Interest rate peg vs inflation targeting

The main difference is that GJS incorporate finite maturity and investment
Related Literature II

- Discrete time: Philippon (2009, QJE)
- Probabilitistic structure
  - Chatterjee and Eyigungor (2012, AER): sovereign debt
Initially, the firm issues debt with principal $P$ and a constant coupon $C$ forever.

At each $t$, a fraction $e^{-mt}$ of this debt remains outstanding, with principal $e^{-mt}P$ and coupon $e^{-mt}C$.

Continuously retire outstanding debt principal at the rate $me^{-mt}$.

The average maturity is $\int_0^\infty tme^{-mt} dt = 1/m$.

Retired debt is replaced by the issuance of new debt with identical coupon, principal, and seniority.

Any finite-maturity debt policy is completely characterized by $(C, P, m)$. 

- Cash flow \((x_t)\) follow a GBM.
- Let \(D^0(x, t)\) denote the time \(t\) value of debt issued at time zero

\[
rD^0(x, t) = e^{-mt} (mP + C) + D^0_t (x, t) \\
+ \mu x D^0_x (x, t) + \frac{\sigma^2 x^2}{2} D^0_{xx} (x, t)
\]

- Let \(D(x) = e^{mt} D^0(x, t)\) denote the total value of outstanding debt at any time \(t\)

\[
(r + m) D(x) = C + mP + \mu x D_x (x) + \frac{\sigma^2 x^2}{2} D_{xx} (x)
\]

- We can see that \(D(x; P)\) does not depend on time
Finite Maturity Debt Contracts: Discrete Time

- A finite maturity debt contract \((c, b_t, \lambda)\) where \(b_t\) is total principal at date \(t\)
- One unit debt pays coupon \(c\)
- A fraction \(\lambda\) is retired and then issue new debt
  \[ b_{t+1} - (1 - \lambda) b_t \]

<table>
<thead>
<tr>
<th>(t = 0)</th>
<th>(t = 1)</th>
<th>(t = 2)</th>
<th>(t = 3)</th>
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<tbody>
<tr>
<td>(b_1)</td>
<td>((c + \lambda) b_1)</td>
<td>((1 - \lambda) (c + \lambda) b_1)</td>
<td>((1 - \lambda)^2 (c + \lambda) b_1)</td>
</tr>
<tr>
<td>(b_2 - (1 - \lambda) b_1)</td>
<td>((c + \lambda) [b_2 - (1 - \lambda) b_1])</td>
<td>((1 - \lambda) (c + \lambda) [b_2 - (1 - \lambda) b_1])</td>
<td>((1 - \lambda)^2 (c + \lambda) [b_2 - (1 - \lambda) b_1])</td>
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<tr>
<td>(b_3 - (1 - \lambda) b_2)</td>
<td>((c + \lambda) [b_3 - (1 - \lambda) b_2])</td>
<td>((1 - \lambda) (c + \lambda) [b_3 - (1 - \lambda) b_2])</td>
<td>((1 - \lambda)^2 (c + \lambda) [b_3 - (1 - \lambda) b_2])</td>
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<tr>
<td>(b_4 - (1 - \lambda) b_3)</td>
<td>(b_4)</td>
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- Cash flow for any debt \(b_t\) is given by
  \[ b_{t+1} (c + \lambda) b_{t+1} \quad (1 - \lambda) (c + \lambda) b_{t+1} \quad (1 - \lambda)^2 (c + \lambda) b_{t+1} \quad \ldots \]
Valuation: Discrete Time

- Unit debt price $p_t$
- Recursive valuation

\[ p_t b_{t+1} = EM_{t,t+1} \left[ (c + \lambda) b_{t+1} + (1 - \lambda) p_{t+1} b_{t+1} \right] + EM_{t,t+1} \text{ (recovery value)} \]
Specific comments

- Taylor rule

\[
\ln \left( \frac{r_t}{\bar{r}} \right) = \rho_r \ln \left( \frac{r_{t-1}}{\bar{r}} \right) + (1 - \rho_r) \left[ \rho_{\mu} \ln \left( \frac{\mu_t}{\bar{\mu}} \right) + \rho_y \ln \left( \frac{Y_t}{\bar{Y}} \right) \right] + \zeta_t
\]

- Compare to DNK models: \( \zeta_t \uparrow \implies r \uparrow, Y \downarrow, \text{(inflation)} \mu \downarrow, \) \( rr \uparrow \)

- A monetary policy shock \( \zeta_t \uparrow \implies \mu \downarrow (\text{?}), \text{Default} \uparrow, \text{Debt} \uparrow, \) \( I \downarrow, Y \downarrow, C \uparrow, N \downarrow, r_f \downarrow \)

- A negative TFP shock \( \implies Y \downarrow, \mu \uparrow (\text{?}), \text{Default} \downarrow, I \uparrow, \) \( C \downarrow (\text{?}), N \downarrow, r_f \uparrow \)

- A negative wealth shock \( (\delta \downarrow) \implies Y \uparrow, C \downarrow, I \uparrow, N \uparrow, \) \( \mu \uparrow, r \uparrow \)

- What is the intuition? Log-linear analysis

- Financial shocks?
Specific comments

- Numerical method?
- Calibrate $c$?
- Which parameters are chosen to match what targets?
- What empirical facts to explain?
Conclusion

- Provide a tractable DSGE model with finite maturity nominal debts
- Related Literature should be more fairly discussed
- More intuition is needed for results related to impulse responses
- Exposition can be improved (proofs, typos, details...)