Stabilization Policy

It is an enduring principle of governance to keep prepared for the unforeseen.
Wei Zheng (580–643)[1]

1 Introduction

Almost all modern governments attempt to stabilize the economy. Especially when the unemployment problem intensifies during a recession, the government is under pressure to do something. And modern governments have enormous power to influence the economy. The government is often the biggest spender in the economy. And, through the central bank, the government can influence interest rates and exchange rates. With great power comes great responsibility. The question is how to wield that power to achieve the common good. For the objective of economic stabilization, we hope that the government's actions are *countercyclical*, meaning that they stimulate the economy when it is in downturns and cool down the economy when it overheats. And we hope that the government avoids *procyclical* policies, which would add fuel to a booming economy and tighten a depressed one.

In IS-LM and AD-AS models, we have considered fiscal and monetary policies that may be useful for smoothing the business cycles. However, to simplify analyses, we simplify fiscal and monetary policies so much so that they reduce to three variables: government expenditure (G), tax (T), and money supply (M). In the real world, fiscal and monetary policies are far more complicated than the three variables can characterize.

In this chapter, we briefly describe how, in the real world, the government may stabilize the economy. We first examine the role of the so-called automatic stabilizers. Then we go deeper into discretionary fiscal policies. Then we study monetary policy in more details. Finally we study how a government may safeguard the financial system by acting as the lender of last resort and conducting macroprudential policies.

2 Automatic Fiscal Stabilizer

Modern governments are big. They take a substantial share of national income by taxation, and they are the biggest spender in the economy. The fiscal policies of the modern government can have a big impact on economic stability. Before the study of discretionary fiscal policies, we first discuss the role of *automatic fiscal stabilizers*.

Automatic stabilizers are relatively fixed features of the fiscal establishment that may dampen economic fluctuations without taking discretionary actions. We may divide automatic stabilizers into two groups, tax stabilizers and spending stabilizers.

2.1 Tax Stabilizers

Many categories of taxes, including the personal income tax, corporate income tax, and sales tax, are automatic stabilizers because their revenue automatically declines when the economy contracts.

In particular, if the personal income tax is *progressive*, then it would be an even stronger automatic stabilizer. To see this, note that when a recession leads to widespread declines in personal income, people may be subject to a lower marginal tax rate under the progressive tax system. Thus the tax revenue will decline more rapidly than under a flat-rate tax system.

Marginal Tax Rate of China's Personal Income Tax (PIT)

China implements a seven-step progressive PIT system. The taxable income is total income minus various deductions, including an allowance of 5000 Yuan per month.

	Annual taxable income (Yuan)	Marginal tax rate (%)
1	$\leq$ 36,000	3
2	(36,000 – 144,000]	10
3	(144,000 – 300,000]	20
4	(300,000 – 420,000]	25
5	(420,000 – 660,000]	30
6	(660,000 – 960,000]	35
7	$>$ 960,000	45

Similarly, enterprise income tax (EIT) is also a better automatic stabilizer than value-added tax (VAT) or business tax (on gross receipts). EIT is on profits, which decline rapidly when a recession hits the economy. VAT and business tax, however, are on business activities. Even if firms do not generate profits, they have to pay VAT or business taxes as long as they are in operation. The tax revenue from VAT or business tax also declines in recessions, but not as fast as the revenue from EIT.

2.2 Spending Stabilizers

The spending stabilizers are mainly transfer payments to the unemployed and the poor. When the economy enters a recession, more people will claim unemployment benefits as they lose jobs. As a result, the fiscal spending on unemployment "insurance" automatically increases. The same is true for transfer payments to the poor.

General social security payments, such as retiree benefits, are also automatic

stabilizers in a sense. Since they are stable over time, the share of social security payments in the GDP automatically rises in recessions and declines in expansions. Thus they are also a stabilizing force for the economy.

2.3 The Importance of Automatic Stabilizers

Automatic stabilizers are very important to economic stability. Once in place, they work automatically, without any delay, and throughout the cycles. Discretionary policies, in contrast, are often delayed responses: It takes time for policy makers to recognize that there is something wrong going on; it takes time for politicians and technocrats to draw up plans; it takes time for a policy to exert effects on the economy. It is not uncommon that when a discretionary policy finally has effects, the problem (e.g., recession) that the policy is intended to solve has been over.

Therefore, policy makers should consider policy effects on economic stability when they deliberate on the reforms of tax code, transfer payments, and social security programs. The more automatic stabilizers, the better. The fewer "automatic destabilizers," the better. For example, although a balanced budget seems moral, the balanced-budget constraint is an automatic destabilizer since it forces the government to cut spending in recessions, when tax revenues decline, and to increase spending in expansions.

3 Discretionary Fiscal Policy

A discretionary policy is based on the judgment of policy makers under a particular situation, as opposed to a policy set by a predetermined rule. Discretionary fiscal policies are taxation and expenditure by the government for the purpose of dampening economic fluctuations.

3.1 Direct Government Expenditure

The discretionary fiscal policy may be direct government expenditures, tax cuts, or incentives. The direct expenditure may be the provision of more public goods. For example, the government may decide to upgrade public education, public security, and so on. It may also be investments in new roads, new generations of communications networks, electricity grids, and so on.

Note these policies also promote long-term growth. But the timing of policies is important since they have a strong impact on the short-term demand of the economy. It would be best if public spending is *countercyclical* as well as pro-growth.

3.2 Tax Cuts or Incentives

The tax cuts or incentives may be for households or businesses. Tax cuts for households put more money in consumers' pockets and induce them to consume more. If a tax cut is permanent, the effect on consumption would be stronger than in the case of a temporary cut. But even if the tax cut is temporary, it may still stimulate consumption due to the myopia of consumers or the *liquidity effect*. To understand the latter, note that if consumers are liquidity constrained, or unable to borrow, the tax cut will relax their borrowing constraint and, thus, stimulate consumption temporarily.

Tax cuts for businesses help to increase profit margins and may stimulate investment. To directly stimulate investment, the government may also provide temporary tax credits for businesses engaged in investment. For tax credits to have timely effects, they have to be temporary. Otherwise, businesses may adopt the usual wait-and-see attitude during recessions, delay investment until there is less uncertainty, and enjoy the tax credit later.

3.3 Deficit and Debt

Expansionary fiscal policies, discretionary or not, often lead to a budget deficit, which is the shortfall in tax revenue to pay for the expenditure. There are two ways to finance the deficit: issuing debts and printing money. The latter is illegal in many countries, including China. However, the central bank's seigniorage profit is part of government revenue, although a small part in normal times. And it is legal, and common, for central banks to purchase government bonds in open-market operations.

Thus it is bond issuance that mainly finances the budget deficit, which necessarily increases government debt. Here, the budget deficit is a *flow* variable, and government debt is a *stock* variable.

For individual households, the budget deficit is something to avoid. Any responsible head of household would try to "make ends meet." But for a nation, a self-imposed balanced-budget constraint is unnecessary and counterproductive. To see that, we first note that government budget deficit is net income to the private sector. Furthermore, an increase in government debt is an increase in assets held by the private sector. And government debts are safe assets, at least when exchange rate risk may be ignored. During financial crises, financial institutions often seek to sell risky assets and purchase safe assets such as government bonds. If there are not enough government bonds, it will take longer for financial institutions to "normalize" their balance sheets.

Second, we note that the balanced-budget constraint makes the fiscal policy necessarily procyclical. Under the balanced-budget constraint, when the economy enters a recession, the government would have to reduce spending since the tax

revenue declines during recessions. When the economy overheats, the government would have to increase spending since the tax revenue rises during booms.

There is no natural virtue about a balanced budget for a government. Fiscal policies should be judged by the effects on the economy, not by whether the budget is balanced.[2] However, this argument takes for granted a responsible government. If the people have a strong distrust of the government, then the balanced-budget constraint is a powerful tool to rein in erratic government behavior such as fighting unnecessary foreign wars, building vanity projects, and so on.

3.4 Ricardian Equivalence

If we omit the role of money printing, we may say that the government can either raise taxes to finance the budget deficit or borrow from the market. Since the government has to pay off the debt, the choice is "tax now or tax later." The well-known doctrine "Ricardian equivalence" says that, under some stringent conditions, this choice does not matter, and tax cuts would fail to stimulate demand. If consumers and firms are forward looking, then they would anticipate future tax hikes when the government cuts taxes now. They save the money, rather than being fooled into consumption or investment.

Even David Ricardo himself does not believe that the Ricardian equivalence holds in reality. He points out that individuals do not behave as rationally as required by the theory. Instead, individuals often take myopic views of the tax burden.

There is another problem with the Ricardian equivalence doctrine. The government can issue long-term bonds to finance the deficit. Compared to the government, people have short lives. When middle-age individuals receive more income from a tax cut financed by a 30-year bond, they may consider it a definite gain. The debt will be paid off by the next generation.

One reply is that people care about their descendants and do not want to leave an excessive tax burden to future generations. Modern economists, indeed, prove that the Ricardian equivalence continues to hold with the availability of long-term financing, under some additional assumptions.[3] In particular, they assume that people can borrow or lend any amount at the same interest rate as the government enjoys.

In the real world, however, consumers have credit constraints, and they have to pay interest rates much higher than the government. Tax cuts are equivalent to an "inclusive" loan with an interest rate as low as the government bond. Despite the possibility of tax hikes in the future, the current tax cuts are, therefore, a definite gain to the current-generation consumers. Thus the current tax cut may result in larger aggregate demand.

Furthermore, there is no reason that the government has to pay off all its debt

at some point. The government may roll over the debt infinitely. Indeed, if the economy is growing, the debt burden can increase as well. Therefore, we should not avoid the budget deficit as a sin and try to minimize government debt as much as possible. What is important is to avoid wasteful spending and put the budget deficit to good use.

3.5 The Limitations

First, we have mentioned earlier that the discretionary policy may be a delayed response to a crisis. After policymakers recognize the problem, draw up plans, go through political processes, and implement the plan, the crisis may already be over. Note that it also takes time for a policy to transmit to the economy.

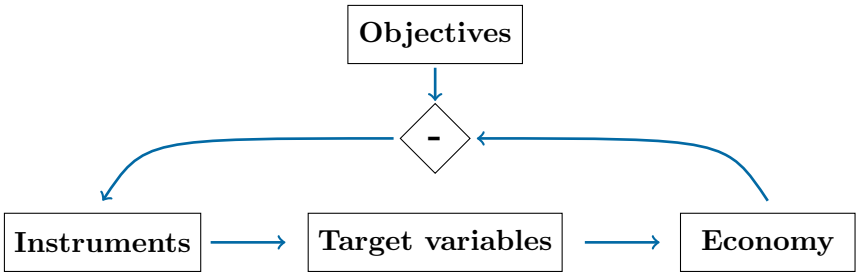
Second, the interest costs of debt may become a burden if the government debt rises too fast. Suppose that the debt/GDP ratio rises to 300 percent and that the interest rate is 2%. Then the interest costs would be 6% of GDP every year.

Here, we need to consider the effect of internal debt and external debt separately. If the government borrows from its citizens, then it adds to its internal debt. For interest payments of the internal debt, the government raises taxes and transfers them to the owners of government bonds, who are also citizens. Thus, the interest payments to the internal debt do not increase the overall burden on the economy, just like transfer payments. But unlike the usual transfer payment, the interest payments may be regressive, i.e., transferring wealth from the poor to the rich.

If the government borrows from foreigners, then it adds to its external debt. A substantial level of external debt may be more problematic for the economy than an equivalent level of internal debt. Since the interest payment on the external debt transfers wealth from citizens to foreigners, it is equivalent to a new tax on the economy in the future. Unlike the usual tax, which may be used to provide domestic public goods, the new tax will be for nothing. Therefore, if the level of external debt rises too fast, the interest payments may become an unbearable burden on the economy.

Finally, external debt usually has a currency mismatch, especially for small economies. The interest and principal payments may be in a unit of foreign currency. But the tax revenue is in domestic currency. The currency mismatch, if on a large scale, may make the country vulnerable to the *self-fulfilling currency crisis*. Suppose that there is depreciation expectation, due to some other weaknesses in the country (e.g., political instability). Investors may move portfolios out of the country, and speculators may short the currency to such an extent that the government finds it unable to service its external debt. Consequently, there may be a sovereign default and a currency devaluation larger than justified by the economic weakness.

Figure 1: Monetary instruments, target variable, and objectives.



4 Monetary Policy

Monetary policy refers to policies deliberated and implemented by the monetary authority, i.e., the central bank, to achieve some *objectives* set by the government or lawmakers. The objectives of monetary policy include price stability, full employment, economic growth, financial market stability, and possibly exchange-rate stability. To achieve these objectives, the central bank tries to manipulate some *intermediate target variables* such as the interest rate on overnight borrowing, growth of money supply, and so on. To manipulate target variables, the central bank employs a variety of *policy instruments* such as open market operations (OMO), required reserves, central bank loans, liquidity facilities, and so on. Figure 1 illustrates the relationship among objectives, target variables, instruments, and the economy.

Note that monetary policy, like fiscal policy, attempts to dampen economic fluctuations. In the language of control system, Figure 1 shows a *feedback loop*. And we hope that monetary policy achieves a *negative* feedback loop. The central bank constantly assesses the economic conditions, comparing reality to its objectives. When the economy shows signs of recession, the central bank attempts to stop the trend by deploying monetary stimulus. When the economy starts to overheat, the central bank also tries to stop the trend, by tightening liquidity.

4.1 Objectives

The most important objective of monetary policy is to maintain price stability. Many central banks, indeed, have explicitly adopted *inflation-targeting*, a standard framework for monetary policy.

Different central banks may interpret price stability differently. European Central Bank (ECB) defines price stability as inflation below 2%. Bank of England (the central bank of UK), under the inflation-targeting framework, sets 2% as the target, allowing for a maximum deviation of one%age point. Even the US Fed, which has a dual mandate (promoting full employment as well as price stability), has an aim for 2% inflation. Generally, developing countries allow higher inflation targets. For example, the Reserve Bank of India targets 4% and allows for a maximum deviation

of two%age points.

There are two reasons why policy makers around the world set a positive inflation target, rather than a zero inflation target. First, moderate inflation facilitates downward adjustment of real wages in the face of adverse shocks, thus alleviating unemployment problems. As James Tobin famously says, *inflation greases the wheels of the labor market*.[4]

Second, positive inflation provides some cushion against deflation. When the economy slows down or enters a recession, inflation typically declines. If inflation is initially positive, then there is a period of disinflation, during which inflation is still positive. It is hoped that the recession will be over before inflation declines to zero. Otherwise, when inflation becomes deflation, the economy may fall victim to the *debt deflation spiral*. During the debt deflation spiral, deflation increases the debt burden and thus depresses consumption and investment. This reduced aggregate demand puts more downward pressure on prices, completing a vicious cycle.

The second most important objective of monetary policy is to promote full employment. Since output and employment have a stable relationship (Okun's Law), the full-employment objective is equivalent to one that targets a zero output gap. And since the output potential is generally growing, the objective of a zero output gap may be further translated into a growth target. The Chinese government, for example, has an annual target for real GDP growth. And in its "five-year plans" it also sets a five-year target for average growth rate in the next five years.

For countries with a fixed exchange rate or, to a lesser extent, managed float, the central banks have to maintain exchange rate stability. As we have discussed earlier, this objective may dominate domestic concerns such as inflation and unemployment. If that is true, then we say that the country does not have an *independent* monetary policy. To achieve exchange rate stability while retaining some degree of monetary-policy independence, the central bank must keep an eye on the balance-of-payment conditions. It may implement restrictions on cross-border capital flows when necessary.

Finally, monetary authorities are also responsible for maintaining stability in the financial system. A stable financial system is essential for the working of modern economies. Since the financial system is inherently unstable, maintaining financial stability is a daunting task for central banks. We may understand the central bank's role in financial stability in two senses: crisis management and the prevention of future crises. After a crisis has broken out, the central bank has to intervene and perform as the lender of last resort. To prevent the next crisis, the central bank has to perform macroprudential regulation and oversight. We will examine these roles in more details later.

Table 1: Objectives, target variables, and instruments of major central banks

	Objectives	Target variables	Key instruments
China	Price stability, economic growth	Interbank 7-day repo rate, loan prime rate	Open market operations
Eurozone	Price stability	Overnight market interest rate	Main refinancing operations, marginal lending facility, deposit facility
Japan	Price stability	Uncollateralized overnight call rate	Open market operations
UK	Price stability	Short-term money market interest rate	Bank rate
US	Full employment, price stability	Federal funds rate	Interest on reserves

4.2 Intermediate Target Variables

Intermediate target variables are those variables that are vitally important to the economy and that are manipulable by the monetary authority. Traditional central banks used to control money supply or the growth of it, as is assumed in the quantity theory of money or IS-LM. Since the 1980s, central banks in the developed world have generally converged to the practice of targeting for short-term money market interest rates (see Table 1). The US Federal Reserve, for example, targets the federal funds rate (FFR), which is the interest rate banks charge when they lend excess reserves to other banks on an overnight uncollateralized basis.

In normal times, a central bank usually has one target variable. However, when the central bank finds the single target variable inadequate, it may target additional variables such as long-term interest rates. For example, in response to the 2008 financial crisis, the Fed first slashed the federal funds rate to almost zero. Finding this inadequate for dealing with the deepening crisis, the Fed started to conduct quantitative easing (QE), which was essentially targeting the quantity of reserves. Soon after the second round of QE concluded, the Fed announced Operation Twist to lower the long-term interest rate, which also became a target variable for the Fed.

Monetary policy that relies on interest rates as target variables is often called the "price-based" monetary policy since interest rates are essentially the price of (future) money. In contrast, monetary policy that targets money supply is called the "quantity-based" money policy. In normal times, the price-based monetary policy is generally more effective than the quantity-based policy since changes in interest rates directly change financial costs in the economy. However, during deep recessions, the target interest rates may hit the zero lower bound. And, for various

reasons, the monetary authority may be reluctant to cut interest rates below zero. Under such circumstances, the monetary authority may switch to quantity-based policies such as QE.

China is in transition from quantity-based to price-based monetary policy making. The People's Bank of China (PBC) used to target money (M2) growth. The development of capital markets and shadow banking, however, makes M2 less connected with the financing activities in the economy. From around 2012, PBC toned down the importance of the M2 target. PBC started to use an alternative measure called Aggregate financing to the real economy (AFRE), which is the total volume of financing provided by the financial system to the economy during a certain period.

Meanwhile, PBC has been pushing for the "liberalization" of interest rates, which is to let the market determine interest rates. The "liberalization" of interest rates paved the way for price-based policy making.[5] An important milestone was reached when PBC reformed the formation mechanism of the loan prime rate (LPR) in August 2019. After the reform, LPR became the benchmark loan interest rate for commercial banks and one of the target variables of PBC. Compared to the previous benchmark loan rate, which was set by the central bank, LPR is market based, and its variation reflects changing demand and supply of funds. At the same time, PBC uses the medium-term lending facility (MLF) rate to exert influence on LPR. So we have the following *bank-lending channel* of monetary policy transmission:

$$\text{MLF Rate} \Rightarrow \text{LPR} \Rightarrow \text{Loan interest rates} \Rightarrow \text{Economic activities.}$$

Another target variable of PBC is the interbank seven-day repo rate (DR007). PBC uses the rate of its repo or reverse repo operations (a type of open-market operations) to influence the interbank seven-day repo rate.

4.3 Monetary Policy Instruments

To manipulate target variables, central banks have a variety of policy tools that we call monetary policy instruments. The usual instruments include open-market operations (OMO), reserve requirements, interest rates on central bank deposits, standing lending facilities, forward guidance, and so on.

4.3.1 Open-Market Operations (OMO)

Through OMO, a central bank adjusts the supply of reserves, which further influences the money supply. OMO may take the form of purchasing or selling securities, often government bonds. When the central bank sells securities, it effectively withdraws liquidity from the financial system. When the central bank purchases securities, it effectively injects liquidity into the financial system.

OMO may also take the form of repo (repurchase operation) or reverse repo. In a repo operation, the central bank lends temporarily with collaterals, in effect injecting

liquidity into the market. In a reverse repo, the central bank borrows temporarily (say, seven days) from the market with collaterals, in effect withdrawing liquidity from the market. The reverse repo may be regarded as a deposit facility. Both repo and reverse repo are conducted using auctions.

China's PBC conducts repo operations regularly. The interest rate on these repo operations has become an important policy signal to market participants. Note that there is a difference in terminology. China's repo operation is equivalent to the reverse repo operation in the US, and China's reverse repo is equivalent to the US's repo.

Central bank intervention of the foreign exchange market is also a type of OMO. When the central bank supports a weak domestic currency, it has to sell foreign currency and buy domestic currency, withdrawing liquidity from the market. When the central bank wants to devalue a strong domestic currency, it has to buy foreign currency and sell domestic currency, injecting liquidity into the market.

4.3.2 Reserve Requirement

The reserve requirement is the minimum amount of reserve commercial banks must hold at the central bank. The reserve requirement is often expressed in the *reserve requirement ratio*, which is the ratio of the required reserve to the total deposits. The reserve requirement may serve a macro-prudential purpose, preventing banks from lending excessively. But it may also serve as a monetary policy instrument that influences the *money multiplier*, which further influences the money supply.

To understand the role of the reserve requirement in influencing the money supply, note that the *base money* (or *monetary base*, *high-powered money*, etc.) consists of two components: currency in circulation (or physically in commercial banks' vaults), and the reserve:

$$B = C + R,$$

where B represents base money, C denotes currency in circulation, and R represents reserve, which is banks' deposits at the central bank.

Note that the money supply also consists of two components: currency in circulation and deposits (demand or saving deposits). For example, M1 in China includes currency in circulation and demand deposits. Let M denote the money supply, we thus have,

$$M = C + D,$$

where D represents deposits. M may be any measure of the money supply. Broader measures such as M2 include less liquid deposits such as savings deposits.

If we further define the currency ratio and the reserve ratio,

$$c = \frac{C}{D}, \quad r = \frac{R}{D},$$

respectively, then we have:

$$M = \frac{1+c}{c+r}B.$$

For broader money-supply measures such as M2, c is small. Hence the money supply is largely determined by base money (B) and the reserve ratio (r). Given a level of base money, lower r results in larger money supply. We may call $m = (1+c)/(c+r)$ the *money multiplier*. Note that the reserve requirement ratio (RRR) is the smallest possible reserve ratio for banks. When banks are active in lending, the reserve ratio may hit RRR. Under such circumstances, the central bank may influence the money multiplier by adjusting RRR.

In most of the developed countries, reserve requirements do not serves as a monetary instrument. In fact, there are no reserve requirements in Canada, the UK, New Zealand, Australia, and Sweden. The US also abolished reserve requirements in March 2020. Of course, this does not mean that banks can create money without limit. Banks have to satisfy *capital adequacy* requirements, which are more important than reserve requirements even in countries with reserve requirements.

However, China's reserve requirement remains high. As of November 2020, China's RRR is 12.5% for large banks. And China used to adjust the ratio fairly frequently. In 2008 alone, PBC adjusted the ratio 10 times, first raising RRR 8 times to control economic overheating and inflation, and then cut it twice to combat the worsening Global Financial Crisis.

4.3.3 Interest on Reserves (IOR)

Banks may deposit at the central bank more than required. The extra amount is often called *excess reserves*. Central banks use the interest rate on reserves to influence both the level of excess reserve and the money market interest rate. If the central bank raises the interest rate on the reserve, then banks would hold more excess reserve, thus reducing lending activity. At the same time, IOR may serve as the *reservation rate* in the interbank money market, the lowest rate that banks are willing to accept for lending out their funds. Adjusting IOR may thus influence the money market interest rate.

The US Federal Reserve recently clarifies that IOR is the "primary tool of monetary policy implementation," which helps steer the federal funds rate (FFR) into the target range. [6]

PBC pays interest on both required reserves and excess reserves. Normally, the interest rate on the required reserves is much higher than on the excess reserves. As of November 3, 2020, for example, the interest rate on the require reserves is 1.62%, while that on the excess reserves is 0.35%. IOR is not a primary instrument for PBC. Since the 2008 Global Financial Crisis, PBC rarely adjusts IOR.

4.3.4 Standing Lending Facilities (SLF)

SLF is a mechanism by which the central bank makes short-term loans to financial institutions *on request*. SLF has different names in different central banks. The US Fed calls it the *discount window*, the ECB the *marginal lending facility*, the Bank of England the *operational standing facility*, and the Bank of Japan the *complementary lending facility*. It is a common feature of central banking.

Like the reverse repo, SLF loans require collaterals. Unlike the reverse repo operation, it is financial institutions, in need of liquidity, that initiate SLF operations. The interest rate on SLF is an important monetary policy rate. If the central bank lowers the interest rate on SLF, then it encourages borrowing from the central bank, thus expanding the base money.

China's PBC started the SLF in 2013. A typical SLF loan in China, however, has a relatively longer maturity than SLF loans in other major central banks. The typical SLF maturity in China is one to three months, while SLF loans in other countries are typically overnight. A bank in need of overnight liquidity support has to go to the interbank market.

4.3.5 Medium-Term Lending Facility (MLF)

PBC introduced MLF in September 2014 as a medium-term liquidity tool. Through MLF, PBC lends to banks against adequate collaterals, so as to supply base money. The term of the MLF loans is typically one year. PBC's MLF is similar to the "longer-term refinancing operations" of ECB.

In recent years, PBC has been using the MLF rate as the medium-term policy rate, which guides the loan prime rate (LPR). And LPR has become the benchmark rate for bank loans in China. By adjusting the MLF rate, the central bank may influence the cost of financing in the economy through LPR.

4.3.6 Forward Guidance

Forward guidance refers to the effort by the central bank to provide information about the likely future course of monetary policy. Forward guidance is a relatively new instrument. The Bank of Japan started to use forward guidance in 1999, and the Fed experimented with it in the early 2000s. Since the 2008 Global Financial Crisis, other central banks also embraced forward guidance as an indispensable instrument.

For example, the ECB began forward guidance in July 2013 when the ECB said that it expected interest rates to remain low for an extended period. Such forward guidance, by reducing policy uncertainty, may reduce the term premium of interest rates, leading to higher economic activity. Such effects may be achieved even without large-scale open-market operations.

Forward guidance may or may not commit the central bank's future course of action. If a forward guidance explicitly commits a future course of policies, we may call it *Odyssean* forward guidance.[7] If a forward guidance merely *forecasts* the economy and the central bank's actions, we may call it *Delphic* forward guidance.[8] Odyssean forward guidance is stronger than Delphic forward guidance since the former reduces policy uncertainty more than the latter. However, the public understands that the central bank may deviate from the Odyssean forward guidance in the future if the economy takes an unexpected turn. Thus the effect of Odyssean forward guidance may depend on the reputation and credibility of the central banker.

4.3.7 Window Guidance

Window guidance is another form of the central bank's communications with the market. In contrast to forward guidance, which is open to the public, window guidance is often closed-door and only with a few selected banks. Between 1961 and 1991, Bank of Japan used window guidance to directly affect bank lending. For the same purpose, PBC of China has been using window guidance since it stopped setting credit plans in the late 1990s.

The banks that receive window guidance may or may not comply. They have to weigh the costs of compliance with the benefits, which include the availability of liquidity support from the central bank or other policy conveniences.

The effectiveness of window guidance depends not only on the central bank's leverage over the banks but also the importance of bank lending in the financial system. If the share of total bank lending in the total financing declines, a phenomenon known as disintermediation, then window guidance will become less effective. To understand the term "disintermediation," note that bank lending is called *indirect finance*, meaning that the savers finance the lender through the intermediation of banks. In contrast, bond and equity issuance is called *direct finance*, meaning that buyers of the bonds and stocks directly finance the issuer.

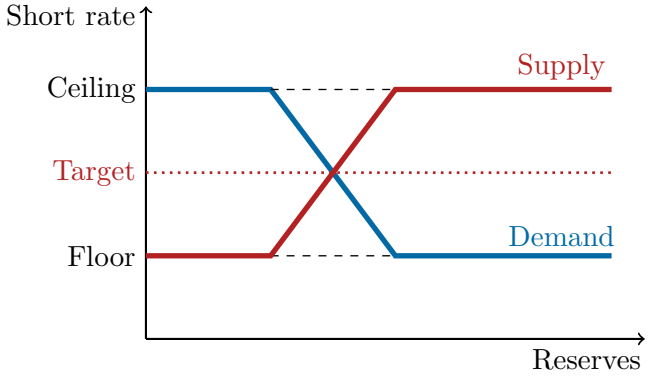
Finally, note that there are other monetary policy instruments employed by central banks. Nowadays, almost all central bankers believe in the value of transparency and predictability. As a result, the websites of central banks around the world provide rich information on the objectives, target variables, and policy instruments. Interested students are encouraged to explore these websites.

4.4 Interest Rate Corridor

The interest rate corridor (or channel) is now a common operating framework for central banks to control the volatility of the short-term money market interest rate, or simply the *short rate*.

The ceiling of the corridor is defined by the interest rate at which central banks

Figure 2: Interest rate corridor.



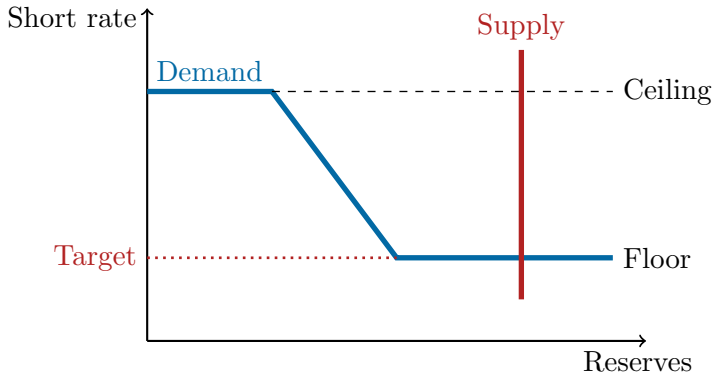
lend to depository financial institutions that we call *banks*. In practice, the ceiling is often provided by the interest rate on SLF (or the discount window). In theory, no borrower would be willing to accept an interest rate higher than the rate at which they can borrow from the central bank.

The floor of the corridor is defined by the interest rate at which central banks borrow from the market. In practice, it is often the interest rate on excess reserves or deposit facility. In theory, no lender would be willing to accept an interest rate lower than what the central bank pays on its borrowing. Both ceiling and floor rates are determined by central banks.

The demand curve for the reserves is flat (perfectly elastic) at the ceiling rate, because no one would be willing to borrow in the money market at a higher rate than the central bank loan charges (Figure 2). The demand curve is also flat at the floor, because banks would be willing to borrow an infinite amount of reserves if the market rate were slightly below the floor rate. (They may lend [deposit] them to the central bank for an instant profit.) Between the ceiling and the floor, the demand curve is downward sloping. As the short rate declines, the opportunity cost of holding excess reserves declines, making banks willing to hold more reserves.

Between the ceiling and the floor, the supply curve is also upward sloping, because a higher rate induces banks with excess reserves to lend more to the market. At the ceiling rate, the supply curve becomes perfectly elastic because the central bank may supply an infinite amount of reserves at this rate, at least in theory. At the floor rate, banks are indifferent between supplying reserves to the market and keeping money idle at the central bank (receiving the floor rate). If the short rate is slightly below the floor rate, there would be no supply at all. Hence the supply curve at the floor rate is also flat (Figure 2).

Figure 3: Interest rate corridor with ample reserves.



4.4.1 Conventional Monetary Policy

In conventional central banking, the central bank uses open market operations to shift the supply curve so that the equilibrium market rate stays close to the target rate.

More practically, a central bank will estimate the quantity of reserves that will be demanded given the target rate and the quantity of reserves that will be supplied by other banks. If the quantity demanded at the target rate exceeds the supply, then the central bank injects the difference into the market by asset purchases or repo operations. If the supply at the target rate exceeds the demand, then the central bank withdraws the difference from the market by asset sales or reverse repo operation.

As experience accumulates over time, the central bank can learn to estimate the gap between supply and demand at the target rate fairly accurately. Of course, even if the central bank fails to get an accurate estimation, the existence of the corridor ensures that the market rate does not go out of the bounds.

4.4.2 Unconventional Monetary Policy

Since the 2008 Global Financial Crisis, most of the developed countries have been conducting unconventional monetary policies. A key characteristic of the unconventional monetary policy is the ample supply of reserves. We may call such a monetary policy framework the *ample-reserves regime*.

Under the ample-reserves regime, the central bank makes sure that the supply curve crosses the demand curve at the floor rate, which coincides with the target rate (Figure 3). Note that the floor rate can be negative. For example, the floor rate in the Eurozone is the interest rate on the deposit facility (DF). As of November 2020, the DF rate is –0.5%.

In the age of ample reserves, the corridor system reduces to the floor system. And the floor rate becomes the most important policy instrument. In comparison, OMO becomes less important because its job reduces to one that only ensures ample reserves. In the US, the IOR has become the key policy instrument.

4.5 Monetary Policy Rule

A monetary policy rule characterizes how a central bank responds, by manipulating the target variable, to changes in economic conditions. Note that central banks do not generally follow any policy rule. But their responsiveness to changing economic conditions leads to an *empirical* relation between the target variable and economic objectives such as inflation and unemployment. If such a relationship is relatively stable over time, the rule may give some guidance for central bankers.

The most well-known monetary policy rule is the Taylor rule, which was proposed by John B. Taylor in 1993. According to the Taylor rule, the target interest rate (e.g., the federal funds rate in the US) responds to the inflation gap and the output gap in the following fashion:

$$i_t = \pi_t + r^* + \theta_\pi(\pi_t - \pi^*) + \theta_y(y_t - \bar{y}), \tag{1}$$

where i_t is the target rate, π_t is the inflation rate, r^* is the *natural rate of interest* that we will discuss shortly, π^* is the inflation target, y_t is the logarithm of the total output, $\bar{y}$ is the logarithm of the potential output, and θ_π and θ_y are constants measuring how the monetary authority would respond to the inflation gap $(\pi_t - \pi^*)$ and the output gap $(y_t - \bar{y})$, respectively.

The natural rate of interest, r^*, or neutral rate of interest, was invented by the Swedish economist Knut Wicksell, who defines the natural rate of interest as a real short-term rate that makes output equal to potential (natural) output with constant inflation. If the Taylor rule in (1) is perfectly effective, in the sense that it keeps the economy at the state of zero output gap and zero inflation gap, then r^* will be the prevailing real interest rate in such a perfect economy. The natural rate of interest is unobservable. Taylor assumed that $r^* = 2\%$ for the US economy.

Both θ_π and θ_y should be positive. By specifying $\theta_\pi > 0$, the Taylor rule says that the central bank should raise the target interest rate faster than inflation. For example, if $\theta_\pi = 0.5$ and inflation rises by 1%, then the central bank should raise the target rate by 1.5%. The idea that the nominal interest rate should rise faster than inflation (to effectively control inflation) is often called the *Taylor principle*.

If both θ_π and θ_y are positive, then the Taylor rule also achieves a trade off between two conflicting objectives. An expansionary monetary policy leads to a higher output (or employment) at the cost of higher inflation. If we fix $\theta_\pi = 0.5$, then the parameter θ_y controls how much weight to put on output or employment. The smaller θ_y, the lower weight on output or employment. If $\theta_y = 0$, then the

Taylor rule reduces to a strict version of inflation targeting that pays little attention to the output (employment) gap.

4.6 Monetary Policy Transmission

In the previous chapter, we discussed two traditional channels of monetary policy transmission. The first is the interest rate channel implicit in the closed-economy IS-LM model: Monetary expansion leads to a decline of the interest rate, which stimulates the investment. The second is the exchange rate channel implicit in the small open-economy with a floating exchange rate: Monetary expansion devalues the domestic currency, which stimulates the net export.

In reality, even the interest rate channel is not as simple as the IS-LM model describes. Through either open-market operations or policy rate adjustments, the monetary authority directly influences short-term interest rates in the money market. And changes in short-term interest rates transmit to the real economy via multiple channels.

First, the short rate influences banks' deposit and lending rates. The money market is an alternative source of funding for banks. A lower money market rate induces banks to offer lower deposit rates for savers and lower lending rates for borrowers. Lower deposit rates encourage consumption, and lower lending rates encourage investment financed by bank lending. Conversely, higher deposit rates lead to more savings and less consumption and discourage investment financed by band loans.

Second, the short rate influences the risk appetite of financial institutions. Institutions such as insurance companies and pension funds usually have relatively rigid built-in expectations about the return to capital. For example, pension funds usually target an annual return of 7–8%. Other institutions, under shareholders' pressure on short-term performance, may also fall victim to such rigid expectations. A low short rate thus often compels financial institutions to "hunt for yield" by taking more risks. Consequently, banks may make risky loans to small businesses that are willing to pay higher interest rates. And institutional investors may scramble to buy risky corporate bonds, making bond financing cheap for risky investments. Conversely, a higher short rate discourages risk taking.

Third, the short rate influences asset prices. A lower short rate leads to higher prices of not only risky bonds but also almost every other asset. To understand this, note first that a lower short rate corresponds to a lower discount rate for future cash flows, which translates into a higher asset price, the present value of the future cash flows. Furthermore, a low short rate also corresponds to an abundant supply of liquidity, which encourages speculations in the financial markets. Higher liquidity itself elevates asset prices since it makes investors feel safe holding the assets.

Rising stock and housing prices would have "wealth effects" on consumers. Con-

sumers who feel richer may increase spending. The housing price is particularly important. A rising housing price may encourage the purchase of houses, which would lead further to spending on durable household goods. Rising asset prices also relax borrowing constraints on businesses. Assets, whether financial or real (land, houses, etc.), are collaterals for borrowing. Higher asset prices imply higher borrowing power.

Conversely, a higher short rate leads to lower asset prices, which make consumers feel poorer and, thus, reduce consumption. In particular, a declining housing price discourages housing purchases and depresses the consumption of household durables. Lower asset prices also lead to worsening credit conditions for businesses due to the lower value of collaterals.

Last but not least important, the actions and forward guidance of the monetary authority directly change the expectation of consumers and businesses. First, a change in the market expectation of future interest rates immediately affects the current long-term interest rates. For example, if the central bank pledges to keep the short rate at a low level for a long time, then the long-term interest rate will decline immediately. Second, the monetary authority may guide the market expectation toward an equilibrium of stability. The presence of expectation often gives rise to the problem of *multiple equilibria*, some of which may be undesirable. For example, if people expect inflation to rise substantially, then substantial inflation will realize as a result of hastened purchases and hoarding. This phenomenon is also known as *self-fulfilling prophecy*. If, however, the monetary authority pledges to maintain price stability and if the pledge is credible, then the market expectation will be anchored for the good low-inflation equilibrium.

The preceding discussion on the transmission of monetary policy is by no means exhaustive. Monetary policies may have more subtle ways to influence the economy. Furthermore, different channels of transmission may reinforce each other dynamically. For example, lower deposit and lending rates stimulate spending on consumption and investment, contributing to higher inflation expectation. The elevated inflation expectation, in turn, contributes to a lower real interest rate, stimulating consumption and investment.

5 Financial Stability

As Hyman Minsky argues, financial instability often underlies the instability of a modern economy. To stabilize the economy, the government must keep an eye on the health of the financial industry. When a financial crisis erupts, the government often has to intervene and acts as the savior. And to prevent the next crisis, the government has to strengthen regulation and oversight. The former role is known as the *lender of last resort*, and the latter is essentially what *macroprudential policy* is all about. Both responsibilities, in most countries and at least partly, falls on the

monetary authority.

5.1 Lender of Last Resort

Financial crises usually involve "runs" on financial institutions. For example, panic savers may want to withdraw deposits from banks. If all savers do this, even healthy banks will go bankrupt. Such *bank runs* can also happen to other modern financial institutions such as investment banks, insurance companies, and so on, which rely on short-term financing. If the market suspects the viability of an institution, then no one will be willing to lend to the institution. Even if the institution is otherwise healthy, it will fail due to the lack of liquidity. Under such circumstances, only the central bank is able to intervene and perform the role of the lender of last resort.

Indeed, after Lehman Brothers failed during the 2008 Global Financial Crisis, other investment banks and insurance companies also became suspect. Even Goldman Sachs and Morgan Stanley, the last two US investment banks, suffered from "runs." In response, the Fed introduced several short-term credit and liquidity facilities to help stabilize markets. And Goldman Sachs and Morgan Stanley were heavy users of these facilities.

The possibility of central bank assistance, however, may encourage financial institutions to take excessive risks, paving the way for future crises. This problem is known as *moral hazard*. Managers may go out of their way to expand the balance sheet, hoping that their institutions to become "too big to fail."

Aware of the moral hazard problem, the central bank may make it clear that it won't save those institutions that have taken excessive risks. However, when a crisis does happen, refusing to be the lender of last resort may become a choice too costly to the financial market and the economy. This problem is an example of *time inconsistency*. The central bank is in a similar position as a stern father who threatens to spank his kid severely for certain misbehavior. But when the kid does misbehave, the father may have to scale down the punishment, possibly under the pressure of the mother and the grandparents.

5.2 Macroprudential Policy

Macroprudential policies refer to rules and actions that promote the stability of the financial system as a whole. In contrast, we may call supervisory or regulatory policies for individual financial institutions "microprudential policies."

We may define the stability of the financial system as the absence of systemic vulnerabilities, which may include asset bubbles, excessive risk taking by banks, excessive debt (households, corporations, local governments), and so on. It is challenging, if not impossible, to ensure the persistent stability of the financial system. Too often, an emerging bubble is indistinguishable from healthy accommodation to

economic expansion. The ever-evolving shadow banking makes it even more difficult to identify problems. Even when problems are identifiable, intervention at an early stage may be politically infeasible. Groups who benefit from asset and credit bubbles may criticize the macroprudential authority for being excessively active, threatening economic freedoms. Often it is too late when the macroprudential authority identifies a systemic vulnerability and decides to act on it. And the action to stop a bubble often causes the bubble to burst. China's stock market panic in 2015 provides a vivid example.[9]

5.2.1 Rules on Leverage

The macroprudential policy may take the form of rules on the maximum leverage financial institutions can take. For example, the macroprudential authority (domestic or international) typically imposes a capital adequacy requirement on commercial banks. That is to say, banks must set aside enough capital buffers for negative shocks. A required reserve ratio serves a similar purpose as the capital adequacy requirement, limiting the leverage of banks' lending business.

There are also rules on leverage that apply to individuals or households. The macroprudential authority typically imposes a minimum margin requirement for margin trading of stocks. Brokers must apply the minimum rules to customers, but they are free to apply more stringent requirements.

The macroprudential authority may also set a minimum down-payment ratio for home buyers. For example, China requires first-time home-buyers to make down payments of at least 30%, and, in some cities, the second-time home-buyers must make down payments of at least 70%. The down-payment requirement effectively reduces the average leverage of home buyers.

For consumer loans in general, the authority may also set a cap of the debt-payment-to-income ratio. In the US, the Consumer Financial Protection Bureau (CFPB) sets a cap of 43% for the debt-payment-to-income ratio, which is the total monthly debt payments divided by the gross monthly income. In China, banks have an implicit cap of 50% for the debt-payment-to-income ratio.

5.2.2 Financial Market Entry

The macroprudential policy may also take the form of restrictions on market entry. For example, in most countries, a new bank has to obtain a license to operate. Licensing requires the attainment of some minimum standards on financial and operational soundness. The license can be expensive, meaning that the process of obtaining one is difficult, especially for nationwide operations. An expensive license acts as an ultimate threat to the new bank. If it behaves irresponsibly, then the authority may revoke the license.

The market entry restriction on financial institutions, and financial regulation in general, is justified by the fact that the financial industry exhibits externality due to its interconnected nature. Banks lend to each other. Insurance companies write insurances (on bonds and companies) that other financial firms trade and hold. And investment banks are counterparties to almost all other financial firms. One bank's default risk, thus, is another's counterparty risk. One bank's default may lead to the collapse of the entire financial system, as shown in Lehman Brother's downfall in 2008. Therefore, the social cost of one bank's default far exceeds the costs to the shareholders of the bank, hence the externality. Left to their own, shareholders of financial firms will take more risk than a benevolent social planner would allow.

5.2.3 Limiting Speculations

The macroprudential policy may also take the form of restrictions on speculation. The stock market and housing market are particularly prone to speculative bubbles, thanks to the visibility and accessibility of the two markets to retail investors. Speculative bubbles are usually the product of word-of-mouth feedback loops. An initial rise in asset price attracts new retail investors into the market. Their entry pushes the asset price even higher, attracting even more investors into the game. This a positive feedback loop that the policymakers want to break.

Stock Market

In the stock market, retail investors have neither the ability nor patience to analyze businesses. They contribute nothing to the market but liquidity. The marginal benefits of increased liquidity to "price discovery" may quickly decline to zero as the army of retail speculators rush into the market. As more money chases the limited supply of stocks, the stock prices soar far above the level that the fundamentals can sustain. The feedback loop requires, however, a continuous flow of new money into the market. When almost everyone has entered and has been talking passionately about stock picks, days of the bull market would be numbered. When the market crashes, the wealth of a large population will be damaged, leading to a sudden contraction of aggregate consumption. If there are not many retail investors, then the impact of a stock crash on consumption will not be as big.

It is, thus, desirable from the perspective of a benevolent social planner that the access to stock speculation should be restricted to a limited circle, just like the access to casinos should be limited. The "every man a speculator" culture is not good for the economy, whether "bears" or "bulls" dominate the stock market. Gambling in the stock market does not require any special knowledge or expertise. So almost everyone from any occupation can participate, with a strong emotional satisfaction that derives from the gambling instinct in human nature. The emotional satisfaction is the strongest during the bull market, where the pleasure of making money quickly and the satisfaction of the gambling instinct reinforce each other. The term "stock

mania" accurately describes such a state of mass mental disease. When a stock mania captures a substantial portion of the population, human capital as a whole is subject to a hit. It is a waste of human capital for every man to become a speculator because it is against the principle of division of labor.

To limit stock speculation, the government may tax stock transactions. For example, China levies a small stamp tax on stock transactions. More potently, the government may tax capital gains, especially short-term capital gains. In the US, short-term capital gains are taxed at the investor's ordinary income tax rate, with the definition of "short-term" being a year or less. Long-term capital gains are taxed at a lower rate. Note that such taxes on transactions or capital gains are extremely unpopular. The financial industry is clearly in opposition to any such taxes. So are retail investors, though they as a whole lose money in the stock market almost all the time.

For more dangerous types of trading, such as margin trading, futures, options, and so on, the government may impose minimum eligibility requirements. For example, to qualify for opening a margin account in China, investors should have tradable securities or cash worth at least 500,000 CNY. The eligibility requirements often include a minimum understanding of the risks involved in trading. But this is just part of the paperwork. Brokerages are more than happy to open whatever accounts for investors as long as they satisfy the minimum financial requirements.

Housing Market

The feedback loop in the housing market can be even stronger than in the stock market. The rise of housing prices not only attracts but also scares new buyers into the market. Unlike stocks, houses are real assets that everyone has to live in, either owning or renting one. And the quality of housing directly determines the quality of living. Especially in countries where home-ownership is treasured and envied, purchasing a home is almost a necessary investment. Young couples who are waiting for marriage, for example, cannot wait to buy a home when they find that housing prices are rising.

Furthermore, investment in homes has built-in leverage. Even a down payment of 30% implies a leverage ratio of more than three. When housing prices rise, thus, the wealth of homeowners rises dramatically. This serves an irresistible word-of-mouth advertisement for home purchases. Even in countries where land supply is elastic (e.g., the US), housing prices can rise fast as speculative demand surges, as illustrated in the housing bubble of the US in 2004–2006. In countries where land supply for home-building is relatively inelastic, say, due to regulation of land use, speculative demand can easily send housing prices sky high.

When housing prices are rising, the economy can easily overheat. First, to satisfy speculative demand, housing developers cannot wait to build more homes. Residential construction competes for resources from other sectors, leading to a larger share of residential construction in GDP. Second, home purchases lead to

demand for home renovation and household durable goods. Finally, the wealth effect of rising housing prices leads to consumption booms in general.

When housing prices start to decline, however, all these sources of demand will disappear. Furthermore, the leverage in home purchasing will start to bite the households that take too much debt and the whole economy. Since the house is usually the biggest asset for a household, the decline of housing value can easily make the "net worth" of household negative. In countries where personal bankruptcy is not allowed, people have to cut consumption, so as to "save out of" the negative net worth. In countries where personal bankruptcy is convenient, people may choose to foreclose their home en masse. This would cause trouble for banks and other financial institutions that hold mortgages, mortgage backed securities (MBS), or other derivatives on home mortgages. The 2008 subprime mortgage crisis of the US was a vivid example.

To limit speculations in the real estate market, governments around the world have introduced various measures. There are numerous kinds of transaction taxes, such as stamp tax, capital gain tax, and so on. There is also the property tax that affects the "carry cost" of property holding. Note that the major objective of the property tax is not macroprudential but financing the government, especially the local government. And there are outright restrictions on home purchases and mortgage loans. China offers many examples of such policies.

6 Concluding Remarks

The most important job of stabilization policies is to keep the system robust so that it can withstand shocks, which will always come. Due to various imperfections discussed in Chapter 5, the real-world market is far from self-correcting. In particular, the financial market, if left alone, may become so fragile that a small shock is enough to crash the whole system. History tells us that the ultimate "correction" in the form of financial and economic crises is too costly for the society. Thus, it is the responsibility of the government to install fiscal automatic stabilizers and conduct macroprudential policies.

As mentioned earlier, macroprudential policy is difficult. Rapid asset price inflation is not necessarily an emerging bubble, which is often indistinguishable from a healthy reaction to economic expansion. The ever-evolving shadow banking makes it even more difficult to identify problems. It thus requires professional expertise on the part of regulators to identify and solve problems at the early stage. But professional expertise is expensive, and capable regulators, who are typically low-paid public servants, may easily be recruited by the financial industry. Furthermore, regulators often have to overcome political resistance to take early actions on an emerging bubble since those who benefit from bubbles will always oppose them. It remains a great challenge for governments around the world to build an effective

macroprudential authority.

Notes

[1]Wei Zheng (魏徵, 580–643) is a famous advisor to Emperor Taizong of Tang.“备豫不虞，为国常道”，唐·吴兢《贞观政要·纳谏》载魏征语。

[2]This view was first proposed by Abba Lerner (1943), Functional Finance and the Federal Debt. Social Research, 10, 38-51.

[3]For example: Barro, Robert J. (1974), Are Government Bonds Net Wealth? Journal of Political Economy. 82 (6): 1095–1117.

[4]Tobin, James (1972), Inflation and Unemployment, American Economic Review, 62, 1–18.

[5]Yi Gang (the governor of the People's Bank of China), 2021, China's Interest Rate System and Market-Based Reform of Interest Rate, Financial Research (in Chinese), 495 (9), 1-11.

[6]Ihrig, Jane, and Scott Wolla (2020). "Let's close the gap: Revising teaching materials to reflect how the Federal Reserve implements monetary policy," Finance and Economics Discussion Series 2020-092. Washington: Board of Governors of the Federal Reserve System.

[7]Odysseus is the hero of Homer's epic poem the Odyssey. He went through a committed journey back home, an "Odyssean journey", and reasserted himself as the rightful king of Ithaca.

[8]Delphi is the ancient Greek sanctuary for the oracle who was consulted about important decisions such as whether to wage a war.

[9]Qian, Junhui, 2016, The 2015 Stock Panic of China. SSRN Working paper available at `dx.doi.org/10.2139/ssrn.2795543`.

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