MONEY AND BANKING
LECTURE 10: TRANSMISSION CHANNELS OF MONETARY POLICY

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OUTLINE

INTRODUCTION

- In last lecture, we discussed central banks use *open market operations*, *discount lending*, and *requirement reserve ratio* to influence *overnight rate in interbank market*.
- But, interbank market is only a subset of financial markets, which include bond market, mortgage market, equity market, and other markets.
- There are many other interest rates in financial markets.
- How central bank's monetary policy action affect decision making is the black box that we explore today. *transmission channel of monetary policy*

OUTLINE

INTEREST RATE CHANNEL

- Key assumptions: central bank liabilities include *currency* and *bank reserves*. $\Rightarrow$ the central bank controls the monetary base.
- Suppose the optimal real balance holding is determined by $\frac{M_t}{P_t} = \mathcal{L}(i_t)$.
- Given the price level P_t does not change, a policy-induced increase in M_t leading to a rise in i_t, and vice versa.
- Changes in M_t represent the only source of uncertainty, the deterministic relationship that links M_t and i_t implies that monetary policy actions can be described equivalently in terms of their effects on either the monetary base or the short-term nominal interest rate.

Interest Rate Channel

- According to traditional Keynesian *interest rate channel*, a policy-induced increase in the short-term nominal interest rate leads first to an increase in the longer-term nominal interest rates, as investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities.
- When nominal prices are slow to adjust, these movements in nominal interest rate translate into movements in real interest rates.
- Based on Fisher equation, $i_t = r_t + \pi^e_{t+1}$, when π^e_{t+1} is stable, i_t and r_t move in the sam direction.
- Recall term structure of interest rates

$$i_{n,t} = \frac{i_{1,t} + i^e_{1,t+1} + i^e_{1,t+2} + \cdots}{n} + \text{LP}_{n,t}\,,$$

where $LP_{n,t}$ is period n *liquidity premium* (positive).

INTEREST RATE CHANNEL

- Firms, finding that their real cost of borrowing over all horizons has increased, cut back on their investment expenditures.
- Likewise, households facing higher real borrowing costs scale back ont their purchases of homes, automobiles, and other durable goods.
- Aggregate output and employment fall.
- *Interest rate channel* lies at the heart of the traditional Keynesian textbook IS-LM model (Hicks, 1937), and it also appears in the more recent New Keynesian models.

ASSET PRICE CHANNEL

- Asset price channels are highlighted by Tobin's (1969) Q-theory of investment and Ando and Modigliani (1963) life-cycle theory of consumption.
- Tobin's q-theory measures the ratio of the stock market value of a firm to the replacement cost of the physical capital that is owned by that firm.
- All else being equal, a policy-induced increase in the short-term nominal interest rate makes debt instruments more attractive than equities in the eyes of investors.
- a monetary tightening $\rightarrow$ a fall in equity prices.

ASSET PRICE CHANNEL

- In this sense, investment becomes more costly for the firm, because firms have to issue more stocks to raise funds.
- Ando and Modigliani's life-cycle theory of consumption assigns a role to wealth as well as income as key determinants of consumption spending.
- In this sense, if stock prices $\downarrow$ after a monetary tightening, household financial wealth $\downarrow$, leading to consumption, output, and employment $\downarrow$.

CREDIT CHANNEL

- The credit channel, as in Bernanke and Gertler (1989), is not a free-standing alternative to the traditional monetary transmission channels.
- It is considered as a set of factors that amplify and propagate conventional interest rate effects. The credit channel is an enhancement mechanism, not a truly independent or parallel channel.
- The fundamental assumption of the credit channel is *financial frictions*.

CREDIT CHANNEL

- Financial frictions stem from addressing*asymmetric information*.
- The effects of monetary policy on interest rates are amplified by endogenous changes in the external finance premium, i.e., the difference between internal funding and external funding (e.g., equity or debt issuance).
- The size of the external finance premium is the wedge between the expected return received by lenders and the costs faced by potential borrowers.

CREDIT CHANNEL

- A change in monetary policy that raises or lowers open-market interest rates tends to change the external finance premium in the same direction.
- There are two possible channels that affect the external finance premium in credit market.
  1. The balance sheet channel stresses the potential impact of changes in monetary policy on borrowers; balance sheets and income statements.
  2. The bank lending channel stress the shift of intermediate credit, particularly loans by commercial banks.

Balance Sheet Channel

- A firm plans to do an investment worth 10,000 RMB. It has 5,000 RMB retained earning from previous period, and needs a bank loan to fill the gap. So, the balance sheet of this borrower can be written as

$$Q_t K_t = N_t + B_t \,, \tag{1}$$

  where $Q_t K_t$ is the market value of this investment, K_t is capital stock to invest, and Q_t is the capital price. N_t is net worth, in this case, 5,000 RMB, whereas B_t is the bank loan.
- Investment has risk, and we use ω_t to denote capital investment risk.

BALANCE SHEET CHANNEL

- Suppose the rate of return on capital investment is R^k_{t+1} and the interest rate on bank loan B_t is R_t.
- Given certain level of investment risk, the borrower is able to payback the loan.

$$R_t B_t = \bar{\omega}_{t+1} R^k_{t+1} Q_t K_t \,, \tag{2}$$

  where $\bar{\omega}_{t+1}$ is the threshold level of risk, minimum level of risk for the borrower to payback the loan.
- For the commercial bank, when investment risk is low, it can get the payback, while risk is high, it can only cover then market value of capital less monitoring cost.

Balance Sheet Channel

- The mathematical expression of the relationship between *external finance premium*, R^k_{t+1}/R_t, and *balance sheet position*, Q_tK_t/N_t, is given by

$$\frac{R^k_{t+1}}{R_t} = \psi\left(\frac{Q_tK_t}{N_t}\right), \tag{3}$$

- The balance sheet position is *leverage ratio*. So, expression (3) indicates, given market value of investment, net worth has inversely related to external finance premium.
- Given net worth, higher market value of investment, higher external finance premium.
- Can you present *economic interpretations*?

BANK LENDING CHANNEL

- Bank lending channel, as we discussed in *open market operations*, is about the supply of intermediary credit.
- When central bank conducts open market purchase, reserves in banking system increase. Bank lending then expands. Bank-dependent business have easier access to bank loans. Economy expands as a result.
- When central bank conducts open market sales, reserves in banking system decrease. Banking lending then contracts. Bank-dependent business have little access to bank loans. Economy slows down.

CREDIT VIEW

- Balance sheet channel and bank lending channel amplifies business cycle.
- When $i_t \downarrow \rightarrow N_t \uparrow$, improved balance sheet position leads to more borrowing.
- On the other hand, $i_t \downarrow$ means cost of borrowing $\downarrow$, leading to more borrowing as well.
- Central bank by increasing reserves to lower interest rate i_t, and banks increase lending to businesses.

CREDIT VIEW

- More investment, for example, more purchase of capital stock K_t, raises capital price Q_t.
- Given unchanged borrowing, B_t, $Q_t K_t \uparrow \rightarrow N_t \uparrow$.
- It leads to more borrowing.
- In this sense, Credit channel (balance sheet channel and bank lending channel) is not independent from asset price channel and interest rate channel, but works together, and amplifies upswings of economic growth. Hence, *credit channel* is also known as ***financial accelerator***.

Outline

BANKING SYSTEM AND MONETARY POLICY SUMMARY

- The fundamental function of banking system is to allocate funds optimally, i.e., optimal risk and return allocation.
- Banking provides *maturity transformation, liquidity transformation, and risk transformation* between *end borrowers* (fund deficit) and *end investors* (fund surplus).
- End investors (fund supplier) and end borrowers (fund demander) agree to allocate funds at some prices, i.e., *interest rates*.

BANKING SYSTEM AND MONETARY POLICY SUMMARY

- By supplying funds through financial system (including banking system), end investors hold various *financial instruments* in the *portfolio*.
- *Money* as one category of financial instruments is very special.
- To study the equilibria in financial system, we simply divide financial instruments into *monetary assets* and *non-monetary assets*. When monetary assets market equilibrates, the second market automatically equilibrates.
- This is the *theories of demand for money* is trying to answer, i.e., *why end investors hold money in the portfolio*.

BANKING SYSTEM AND MONETARY POLICY SUMMARY

- Banking system, including central banks, provides *money supply*, and also generates *credit supply*.
- Banking system functions as an intermediary between end investors and end borrowers, to address *asymmetric information problem*.
- However, due to *maturity mismatch* in balance sheet, banks are vulnerable to bank run, which is devastating because it stops money supply.
- To backstop bank run, central banks, using *monetary base* with *fiat money*, provide *flexible money supply* with commercial banks to the economy.

Banking System and Monetary Policy Summary

- Since fiat money is generated by banking system in an economy, without appropriate management, it creates *inflation*.
- The marginal cost of extra money creation is almost costless, whereas the social loss associated with increased money is huge.
- Hence, the central bank is assigned with constrained money supply to the economy. To do so, the central bank takes active monetary policy.

BANKING SYSTEM AND MONETARY POLICY SUMMARY

- The primary goal of monetary policy is *price stability*, which is measured by *inflation*.
- Price stability is tradeoff with output growth.
- Therefore, central bank sets *short-term interest rate* based on Taylor rule to contain inflation within target range, i.e., *inflation-targeting*.
- The trick for modern monetary policy is that, based on $i_t = r_t + \pi^e_{t+1}$, keeping expected inflation in target, central banks are able to manipulate nominal interest rates to influence real interest rates.

Banking System and Monetary Policy Summary

- As real interest rates changed, banks, end investors and end borrowers would readjust their balance sheets, portfolio, and borrowing, respectively.
- Through *interest rate channel, asset price channel, and credit channel*, changes in short-term interest rates in *interbank market* spreading to broader economic activities.
- In essence, central banks by changing money supply to change the price of fund allocation, i.e., interest rates in the economy to keep the economy on the right track.

BANKING SYSTEM AND MONETARY POLICY SUMMARY

- Still, we only focus on the case in which commercial banks stand as intermediaries between end borrowers and end investors. *How about financial markets where end borrowers directly raise funds from end investors*?
- What role of financial institutions such as investment banks, insurance companies, and hedge funds play in this area?
- What does monetary policy to do with this sector?