Corporate Finance and Monetary Policy

Guillaume Rocheteau*    Randall Wright†    Cathy Zhang*

*U. of California, Irvine
†U. of Wisconsin, Madison

*Purdue University

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What we do

• A model of corporate finance and monetary policy
• How policy (with different instruments) affects:
  - firms’ financing choices (money and credit)
  - interest rates
  - investment
• Implications for pass through and transmission mechanism
  1. Pass through and microstructure
  2. Transmission and firm heterogeneity
Pass through
Key ingredients

1. Competing financing means: cash and credit
   - relevant empirically
     e.g., for small businesses (SSBF, 2003)
     - Liquid assets: 95%
     - Credit line or bank loan: 45%
     - Owner loans: 30%

2. Market for bank loans as an OTC market
   - bilateral contracts, search and bargaining
   - intensive and extensive margins of credit
Firms’ money demand, banks’ profitability
Our model

- Entrepreneurs
- Investment Opportunities
- Trade Credit
- Retained Earnings
- External Finance
  - Interbank Market
  - OTC Credit Market
- Internal Finance
  - Banks
1. **Pass through** from nominal policy rate to real lending rate
   - without nominal rigidities, segmentation, regulation
   - depends on credit frictions, policy instruments, etc.

2. **Transmission mechanism**
   - disconnect between pass through and transmission
   - depends on firms’ characteristics, credit frictions
   - policy implementation, e.g., OMOs

3. **By-products**: topical phenomena (negative rates, liquidity traps)
New Monetarist approach to money, credit, and banking
- Money and credit: e.g. Sanches and Williamson (2010)
- Banking: e.g. Cavalcanti and Wallace (1999)

Frictions in credit market
- Limited pledgeability: e.g. Kiyotaki and Moore (1997)
- Search frictions: e.g. Wasmer and Weil (2004)
- Intermediation spreads: e.g. Duffie et al. (2005)

Corporate finance and policy: e.g. Bolton and Freixas (2006)

Monetary policy and transmission: e.g. Bernanke et al. (1999)
ENVIRONMENT
• Time: \( t = 0, 1, 2..., \infty \)

• Each period has two stages:
  1. Competitive market for capital \((k)\)
     OTC market for bank loans
  2. Production \((y)\) and settlement of debts

• Capital is durable across stages but not across periods
Agents

- 3 types of agents
  1. Suppliers: produce $k$
  2. Entrepreneurs: transform $k$ into $y$
  3. Banks
Preferences

\[ U(c, h) = c - h \]

- Discount factor: \( \beta = 1/(1 + \rho) \)
Technologies

- **Entrepreneur’s technology:**
  \[ y = \varepsilon f(k) \text{ where } \varepsilon \in \{0, 1\} \]
  where \( \{\varepsilon_t\} \text{ iid with } \Pr(\varepsilon_t = 1) = \lambda \)

- **Supplier’s technology:**
  \[ k = h \]
Limited enforcement/commitment

- \( k \) in stage 1 \( \rightarrow \) \( y \) in stage 2
- Entrepreneurs cannot commit to repay in stage 2
- Suppliers have no recourse (no trade credit)
  (in paper: \( \chi_s f(k) \) is pledgeable to suppliers)
1. issue short-term liabilities
   - can serve as means of payment because banks can commit to repay
2. supply loans
   - can enforce repayment up to $\chi_b f(k)$ where $\chi_b \in (0, 1]$
Frictions in credit market

- $\alpha \in (0, 1]$ pairwise meetings between entrepreneurs and banks
  - delays to get loan application accepted
- Short-lived relationships: destroyed at end of period
- Terms of loan contract determined through bargaining
EXTERNAL FINANCE
Bank credit

- Loan contract: loan size, $k$, and interest payment, $\phi$

  Entrepreneur’s surplus : $S^e = f(k) - k - \phi$
  Bank’s surplus : $S^b = \phi$

- Nash bargaining s.t. pledgeability constraint:

  $\max (S^e)^{1-\theta} (S^b)^{\theta}$  s.t.  $k + \phi \leq \chi_b f(k)$
Terms of the loan contract

1. If $\chi_b \geq \chi_b^*$, then $k = k^*$ and
   \[ \phi = \theta \left[ f(k^*) - k^* \right]. \]

Lending rate

\[ r \equiv \frac{\phi}{k} = \frac{\theta \left[ f(k^*) - k^* \right]}{k^*} \]

2. If $\chi_b < \chi_b^*$, pledgeability binds

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<td>$\phi$</td>
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INTERNAL FINANCE
Adding money

- Investment can be financed with earnings retained in cash
- Supply of money: $M_{t+1} = (1 + \pi)M_t$
- Unbanked entrepreneur with $a^e_m$ real balances:

$$\Delta^m(a^e_m) = \max \{ f(k^m) - k^m \} \text{ s.t. } k^m \leq a^e_m$$
Terms of loan contract

\[(k, d, \phi) \in \arg \max \left[ \begin{array}{c}
\text{profits} \\
\text{disagreement}
\end{array} \right] (f(k) - k - \phi - \Delta^m(a^e_m))^{1-\theta} \phi^\theta \]

s.t. \[k - d + \phi \leq \chi_b f(k)\]

\[d \leq a^e_m\]

1. Money raises financing capacity, \(\chi_b f(k) + a^e_m\)
2. And affects bargaining position, \(\Delta^m(a^e_m)\)
Terms of loan contract

- If liquidity constraint does not bind: $k^c = k^*$
- Lending rate decreases with $a_m^e$

$$r = \frac{\theta \left[ f(k^*) - k^* - \Delta^m(a_m^e) \right]}{k^* - a_m^e}$$
Coexistence of money and credit

- Entrepreneurs retain earnings in cash to maximize:

\[-ia_m^e + \lambda (1 - \alpha) \Delta^m (a_m^e) + \lambda \alpha \Delta^c (a_m^e)\]

internally financed

banked financed

where \(1 + i = (1 + \rho)(1 + \pi)\)

- RESULT #1: For all \(i > 0\) and \(\chi_b > 0\), money and credit coexist if \(\lambda (1 - \alpha) > 0\) or \(\lambda \alpha \theta > 0\)
RESULT #2: Nominal rate affects real lending rate

- No regulation
- No nominal rigidity
- No market segmentation

For small $i$:

$$r \approx \frac{\theta}{2\lambda [1 - \alpha(1 - \theta)]} i$$
\[ f(k) = k^{1/3}, \quad \theta = 0.16, \quad \alpha = 0.9, \quad \lambda = 2/3 \]
**RESULT #3**: Disconnect between pass through and transmission

For small $i$, aggregate investment is

\[
K \approx \lambda \alpha k^* + \lambda (1 - \alpha) k^* + \frac{(1 - \alpha)i}{f''(k^*) [1 - \alpha(1 - \theta)]}
\]

- $\partial r / \partial i$ (pass through) $\uparrow$ with $\alpha$ and $\theta$
- $|\partial K / \partial i|$ (transmission) $\downarrow$ with $\alpha$ and $\theta$
Transmission with 2 channels

**RESULT #4:** Transmission changes qualitatively when liquidity constraint binds, \( i \geq \bar{i} \)

\[
k_c - k^* \approx \frac{1}{1 - \chi_b} \frac{k^m - \bar{k}}{(i - \bar{i}) D}
\]
Transmission and pass through

- $f(k) = k^{1/3}$, $\theta = 0.16$, $\alpha = 0.9$, $\lambda = 2/3$
Firm heterogeneity

- firms’ characteristics: $f(k) = k^{\gamma}, \chi_b, \lambda, \alpha$
INTERBANK MARKET
Policy with different interest rates
Interbank market

- Reserve requirement:

\[
\text{Reserves} = \nu \times \ell
\]

- A competitive interbank market in stage 1
- Banks can commit to repay intra-period loans to other banks
- Interbank rate: \( i_f \)
RESULT #5: $i$ and $i_f$ have distinct pass through rates

For small $i > \lambda \nu i_f$, 

$$r \approx \nu i_f + \frac{\theta (i - \lambda \nu i_f)}{2\lambda [1 - \alpha(1 - \theta)]}$$

Transmission:

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OMO in interbank market

- $M$ increases by $\mu M > 0$ to purchase bonds
- Asset purchases in stage 2 are neutral
- Purchases in the interbank market are non-neutral
- Redistribution of liquidity
  1. Entrepreneur’s real balances fall
  2. Bank-financed investment increases
- Interbank rate decreases
Conclusion: Follow-up projects

1. Lending relationships and optimal policy (Rocheteau, Wong, and Zhang 2016)
   Policy trade-off: lending relationship creation vs self-insurance

2. Life cycle of firms, money demand, and financing choices
   Dynamics of money accumulation and access to banking

3. Alternative market and information structures
   Adverse selection in loan market under competitive search