Lending Relationships and Monetary Policy

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Motivation

- Financial Intermediation and different short term interest rates have been receiving increasing attention in the monetary economics literature. Is banking channel of monetary policy important? Should the central bank care about short term rates interest rates other than the base (repo) rate?
- Two clusters: Banks produce loans and deposits - Goodfriend and McCallum (2007) and Costly State Verification - Bernanke, Gertler, and Gilchrist (1999).
- Firm-Bank Relationships or Lending Relationships have been so far neglected.

Motivation II

- Lending relationships are directly aimed at resolving the problems of asymmetric information.
- Firms may release more information to a bank than it does to the market. Banks may invest in acquiring information if they know there is potential to profit from a long lasting relationship. Main benefit - improve flow of information.
- Problem - there is also a (hold-up) cost. After relationships are formed banks gain information advantage which translates into market power. It is costly for a firm to switch banks, since it has to work on reducing information asymmetries again.

Motivation III

Why should one look at Firm-Bank Relationships?

- Banking spread (markup) are countercyclical after controlling for credit spread (Aliaga-Diaz and Olivero (2007)).
- Banking spreads change by as much as 95 bp in a recession for firms without access to bond market in the U.S. (Santos and Winton (2008)) .

This paper

Primary Objectives

- Provide a simple theoretical framework that augments NKM model with Firm-bank relationships
- Analyze its effects on credit market outcomes, economic activity and monetary policy.

Main Questions

- How do banking spreads move when lending relationships are present?
- Do banking spreads affect monetary policy or should the central bank care about them?
- Should the base rate respond directly to credit variables or responding to output gap and inflation suffice?
- Do firm-bank relationships have any impact on the determinacy properties of the NKM model?

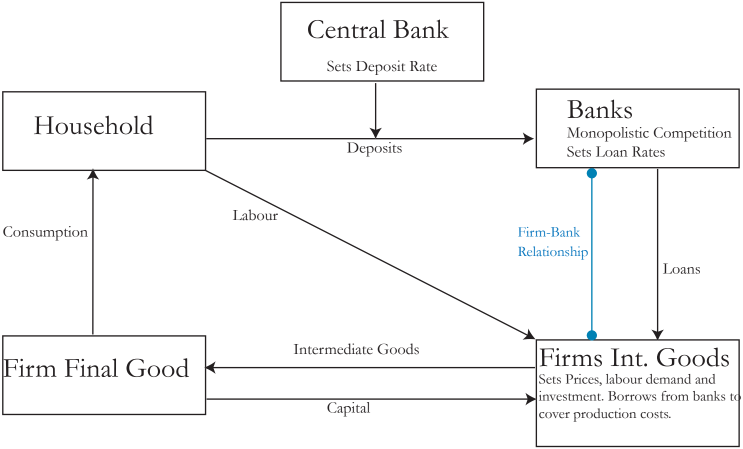
Main results

- Banking spreads move countercyclicaly generating amplified output responses,
- Spread movements are important for monetary policy making even when a standard Taylor rule is employed,
- Modifying the policy rule to include a banking spread adjustment improves stabilization of shocks and increases welfare when compared to rules that only respond to output gap and inflation, and finally
- The presence of strong lending relationships in the banking sector can lead to indeterminacy of equilibrium, forcing the central bank to react to spread movements.

Literature

- Goodfriend and McCallum (2007) stress the importance of different short term interest rates.
- De Fiore and Tristani (2008) shows that the natural rate dynamics is impacted by credit frictions, thus monetary policy should be conducted by the appropriate model that incorporate them.
- Curdia and Woodford (2008) analyze the impact of ad-hoc credit spread movements onto monetary policy also looking at credit adjusted spread monetary rules. Spread adjusted rules perform better than Standard Taylor rules.

Economic Structure



Intermediate Firms

- We divide the intermediate firm problem into three parts - Pricing, Production and Financial Problems
- Pricing Problem - Standard Calvo Scheme (no inflation indexation)

$$p_{i,t} = \frac{\varepsilon}{\varepsilon - 1} \frac{E_t \left\{ \sum_{s=0}^{\infty} \frac{C_{t+s}^{-\sigma}}{C_t^{-\sigma}} (\omega\beta)^s \Lambda_{t+s} Y_{t+s} \left(\prod_{k=1}^{s} \pi_{t+k} \right)^{\varepsilon} \right\}}{E_t \left\{ \sum_{s=0}^{\infty} \frac{C_{t+s}^{-\sigma}}{C_t^{-\sigma}} (\omega\beta)^s Y_{t+s} \left(\prod_{k=1}^{s} \pi_{t+k} \right)^{\varepsilon - 1} \right\}}$$

Firms II - Production Problem

- Production Problem - Firms must borrow to pay for labour and investment costs.

$$\min_{K_{i,t+1},H_{i,t}} E_t \left\{ \sum_{t=0}^{\infty} Q_{0,t} \left({R_{t,i}}^{\gamma_1} W_t H_{i,t} + {R_{t,i}}^{\gamma_2} P_t I_{i,t} \right) \right\}$$

- F.O.C.

$$\begin{aligned} \Lambda_t &= \frac{R_t^{\gamma_1} W_t H_{i,t}}{P_t Y_{i,t}(1-\alpha)} \\ R_t^{\gamma_2} &= E_t \left\{ \frac{\pi_{t+1}}{R_{CB,t}} \left[\Lambda_{t+1} \frac{\alpha Y_{i,t+1}}{K_{i,t+1}} + (1-\delta) R_{t+1}^{\gamma_2} \right] \right\} . \end{aligned}$$

- γ_1 and γ_2 control degree of cost channel of monetary transmission.

Firms III - Financial Problem

- Financial Problem - Select the banks to acquire the necessary funds to pay salaries and investment.
- Simple way to incorporate a switching cost - assume each firm has an intrinsic preference to continue doing loans with the banks it dealt with in the previous period. Firm i cares about a measure $X_{t,i}$ given by (see Ravn, Schmitt-Grohe, and Uribe (2006))

$$X_{t,i} = \left[\int_0^1 \left(L_{t,i,j} - \theta L_{t-1,j} \right)^{1-\frac{1}{\varrho}} dj \right]^{\frac{1}{1-\frac{1}{\varrho}}} .$$

- Resulting demand for loans for bank j considering that all firms are equal is given by

$$L_{t,j} = \left(\frac{R_{t,j}}{R_t} \right)^{-\varrho} X_t + \theta L_{t-1,j}$$

Banks

- Banks profits are given by

$$\Pi_{t,j}^{B} = R_{t,j} L_{t,j} - R_{t,CB} D_{t,j} - \frac{\psi}{2} \left(\frac{\mu_{t,j} - \mu_{t-1,j}}{\mu_{t-1,j}} \right)^2 L_t .$$

- Where $\mu_{t,j} = R_{t,j} / R_{t,CB}$ is the banking spread (markup).
- Motivate AC by the existence of adverse effects of spread changes on the firm-bank relationships, which increase in magnitude with the size of the spread change.

Banks II

- F.O.C.

$$
\begin{aligned}
L_t R_t &= \eta \nu_t X_t + \psi \left(\frac{\mu_t}{\mu_{t-1}} - 1 \right) \frac{\mu_t}{\mu_{t-1}} L_t - E_t \left[Q_{t,t+1} \psi \left(\frac{\mu_{t+1}}{\mu_t} - 1 \right) \frac{\mu_{t+1}}{\mu_t} L_{t+1} \right] \\
\nu_t &= \frac{(\mu_{t,j} - 1)}{\mu_t} R_t + E_t \left[Q_{t,t+1} \theta \nu_{t+1} \right].
\end{aligned}
$$

- Credit market clearing conditions are given by

$$
\begin{aligned}
X_t + \theta L_{t-1} &= \gamma_1 W_t H_t + \gamma_2 P_t I_t \\
X_t &= L_t - \theta L_{t-1}.
\end{aligned}
$$

Equilibrium

- Consumption Euler Equation, Investment Equation, Marginal Cost, Good Market Clearing Condition, Philips Curve, Credit Market Clearing Conditions and the Two Bank F.O.C..
- Close the model with a monetary rule that sets $R_{CB,t}$. Linearized Standard Taylor Rule

$$\widehat{r}_{t,CB} = \epsilon_y \widehat{y}_t + \epsilon_\pi \widehat{\pi}_t + \epsilon_r \widehat{r}_{t-1,CB}.$$

- Numerical Analysis - Standard parameter values - $\overline{\mu} = 1.005 \Rightarrow$ Annual Spread of 2%. $\gamma_1 = \gamma_2 = 1$. $\theta = 0.75$ and $\psi = 25$.

Figure 1: Cyclical Properties of Banking Spread - $\theta = 0.75$, $\psi = 25$

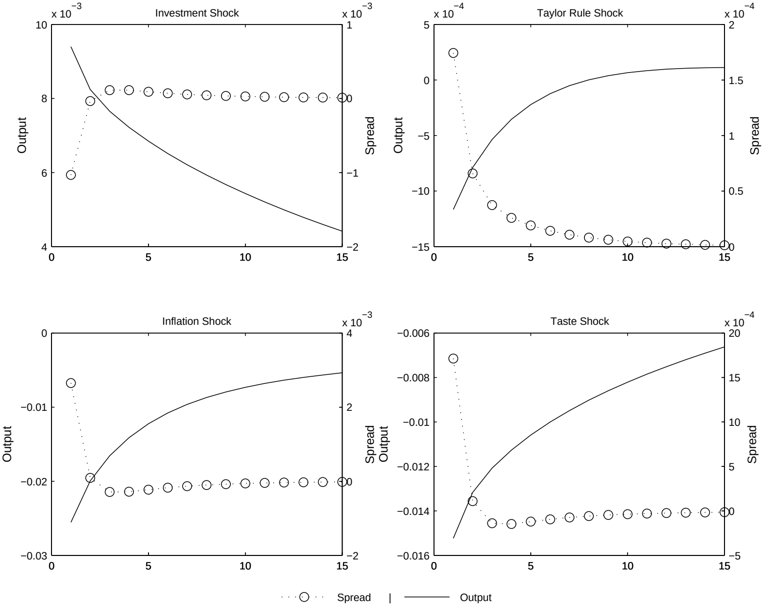


Figure 2: Endogenous Spread and Amplification of Output Responses

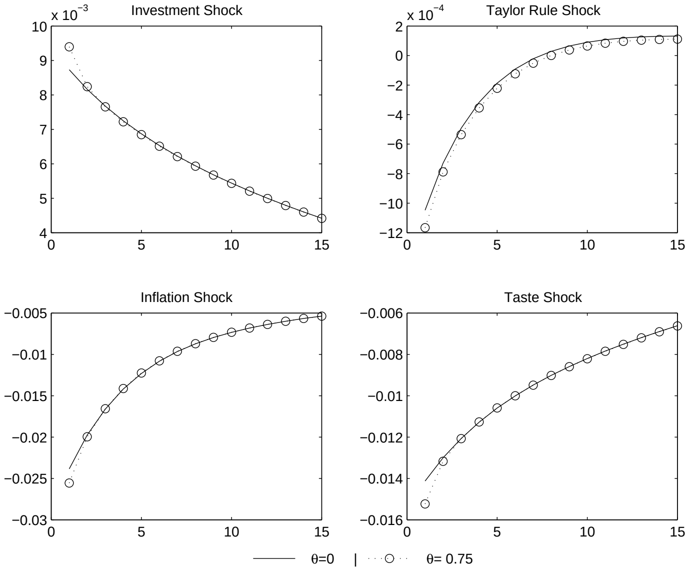


Figure 3: Endogenous Spread and Base Rate Response

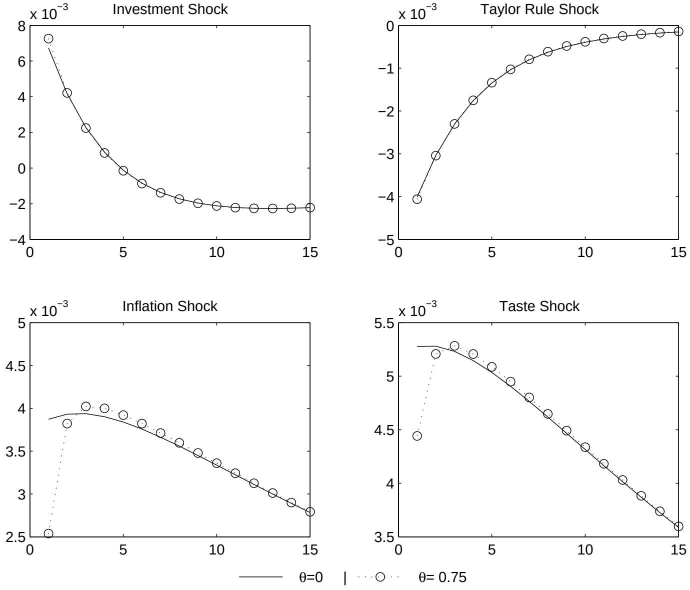
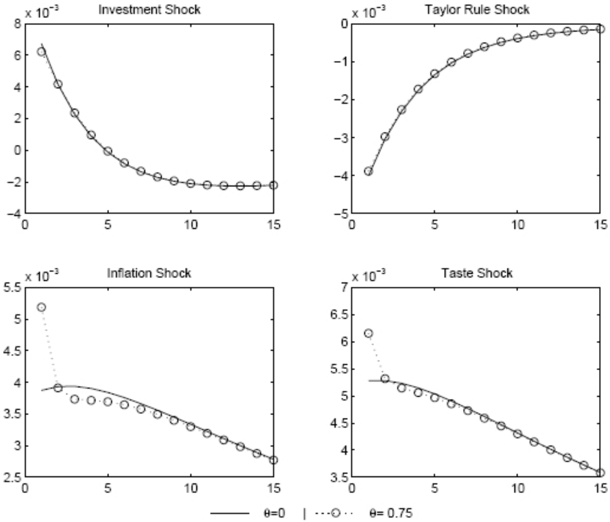
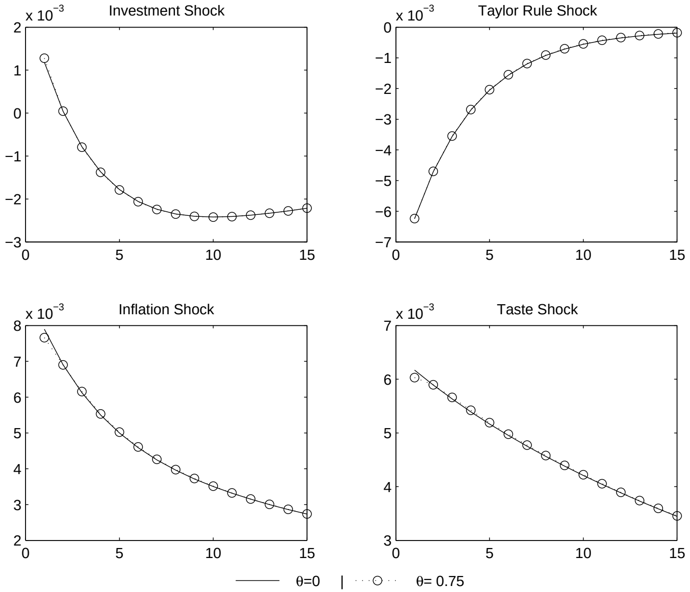


Figure 3: Endogenous Spread and Interest Rate Response



(a) Loan Rates

Figure 8: Endogenous Spread and Inflation Responses



Adjusted Taylor Rules

- We consider two adjusted Taylor Rules
- Spread - Adjusted Monetary Rule

$$\widehat{r}_{t,CB} = \epsilon_y \widehat{y}_t + \epsilon_\pi \widehat{\pi}_t + \epsilon_r \widehat{r}_{t-1,CB} - \epsilon_\mu \widehat{\mu}_t,$$

- Credit Aggregates - Adjusted Monetary Rule

$$\widehat{r}_{t,CB} = \epsilon_y \widehat{y}_t + \epsilon_\pi \widehat{\pi}_t + \epsilon_r \widehat{r}_{t-1,CB} + \epsilon_l \widehat{l}_t,$$

Figure 4: Spread-Adjusted Taylor Rule

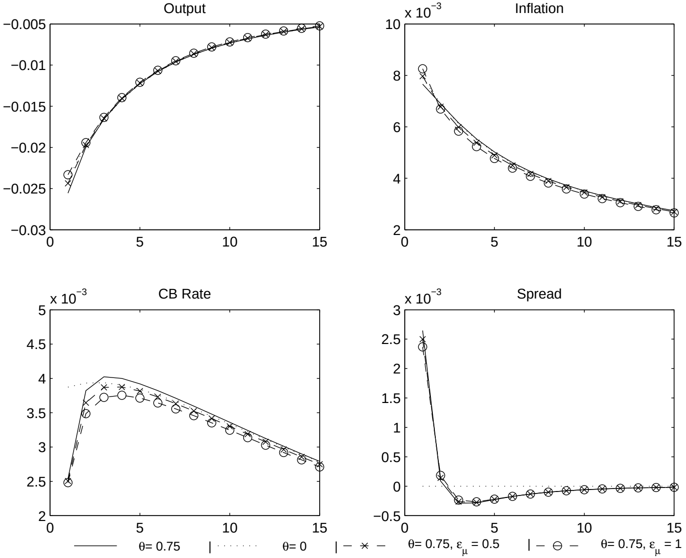
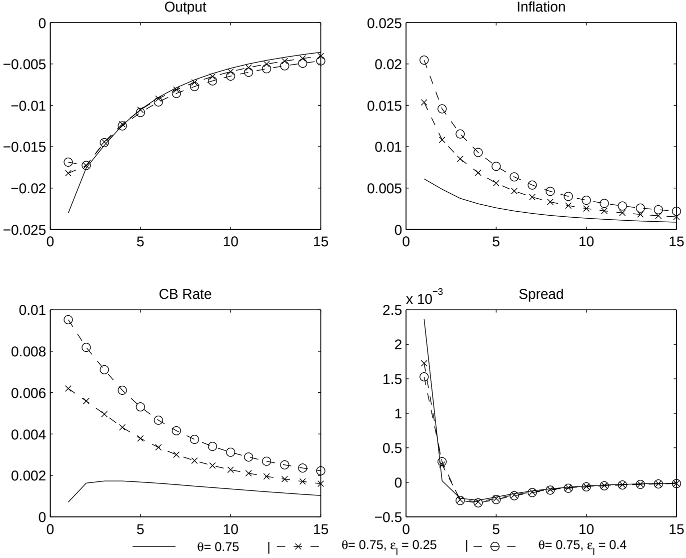


Figure 10: Credit-Adjusted Taylor Rule - Inflation Shock



Welfare Results

Table 1: Monetary Policy Rule - Welfare Analysis

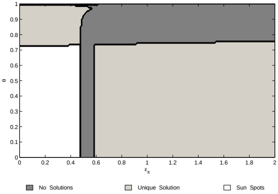
		$\epsilon_r = 0$			$\epsilon_r = 1$		
		ϵ_μ			ϵ_μ		
		0	0.5	1	0	0.5	1
ϵ_y	0	0.00%†	0.01%	0.02%	0.00%†	0.02%	0.04%
	0.1	0.00%	0.01%	0.02%*	0.02%	0.04%	0.05%
	0.2	-0.01%	0.00%	0.01%	0.03%	0.04%	0.05%*
	0.3	-0.06%	-0.05%	-0.04%	0.03%	0.04%	0.05%
	0.4	-0.17%	-0.16%	-0.14%	0.03%	0.04%	0.04%
	0.5	-0.44%	-0.42%	-0.41%	0.01%	0.02%	0.02%
		ϵ_l			ϵ_l		
		0	0.2	0.4	0	0.2	0.4
ϵ_y	0	0.000%†	-0.056%	-2.215%	0.000%†	0.049%*	-0.070%
	0.1	0.002%*	-0.191%	-25.178%	0.021%	0.033%	-0.140%
	0.2	-0.012%	-0.536%	-**	0.032%	0.007%	-0.243%
	0.3	-0.057%	-1.644%	-	0.034%	-0.032%	-0.400%
	0.4	-0.168%	-7.930%	-	0.028%	-0.091%	-0.650%
	0.5	-0.443%	-	-	0.012%	-0.179%	-1.072%

† Indicates the reference policy for that quadrant

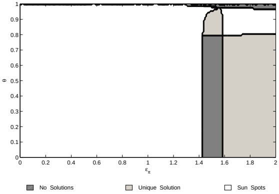
* Indicates the best set of policy parameters for that quadrant

** A dash indicates there was no unique equilibrium for these policy parameters.

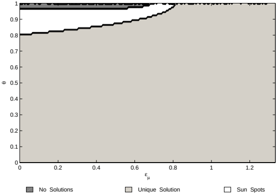
Figure 6: Indeterminacy Analysis - Effect of Firm-Bank Relationship



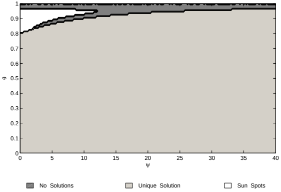
(a) Varying ϵ_π setting $\epsilon_y = 0.5$, $\epsilon_r = 1$



(b) Varying ϵ_π setting $\epsilon_y = 0.5$, $\epsilon_r = 0$



(c) Spread-Adjusted Policy Rule



(d) Effect of Spread Adjustment Costs

Conclusions

- Lending Relationships generate countercyclical banking spreads and sizable increases to spread in recessions matching empirical findings.
- Countercyclical banking spreads lead to output amplification and potential indeterminacy problems.
- Even under standard monetary policy rules the base rate responds to movements in spread, thus Monetary Policy setting that does not account for different short term rate dynamics may be sub-optimal.
- Monetary Rules that respond directly to spread movements are more suited to stabilize shocks and moreover lead to higher conditional welfare levels.

Future Research

- Take the model to the data, trying to measure strength of firm-bank relationships. More reliable quantitative analysis.
- Banks managing maturity mismatches in the Balance Sheet. IR and Spread Term Structure.

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