Bank Lending Channel

Taken from M. Affinito, 2016

Introduction

- Monetary policy may affect the external finance premium by shifting the supply of credit
- Firms are captive due to the central role played by banks in intermediation, and bank loans among their sources of external funds

Introduction

- Start with a standard IS/LM model
- Introduce intermediation into the IS/LM
  - Bernanke Blinder (1998) - Credit, Money, and Aggregate Demand
- Study the effects of monetary policy on banks

First case

No Credit Frictions

Traditional IS-LM Model

Standard IS / LM

- Let's begin in a world without credit frictions
  - 1 consumption good
  - 2 assets: money *D* and bonds *B*
  - 4 types of agents: households, firms, banks, government

- Two key variables:
  - households' income *Y*
  - interest rate on bonds r_B

Households

- Household ***savings S*** consist of bank deposits *D* and bond holdings *B*

$$S(Y, r_B) = D^h(Y, r_B) + B^h(Y, r_B)$$
$$+, + \qquad +, - \qquad +, +$$

- Assumptions

- Deposits increase with income *Y* and decrease with the interest rate on bonds r_B

  – Bond holdings increase with both *Y* and r_B

  – Savings increase with both Y and r_B (bond holding effect dominates)

Firms

- Firm investment is financed issuing bonds

$$B^f(r_B) = I(r_B)$$

  - Firm investment decreases with the interest rate

Banks

- Bank Balance Sheet

$$R + B^b = D^h$$

Bank assets *Bank liabilities*

D^h: household deposits, R: reserves, B^b: bonds

- Reserve requirement: Banks are obliged to hold a minimum amount of reserves (money base)

$$R = \alpha D^h$$

- If banks don't hold any excess reserves, then reserves and bonds are related by

$$B^b = \frac{R}{\alpha} - R = \frac{(1-\alpha)}{\alpha} R$$

Government

- Government revenues come solely from seignorage, i.e. the difference between the value of money and the cost to produce it and distribute it, (reserves R)

- Current government spending equals revenues R plus issued debt B^g

$$G = R + B^g$$

  - very stylized government budget constraint

Market Clearing

- Bond market is in equilibrium:

$$B^g + B^f = B^b + B^h$$

Supply *Demand*

Market Clearing

- Money market (LM) is in equilibrium:

$$R = \alpha D^h(Y^{+}, r_B^{-})$$

  - LM underlines a positive relationship between Y and r_B
    - Because of the binding constraint, deposits do not respond to interest rate fluctuations
    - When r_B increases, Y must rise to keep D^h from falling

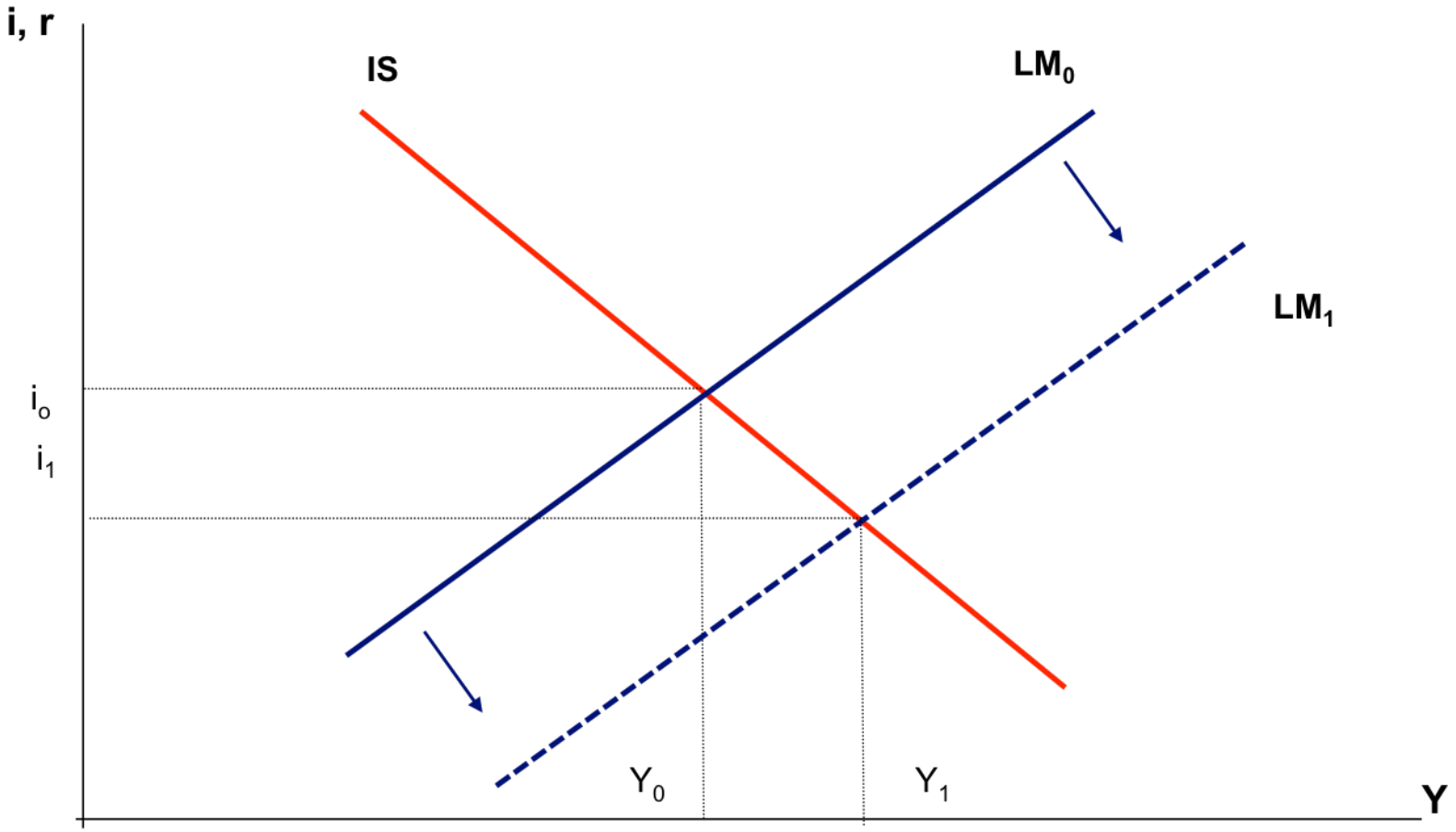
Market Clearing

- Goods market (IS):

$$I(r_B^{-}) + G = S(Y^{+}, r_B^{+})$$

  - IS represents a negative relationship between Y and r_B
    - Hold *Y* fixed.
    - When r_B increases, investment falls but savings increase
    - Since *G* is fixed, *Y* must fall to bring down savings

Effect of a Monetary Expansion



Effect of a Monetary Expansion

- What happens if the reserves of the banks increase?
  - Excess supply of money implies the interest rates on bonds must decrease:

$R\uparrow \rightarrow B^g \downarrow \rightarrow D \uparrow \rightarrow r_B \downarrow \rightarrow Y \uparrow$

    - LM curve shifts down and right

  - Investment and Output increase
  - Interest rates decrease

- Monetary policy affects economic activity through reserves (money market)

What about the bond market?

- Government: increasing R while holding G constant requires less government bonds

$R\uparrow \rightarrow B^g \downarrow \rightarrow r_B \downarrow$

- Banks: R stimulates the demand for bonds by banks

$R\uparrow \rightarrow B^b \uparrow \rightarrow r_B \downarrow$

What about the bond market?

- *R* stimulates the demand for bonds by banks (counterpart of excess supply of money) which lowers the interest rate

- Households buy less bonds (do not balance)

$D \uparrow$, $r_B \downarrow \rightarrow B^h \downarrow \rightarrow$ (price $\downarrow$) $\rightarrow$ $r_B \uparrow$; but $Y \uparrow \rightarrow B^h \uparrow \rightarrow$ (price $\uparrow$) $\rightarrow$ $r_B \downarrow$

- Firms invest more

$r_B \downarrow \rightarrow B^f \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$

– Loans and bonds are perfect substitutes for firms

Second case

Introduce Credit Frictions

IS-LM-CC Model
(or CC-LM Model)

Introduce Credit Frictions IS/LM/CC model

- Assumptions

1. Only banks can lend to firms
2. Loans are imperfect substitutes for bonds

Market Segmentation

- Segmentation in credit markets (loans and bonds are not perfect substitutes):

$$r_L \neq r_B$$

- Firm investments can be financed through loans and bonds

$$B^f(\overset{-}{r_B}, \overset{+}{r_L}) + L^f(\overset{+}{r_B}, \overset{-}{r_L}) = I(\overset{-}{r_B}, \overset{-}{r_L})$$

  - Firm investment decreases with the interest rate on bank loans and bonds

Bank Balance Sheet

$$R + L^b + B^b = D^h$$

Banks' assets *Banks' liabilities*

D^h: household deposits, R: reserves, B^b: bonds, L^b: loans

- Banks are obliged to hold a minimum amount of reserves (money base)

$$R = \alpha D^h$$

- No excess reserves implies

$$B^b + L^b = \frac{1-\alpha}{\alpha} R$$

Bank Portfolio

- Assume banks compose their portfolio so that

$$L^b = \mu(\overset{-}{r}_B, \overset{+}{r}_L)R$$

$$B^b = \nu(\overset{+}{r}_B, \overset{-}{r}_L)R$$

- Banks supply of loans increases with interest rate on loans and decreases with interest rate on bonds
- Banks demand for loans increases with interest rate on bonds and decreases with interest rate on loans

Market Clearing

- Bond market is in equilibrium:

$$B^g + B^f = B^b + B^h$$

Supply *Demand*

Market Clearing

- Money market (LM) is in equilibrium:

$$R = \alpha D^h(Y^{+}, r_B^{-})$$

  - LM is unchanged

Market Clearing

- Goods market is in equilibrium if:

$$I(\overset{-}{r_B}, \overset{-}{r_L}) + G = S(\overset{+}{Y}, \overset{+}{r_B})$$

Loan market is in equilibrium if

$$L^f(r_B, r_L) = L^b(r_B, r_L) = \mu(r_B, r_L)R$$

Market Clearing

$$I(r_B, r_L) + G = S(Y, r_B)$$

Loan market equilibrium translates into the following relationship

$$r_L = \varphi(\overset{+}{r_B}, \overset{-}{R})$$

The CC- curve

- By substituting for r_L in the IS equation, we get

$$I\left(r_B, \varphi\left(\overset{+}{r_B}, \overset{-}{R}\right)\right) + G = S\left(\overset{+}{Y}, \overset{+}{r_B}\right)$$

- **CC equation** (Commodities and Credit, Patinkin 1956)

- Differently from traditional IS curve, CC depends on *R*
  - ➢ φ falls as *R* rises, boosting investment in the CC curve

The CC- curve

- The CC-curve represents all combinations of Y and r_B which ensure that the commodity market and the loan market are simultaneously in equilibrium

- The slope of the CC-curve is negative, i.e. $d\,r_B / dY < 0$

An increase in bond rate r_B, determines an excess demand for bank loans and an excess supply of commodities. A rising loan rate r_L brings the market for bank loans back to equilibrium, but it worsens the situation of excess supply in the goods market. Therefore, income Y has to decrease until $I + G = S$ holds again

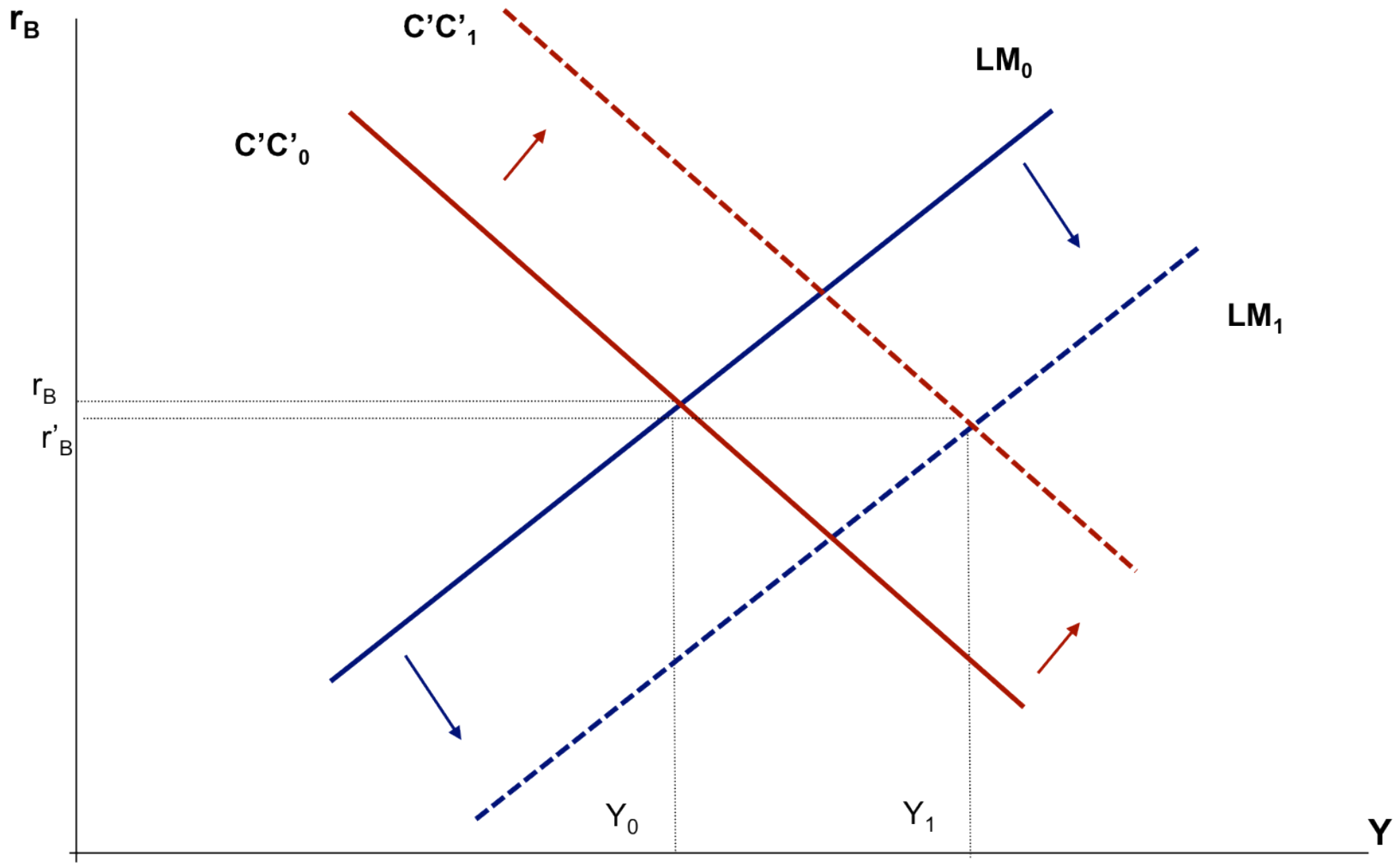
The Effect of a Monetary Expansion

An increase in banks' reserves has two effects:

- The quantity of money increases (LM shifts to the right);
- The volume of credit increases too, which stimulates investment demand for firms (CC curve shifts upwards)

- Y in increased, the effect on interest rate on bonds is ambiguous

The Effect of a Monetary Expansion



The Effect of a Monetary Expansion

- The positive effect of the LM-curve shifting to the right is reinforced by the CC-curve shifting to the right as well.

- In the new equilibrium real income *Y* is higher, while the effect on the bond interest rate is ambiguous

The Effect of a Monetary Expansion

- Difference with traditional IS-LM model
  - φ is inversely related to R, and affects investment on its own
  - An increase in investment demand implies, for a given r_B, Y must be higher

- Amplification of monetary policy through the credit channel
- Monetary contractions may lead to severe crises

The Effect of a Monetary Expansion

- The central bank reserves R are a shift parameter of the CC-curve. This result has important consequences for the effectiveness of monetary policy measures

How does the credit channel work?

- If reserves increase, then the loan to bond interest rate spread ($r_L - r_B$) falls.
  - Increase in the reserves available to banks increases the supply of loans
  - Given the demand for loans, downward pressure on the loan rate r_L

How does the credit channel work?

- If reserves increase, then the loan to bond interest rate spread ($r_L - r_B$) falls.
  - Increase in the reserves available to banks increases their demand for bonds
  - However, household demand for bonds decreases as the interest rate falls, so the increase in demand of bonds by banks does not require a decrease of the same magnitude in r_B

The empirical literature on the credit view

- the literature on the bank lending channel shows that the channel does matter
- It suggests that large banks with highly liquid and diversified assets are less sensitive to monetary policy impulses
- they adjust their credit supply more gradually to changes in the monetary policy stance

A Financial Crisis

- Suppose φ spikes (banks are scared: a reduction in μ)
- IS curve shifts to the left sharply
  - Interest rate on bonds falls
  - Interest rate on loans spikes
- Monetary Policy Response: increase *R*
  - Interest rate on bonds continues to fall
  - Interest rate on loans stays high
- Liquidity Trap: What to do?
  - Keep increasing R, credit channel may still be active
  - Does this work? Unclear
- Other options? quantitative easing