Discussion of
Payments, Credit and Asset Prices
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• A very meaty paper!

• Detailed micro model of liquidity in the banking system:
  → macro implications for inflation and asset prices
  → aggregate liquidity management by government
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  → aggregate liquidity management by government

• Each partial equilibrium problem is simple and intuitive. Yet, this results in rich general equilibrium interactions
Structure of the model

• Endowment economy with three endogenous macro outcomes
  — consumption, inflation, asset prices

• Three types of agents
  — households, banks, government

• Multiple assets
  — deposits, reserves, short-term debt, bank equity, stock market

• Two types of frictions in the payment system:
  1 Liquidity constraints (cash-in-advance)
    — on both households and banks
  2 Costly leverage (collateral “requirements”)
    — on both banks and government

• “Neoclassical” limit (or “Friedman rule”):
  — no constraint binds, collateral costs are zero
Household liquidity (cash-in-advance) constraint:

\[ P_t C_t \leq D_{t-1} \implies i_t^D \leq i_t^h \]
Mechanism

1. Household liquidity (cash-in-advance) constraint:

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2. Bank liquidity (liquidity ratio \( \lambda_t = M_t / D_t \)):

\[ \tilde{\lambda}_t D_{t-1} \leq M_{t-1} + F_{t-1} \quad \Rightarrow \quad i_t^R, i_t \leq i_t^h \]
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3. Bank cost of leverage \( c(\kappa_t) \), where collateral ratio:

\[ \kappa_t = \frac{M_t + B_t + \rho Q_t \theta_t}{D_t + F_t} \implies i_t^R \leq i_t \leq i_t^Q \leq i_t^h \]
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Government sets: \( i_t^R, g_t = \Delta M_t / M_t \) and \( b_t = B_t^g / M_t \)
Macro Outcomes

1. Consumption:

\[ C_t = \bar{\bar{Y}} - \text{Cost of Leverage}_t \]

2. Price Inflation:

\[ P_t = \frac{D_{t-1}}{C_t} \]

3. Asset prices

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All shaped by endogenous choices of liquidity and collateral ratios, \( \lambda_t \) and \( \kappa_t \)
Figure 3: The blue line is the liquidity management curve. The green line is the capital structure curve. In the yellow shaded region, reserves are abundant, $\lambda \geq \bar{\lambda}$.

The interest rate on bonds, the real price of trees and the interest rate on deposits are given by

$$i = \delta + \pi + c'(\kappa), \quad q = x \delta + \rho c'(\kappa), \quad (19)$$

$$i_D = \delta + \pi + c(\kappa) - c'(\kappa) \kappa + (c(\kappa) - c'(\kappa) (\kappa - 1)) \int_{\bar{\lambda}}^{\lambda} G(\tilde{\lambda}) \, d\tilde{\lambda}. \quad (20)$$

The proof is in Appendix A.6. We now describe where the curves come from and then use them for graphical analysis.

Figure 3 plots both curves. It divides the $$(\lambda, \kappa)$$-plane into two regions: in the white region with $\lambda < \bar{\lambda}$, reserves are scarce, banks' liquidity constraint sometimes bind and there is an active interbank credit market. In the yellow shaded region with $\lambda \geq \bar{\lambda}$, reserves are abundant, bank liquidity constraints never bind and no bank borrows overnight. Equilibrium could in principle be in either region.

The figure can also be used to track several other variables that are simple function of $\lambda$ and $\kappa$.

From (19), the real interest rate on bonds is monotonically increasing in the collateral ratio, so it can be read along the vertical axis. Similarly, the tree price declines in $\kappa$. Moreover, the short run response of inflation in (15) depends importantly on the change in the money multiplier $1/\lambda$ that can be inferred from movement along the horizontal axis.

The liquidity management curve is derived from banks' first order condition for reserves in (10). Banks' opportunity cost of holding reserves on the left-hand side is equal to the sum of the collateral benefit and the expected liquidity benefit of reserves on the right-hand side. A liquidity benefit accrues only if there is a chance that the bank's liquidity constraint binds, that is, if $\lambda < \bar{\lambda}$ and hence $G(\lambda) < 1$.

In general equilibrium, the liquidity benefit equals the leverage cost saved by not accessing the

- **Two curves:**
  1. Liquidity management: FOC of the banks (for $\kappa_t$ given $\lambda_t$)
  2. Capital structure: definition of the collateral ratio $\kappa_t$ in GE
Analysis

Two curves:

1. Liquidity management: FOC of the banks (for $\kappa_t$ given $\lambda_t$)
2. Capital structure: definition of the collateral ratio $\kappa_t$ in GE

Continuous-time limit for tractability. What is cash-in-advance in continuous time?

$$P_t C_t \cdot \Delta \leq D_{t-1} \cdot \Delta$$
• Two tradeoffs for a model:
  1. detailed vs concise model of monetary transmission
     — when should we use which one?
     — is there a useful reduced form?
  2. ad hoc vs micro-founded modeling of leverage costs
     — ad hoc is fine in partial equilibrium, but is it innocuous in general equilibrium?
     — probably not prudent to carry out optimal policy analysis with ad hoc costs
     — what is the nature of $\tilde{\lambda}_t$ shock and why it cannot be minimized?

• the only welfare objective: minimize collateral costs
  — endogenous output due to sticky prices
  — endogenous output due to financial frictions
• the basic fact: $i_t^D < i_t$
  — is it a sign of binding liquidity constraints or market power in the banking sector?
  — would the new technologies reduce the liquidity frictions, market power, or both?

• return on bank equity is strictly above the return on stock market when liquidity constraints bind: $i_t^h > i_t^Q$

• cross sectional variation in government $c_g(\cdot)$ would shape country outcomes for liquidity and collateral ratios $\lambda_t$ and $\kappa_t$, and hence the macro outcomes