Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance

by

Kashyap, Stein and Wilcox (1993) AER
Motivation

- For some borrowers, non-bank credit is NOT a perfect substitute of bank loans → tight monetary policy may contract economic activity beyond what the money channel can explain.


- *Identification Problem*: (Bernanke and Blinder, 1992) the decline in loans due to a monetary policy shock could be a decline in loan demand rather than a decline in loan supply.

Strategy

- Study the response of non-bank and bank credit to monetary tightenings, in particular, the commercial paper market. If the only channel operating is the typical money channel, it should not change the composition of credit sources.
I. The Model

- In the usual IS-LM model there are only 2 assets: money and bonds. Here we need three: money, bonds, and securities.

- Investment, \( I \), can be financed by a fraction:
  
  - \( \alpha \) with bank loans at a rate \( r_l \)
  - \((1 - \alpha)\) with commercial paper at a rate \( r_p \)

- Assume markets clear

- Assume there are benefits from borrowing from a bank, \( R = If(\alpha) \), where \( f(.) \) is increasing and concave (key ingredient).
The optimal mix $\alpha^* = F(r_l - r_p)$ where $F(.) = f^{-1}(.)$ and therefore, $F(.)$ is decreasing in the interest rate differential. Therefore, any shock disturbing the cost of loans relative to commercial paper shifts the firm’s financing mix.

The net cost of capital, $k$, is

$$k = r_p + \alpha^* (r_l - r_p) - f(\alpha^*)$$

$$\min_{\alpha} k \Rightarrow$$

F.O.C.

$$r_l - r_p = f'(\alpha) \Rightarrow \alpha^* = f'^{-1}(r_l - r_p)$$
Other elements of the model:

\[ I = I^d (Y, k) \]
\[ Y = I + G \quad G \text{ is autonomous demand and is not explicitly modeled} \]
\[ r_p = H(Y, M) \quad \text{the LM curve} \]
\[ L^s = J(r_l - r_p)M \quad \text{is the loan supply by banks, } J' > 0 \]
\[ L^s = L^d \Rightarrow J(r_l - r_p)M = \alpha * I \]

- \( r_l \) and \( r_p \) are determined by monetary policy
- Given \( M \) and \( G \), the above equations can be solved for \( Y, I, k, r_l, r_p, \) and \( \alpha^* \)
Two necessary conditions for a lending channel to exist beyond the money channel:

1. Loans and paper are imperfect substitutes as bank assets. A contraction in money must not mean that banks imply liquidate assets. There must also be an incentive to reduce bank holdings. Here, this is made operational via the investment specification.

2. Loans and paper are imperfect substitute forms of finance, i.e., firms cannot costlessly move from loans to commercial paper. This wedge is made explicit by the benefits of bank relations modeled in \( R \).

Checking condition 1

From \( \alpha^* = F(r_l - r_p) \Rightarrow \frac{d\alpha^*}{dM} = F' \frac{d(r_l - r_p)}{dM} \). Only if \( \frac{d(r_l - r_p)}{dM} = 0 \) then \( \frac{d\alpha^*}{dM} = 0 \) and firms do not alter their financing mix.
Checking condition 1 (cont.)

- From $L^d = \alpha^* I \Rightarrow \frac{dL}{dM} = \alpha^* \frac{dI}{dM} + I \frac{d\alpha^*}{dM}$. Note that $\frac{dL}{dM} > 0$ even if $\frac{d\alpha^*}{dM} = 0$ (i.e. perfect substitutability between loans and c. paper) since $\frac{dI}{dM} > 0$ (this is the problem in Bernanke and Blinder, 1992).

- $\frac{d\text{Paper}}{dM} = (1-\alpha^*) \frac{dI}{dM} - I \frac{d\alpha^*}{dM}$ therefore, money tightening reduces investment and the demand for all forms of financing but it also implies a substitution away from loans and into paper. This suggests we should examine the correlation between paper and monetary policy.
Checking condition 2

- The Modigliani-Miller theorem would suggest the value of the firm is invariant to the choice of debt-equity mix.

- If M-M holds, the choice of loans/c. paper mix should be uninformative about investment activity. This suggests checking condition 2 by looking at the relationship between $\alpha^*$ and investment.

- Recall:

\[
I = I(Y,k) \\
k = r_p + \alpha^* (r_i - r_p) - f(\alpha^*) \\
\frac{dI}{d\alpha} = I_k \left( \left[ r_i - \frac{r_p}{\alpha} \right] - f' \right) > 0
\]
• **Heterogeneity:** Large firms tend to use commercial paper only, small firms loans only. This suggests that only mid-size firms are in a position to significantly modify their financing mix.
II. Monetary Policy and the Composition of External Finance

Examine the correlation of commercial paper and monetary policy and the financing mix and monetary policy.

Measures of the stance of monetary policy:

1. The Romer Dates
2. The Federal Funds Rate
3. The Fed Funds Rate to 10-year, T-Bond spread

Defining $\alpha$

$$\alpha = \text{mix} = \frac{\log(\text{commercial loans})}{\log(\text{commercial paper})}$$
Evidence

- Romer and Romer:
  - Focus on movements in commercial paper, bank loans and the *mix* in the year before and three years following each Romer date.
  - Then calculate the sample average trend:
    - c. paper grows at or above trend over the first year after the date.
    - there is little action in bank loans initially but after 2 years they are usually below trend.
    - the *mix* declines markedly.

- Granger-causality tests
  - There is a statistically significant increase in the prime-c. paper spread subsequent to a monetary contraction.
• Granger-causality tests (cont.)

  o Increases in commercial paper volume after monetary tightenings likely represent substitution away from bank loans rather than substitution away from other non-bank sources of finance since bonds typically move in the same direction. *This suggests movements are due to supply effects.*
III. Composition of External Finance and Real Activity

Basic Question: Does the financing mix add additional explanatory power to investment equations beyond that included in interest rate variables?

Three classical empirical models:

- the “accelerator”
- the “neoclassical”
- Q-model
The “Accelerator

Assume the desired capital stock is a proportion of output

\[ K^* = \alpha Y + \text{adj. costs} \]

Let \( I^N \) be net investment

\[
I^N_t = \mu + \sum_{s=0}^{N} \beta_s \Delta K^*_{t-s} = \mu + \sum_{s=0}^{N} \beta_s \Delta Y_{t-s}
\]

normalizing by potential output,

\[
\left( \frac{I}{YP} \right)_t = \frac{\mu}{YP_t} + \sum_{s=0}^{N} \beta_s \left( \frac{\Delta Y_{t-s}}{YP_{t-s}} \right) + \delta \frac{K_{t-1}}{YP_t} + u_t
\]

\[ u_t = \rho u_{t-1} + \varepsilon_t \]
Neoclassical – Jorgenson

\[ K^* = \gamma \frac{pY}{C}; \ p \text{ is the price of output; } C \text{ is the rental price of capital.} \]

Assuming a Cobb-Douglas production function and setting \( \gamma \) as the share of capital,

\[
\left( \frac{I}{YP} \right)_t = \frac{\mu}{YP_t} + \sum_{s=0}^{N} \beta_s \left[ \Delta \left( \frac{pY}{C} \right)_{t-s} \right] + \delta \frac{K_{t-1}}{YP_t} + u_t
\]

\[ u_t = \rho u_{t-1} + \varepsilon_t \]
Q-model

If the market value of the firm exceeds the replacement costs of its assets, then it should seek to expand.

\[
\frac{I_t}{K_{t-1}} = \mu + \sum_{s=0}^{N} \beta_s Q_{t-s} + u_t
\]

\[
u_t = \rho u_{t-1} + \varepsilon_t
\]

\[
Q = \frac{\text{market value of the firm}}{\text{replacement cost}}
\]

Also check with inventory equations.

Given these specifications of investment equations, now expand them to include lags of the variable *mix* and lags of interest rates for the period 1964-1988 and do F-tests for joint significance.
Findings

- *mix* is a significant determinant of inventories even though interest-rate effects are usually not-significant.

- there is a positive correlation between bank loans and inventories.

- *mix* is important in equipment investment but not for residential investment.

Financing variables as predictors of economic activity

Essentially do a battery of Granger-causality tests of the 6-month CP-TBill spread and the *mix* variable a la Bernanke and Blinder (1992)

Finding: *mix* does better in latter samples, as the CP market becomes more important.
Brief comments on: “What do a million observations on banks say about the transmission of monetary policy?” AER (2000)

- Use quarterly data on every insured U.S. commercial bank from 1976 to 1993.

- Panel data on balance-sheet observations

- The impact of monetary policy shocks is stronger on banks with less liquid balance sheets (lower ratios of securities to assets) – this effect is mostly attributable to small banks.

- Finding: there is a significant bank lending channel but the question is how important is it quantitatively.