Economics 435
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Handout on Bernanke-Blinder

Consider an economy where bank credit is imperfectly substitutable for bond finance, as in Bernanke and Blinder (*AEA Papers and Proceedings* 1988), ***augmented by allowing the credit supply to depend on a shift variable, the "riskiness" of the marginal investment project.*** Banks hold liabilities of deposits. On the asset side, the banks hold loans, reserves and either domestic government debt.

Loan demand is given by:

$$L^d = \underset{-}{L}(\rho, \underset{+}{i}, \underset{+}{y}) \tag{1}$$

Loan supply is given by:

$$L^s = \underset{+}{\lambda}(\rho, \underset{-}{i}, \underset{-}{Z})D(1-\tau) \tag{2}$$

where Z is a measure of riskiness of the marginal investment project, and τ is the reserve ratio. The data generating process of Z is not modelled explicitly. The credit market equilibrium is given by equating loan supply and demand. ***Note: Z is not in the Bernanke-Blinder model.***

The money market equilibrium is given by equating the demand for deposits with the supply; hence the LM schedule is:

$$\underset{-}{D}(\underset{+}{i}, y) = mR \tag{3}$$

where m is the money multiplier, and R is the stock of reserves. (Excess reserves are ignored in this analysis.) The money multiplier is assumed constant. Allowing it to depend positively on the interest rate does not change the qualitative conclusions.

The CC curve is a conventional IS curve, except that it depends upon the bank lending rate as well as the interest rate:

$$y = \underset{-}{Y}(\underset{-}{i}, \rho) \tag{4}$$

Substituting money market equilibrium into the loan market equilibrium yields:

$$L(\rho, i, y) = \lambda(\rho, i, Z)mR(1-\tau) \tag{5}$$

Solving for the equilibrium loan rate, ρ, one obtains:

$$\rho = \varphi(\underset{+}{i}, \underset{+}{y}, \underset{-}{R}, \underset{+}{Z}) \tag{6}$$

In this formulation, the spread between the bank loan rate and the risk free rate, ρ-i, is a positive function of Z, the riskiness of the marginal project. The CC schedule is obtained by substituting (6) into (4).

To solve out the model analytically, work with the semi reduced form equation representing the CC equation is:

$$y = Y(i, \rho) \tag{6'}$$

Taking the total differential yields:

$$dY = Y_i di + Y_\rho(\rho_i di + \rho_Y dY + \rho_R dR + \rho_Z dZ) \tag{7}$$

Rearranging:

$$dY(1 - Y_\rho \rho_Y) = (Y_\rho \rho_i + Y_i)di + Y_\rho \rho_R dR + Y_\rho \rho_Z dZ \tag{8}$$

The LM curve is obtained by differentiating (5):

$$\begin{gathered} dD = m(dR) = D_i di + D_Y dY \\ m \equiv D_R \end{gathered} \tag{9}$$

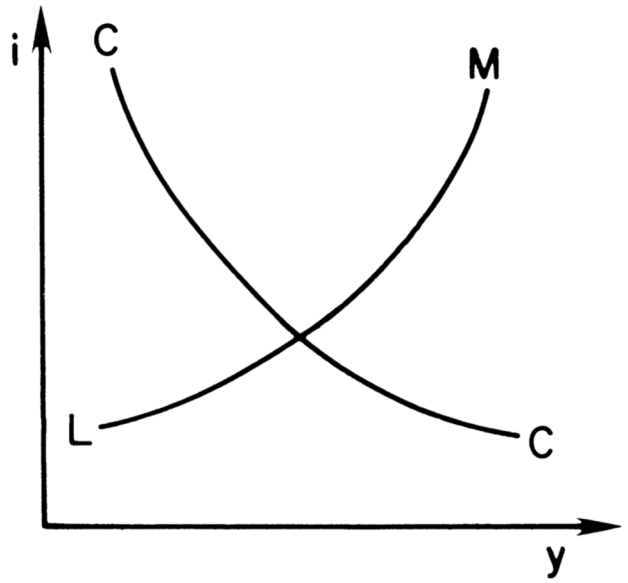

FIGURE 1

Solving for the deposit interest rate:

$$di = \frac{m(dR) - D_Y dY}{D_i} \tag{10}$$

Substituting (10) into (8):

$$dY\left[1-Y_\rho\rho_Y+\frac{(Y_\rho\rho_i+Y_i)D_Y}{D_i}\right]=\left[\frac{(Y_\rho\rho_i+Y_i)m}{D_i}+Y_{\bar{n}}\rho_R\right]dR+Y_\rho\rho_Z dZ \tag{11}$$

$$dY=\frac{1}{\Delta}\left\langle\left[\left(\frac{(Y_\rho\rho_i+Y_i)m}{D_i}\right)+Y_\rho\rho_R\right]dR+Y_\rho\rho_Z dZ\right\rangle \tag{12.1}$$

$$\Delta\equiv\left[1-Y_\rho\rho_Y+\frac{(Y_\rho\rho_i+Y_i)D_Y}{D_i}\right] \tag{12.2}$$

The comparative statics are summarized in the table below.

TABLE 1—EFFECTS OF SHOCKS ON OBSERVABLE VARIABLES

Rise in:	(1) Income	(2) Money	(3) Credit	(4) Interest Rate[a]
Bank Reserves	+	+	+	−
Money Demand	−	+	−	+
Credit Supply	+	+	+	+
Credit Demand	−	−	+	−
Commodity Demand	+	+	+	+

[a] On bonds.

Marginal risk – – – –

One can examine what happens graphically, and how policy can respond, in the Figure below.

- If riskiness of the marginal investment project rises (Z), the CC curve shifts in.
- If the money multiplier (*m*) falls, both the CC *and* LM curves shift in.
- If some financial institutions fail, both the CC *and* LM curves shift in.

Here, we take Z as exogenous. But if Z depends upon the level of economic activity, then one could have an adverse feedback loop, wherein the initial shift inward of CC results in an additional increase in Z and hence further inward shift of CC.

Application: 2007-08 Financial Crisis

The housing market collapse results in higher perceived risk for mortgage loans. The delinquency rate is the proportion of loans that are late in payments (blue line in Figure 2). The TED spread is the spread between Libor (an interest rate that large banks charge other large financial institutions to borrow) and the Treasury yield (at 3 month maturity). The TED spread is a proxy for the riskiness of lending (i.e., of $(\rho\text{-}i)$.) (The brown line in Figure 2.)

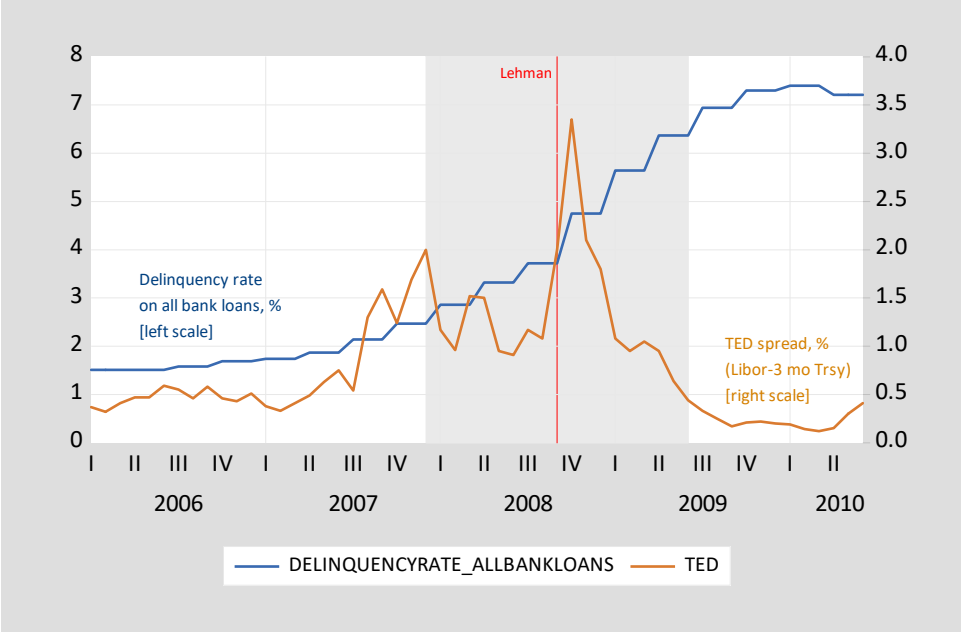

Figure 2: Bank loan delinquency rate, % (blue, left scale), and TED (Three month Libor minus Treasury) spread, % (brown, right scale). NBER defined recession dates shaded gray from peak to trough.

The rise in Z shifts in the CC curve (showing up as a reduction in lending relative to what it otherwise would have been), and the money multiplier (the link between money supply and money base, m) shrinks as banks tend not to reloan deposits, shifting in the LM curve (white arrows).

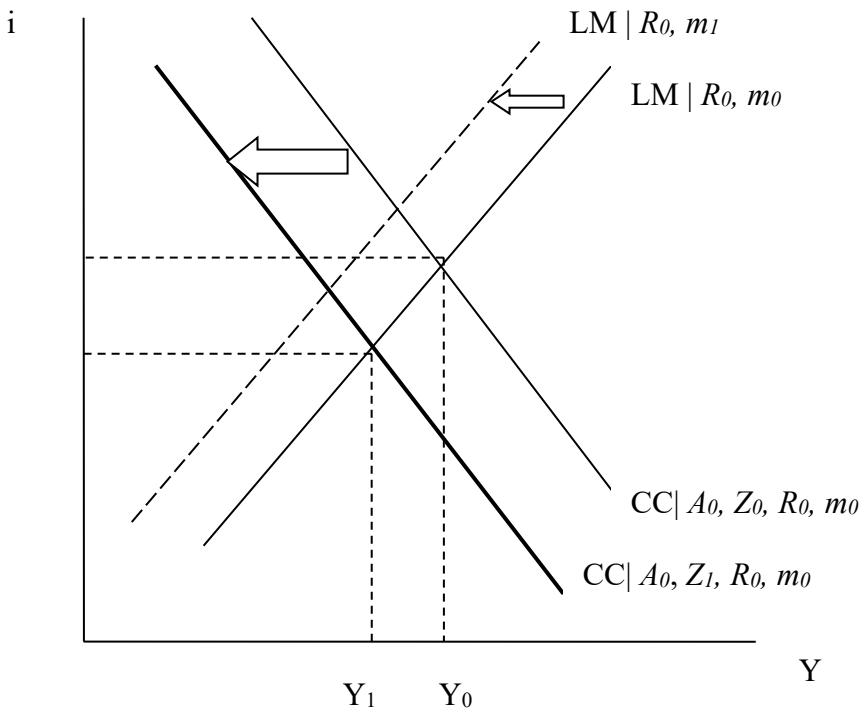

Figure 3: Shifts due to rise in risk, shrinkage in money multiplier.

In 2008, even before Lehman Brothers collapsed, bank lending was flattening out. Below in Figure 4 is bank lending (blue line).

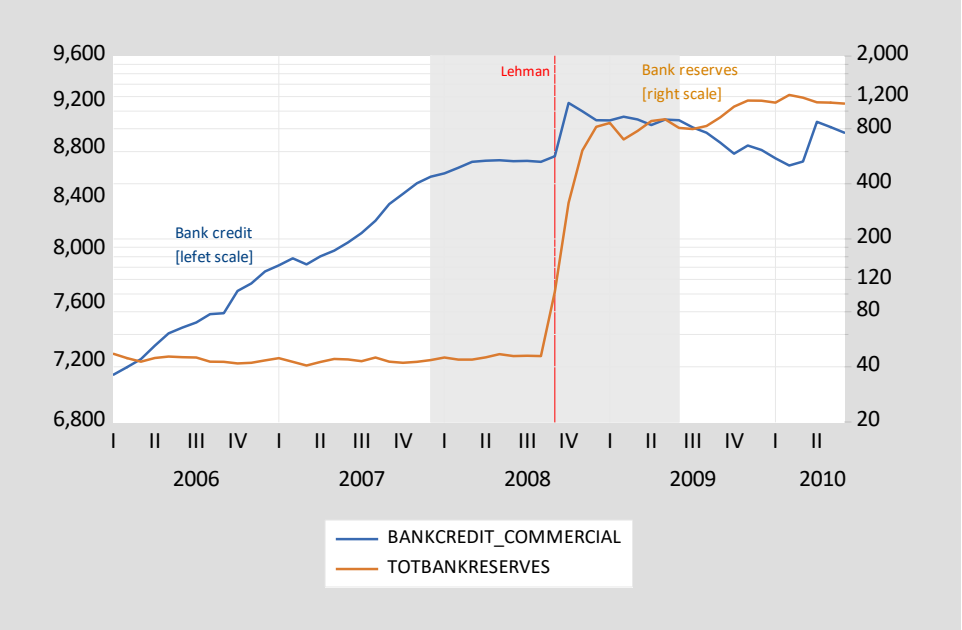

Figure 4: Bank credit by all depository institutions, in billions $ (blue, left scale), and total reserves held by banks, in billions $ (brown, right scale). NBER defined recession dates shaded gray from peak to trough.

To offset the contractionary effect of slowing bank lending growth the monetary authorities can either increase Reserves, or directly lend to the financial institutions. This shows up in Figure 4 above as a jump up in the brown line; this spurs lending. This is shown below in Figure 5 as a shift outward of CC curve. More reserves also shift out the LM curve, even though the money multiplier is now smaller (gray arrows).

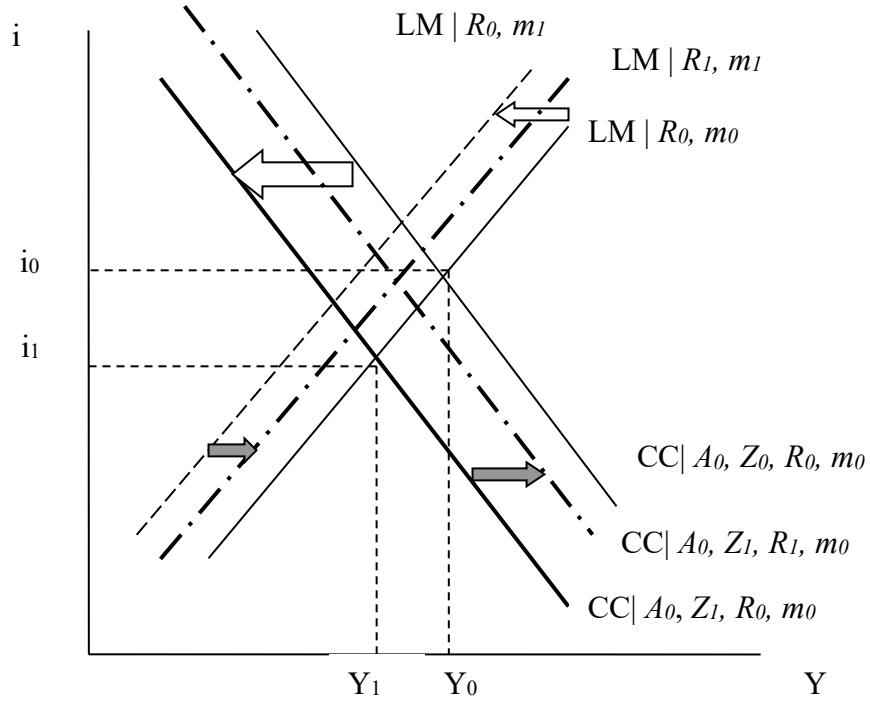

Figure 5: Shifts due to increase in reserves.

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